Size matters

First global ranking of metropolitan areas

pwc

July 2017
First global ranking of agglomerations

**Research objectives:**

1. What is the role of agglomerations in world development?
2. What is the role of agglomerations in countries’ development? (ranking of growth dynamics of world agglomerations)
3. What is the potential for development of largest agglomerations? (ranking of efficiency of agglomerations)

**Key question of research:**

“Agglomerations – resource devourers or drivers of growth?”

**Structure of report short version**

**Section 1.**
Determining the role of agglomerations in world development: contribution of agglomerations to socio-economic development of the world

Page 7

**Section 2.**
Ranking of growth dynamics of Top 20 agglomerations: comparing agglomerations’ to countries’ level of development

Page 13

**Section 3.**
Ranking of efficiency of Top 10 agglomerations: detailed comparison of agglomerations between each other by development factors

Page 29

**Factors for agglomeration development**

- Specialisation
- Lower transaction costs
- Concentration of intellectual capital
- Higher living standards
- Balanced housing and transport systems

**Agglomerations or Metropolitan areas** represent large urbanised areas that generally consist of a core and a periphery characterised by a high population density and well-developed transport network.

**Agglomerations**

- London agglomeration
- Sydney agglomeration
- Paris agglomeration
- New York agglomeration
- Tokyo agglomeration
- Shanghai agglomeration
- the Moscow agglomeration
- Seoul agglomeration
- Buenos Aires agglomeration

**PwC**

July 2017
### Key conclusions on agglomeration ranking outcomes

<table>
<thead>
<tr>
<th>Factors for agglomeration development</th>
<th>Key conclusions on the chapter</th>
<th>Key conclusions for the Moscow agglomeration</th>
<th>Page</th>
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</thead>
<tbody>
<tr>
<td>Agglomerations – 2030</td>
<td>By 2030, seven out of ten city dwellers or 24% of the world population will live in largest agglomerations of more than 1.5 million inhabitants.</td>
<td>For 11 out of 13 development indicators, the Moscow agglomeration outperforms Russia by a large margin.</td>
<td>Page 9</td>
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<tr>
<td>Agglomerations are drivers of country’s growth</td>
<td>Agglomerations are territories of outperforming growth. Agglomerations outperform the countries where they are located by the majority of indicators (11/13).</td>
<td>Each 10 residents of the Moscow agglomeration create 2 jobs in regions of Russia owing to high level of consumption.</td>
<td>Page 13</td>
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<tr>
<td>Agglomerations’ influence areas</td>
<td>Significant volume of consumption in an agglomeration stimulates development of other country’s territories.</td>
<td>For the last 15 years labour productivity in the Moscow agglomeration in industrial manufacturing has been growing 1.7 times faster than in other agglomerations, in financial and business services – 1.2 times, in public services – 3 times.</td>
<td>Page 29</td>
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<tr>
<td>Financial and business services sector</td>
<td>Financial and business services sector is a key one in the agglomeration’s economy, but the highest growth of labour productivity is seen in the manufacturing industry.</td>
<td>The Moscow agglomeration is the leader by creative sector growth rates (+22% a year) among the compared agglomerations.</td>
<td>Page 31</td>
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<tr>
<td>In most agglomerations, the gross value added growth rates generated by the creative sector for the last 5 years outperformed growth rates for the rest of the economy.</td>
<td>The Moscow agglomeration is the leader by creative sector growth rates (+22% a year) among the compared agglomerations.</td>
<td>Page 33</td>
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<td>In agglomerations of developed countries, the labour market is more balanced - it is easier to find scarce specialists here than averagely in the country.</td>
<td>Labour surplus in the Moscow agglomeration helps specialists with no demand find a job faster than in most other agglomerations.</td>
<td>Page 35</td>
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<td>High concentration of resources in largest agglomerations creates optimal conditions for doing business.</td>
<td>The business activity in the Moscow agglomeration is one of the highest (72 enterprises per 1,000 people).</td>
<td>Page 37</td>
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<td>Concentration of universities in agglomerations improve their efficiency due to high intensity of communications.</td>
<td>The Moscow agglomeration shows good dynamics of scientometric indicators of universities and high level of school leavers’ competence.</td>
<td>Page 39</td>
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<td>In agglomerations, better quality of medical services is provided through concentration of resources, professional staff and access to high technologies</td>
<td>The Moscow agglomeration has a fairly effective health care system with significant differences between Moscow and the Moscow region</td>
<td>Page 41</td>
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<td>High concentration of economic activity reduces the transport accessibility and has a negative impact on the labour productivity.</td>
<td>For the last 8 years traffic congestion in Moscow has reduced by 4% unlike in other cities where the congestion and time losses have significantly grown.</td>
<td>Page 43</td>
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<td>Uneven spatial distribution of residents within an agglomeration gives rise to considerable fluctuations in the cost of housing.</td>
<td>The Moscow agglomeration has high concentration of economic activity in the core, which is one of the reasons for a significant difference in the cost of housing in the agglomeration’s core and periphery.</td>
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</table>
Contribution of largest agglomerations to global development by 2030:
The contribution of agglomerations to the socio-economic development of the world
By 2030, the centres of global urban economy will shift into Africa and Asia. Such agglomerations as Lagos (Nigeria) and Kinshasa (Democratic Republic of Congo) will nearly double and reach the size of the Moscow agglomeration.

(PwC modelling based on the data on population provided by UN)

- The Moscow agglomeration will remain the largest in Europe with its population of above 20 million people.
- Delhi agglomeration will have 36 million residents almost equaling the population of Tokyo agglomeration, the world’s largest agglomeration today (37 million people). The population of Shanghai, Mumbai, Beijing and Dakka agglomerations will also approach 30 million people.
- By 2030, seven out of ten city* dwellers or 24% of the world population will live in largest agglomerations of more than 1.5 million people.
- Largest agglomerations’ residents will create USD 4 out of 10 of the global GDP. The same amount will be contributed into the global GDP by 66% of the global population living in towns and villages.

*Cities with population over 300,000 people

Factors for agglomeration development

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<tr>
<th>Population, 2030, million people</th>
<th>Average annual growth, 1950-2030</th>
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<tr>
<td>10</td>
<td>&lt; 1%</td>
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<td>20</td>
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<td>30</td>
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<td>37</td>
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<tr>
<td>40</td>
<td>6 - 11 %</td>
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Sources: United Nations, PwC estimates

July 2017
Asian agglomerations’ economies will develop due to the growth of labour productivity. Economies of North America and Africa – due to the growth of population.

- By 2030, the cities will become polarised on the world map – the population of medium-sized agglomerations will gradually decline – only towns and major agglomerations will remain.
- By 2030, the share of largest agglomerations in the global GDP will increase from 38% to 43%. The compound annual growth rates will be 1 pp higher than the average global growth rates (3.7% against 2.9%).
- The GDP growth in largest agglomerations will be attributed (by 60%) to the growth of their population and (by 40%) to the growth of labour productivity.
- Over the next 15 years, the Moscow agglomeration’s GDP will grow by 27%; the annual growth rates will be 1.6%. The GDP will grow by 84% due to the growth of labour productivity and by 16% due to the growth of population.

### Changes in the regions' GDP by types of settlements, CAGR %, 2016-2030

- **Major agglomerations**: >1.5 million
- **Large agglomerations**: 0.5-1.5 million
- **Medium-sized agglomerations**: 0.3-0.5 million
- **Towns**: <0.3 million

#### Agglomerations and cities of North America

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<tr>
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<th>Major</th>
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#### Agglomerations and cities of Europe

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#### Agglomerations and cities of Africa and Middle East

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#### Agglomerations and cities of Asia and Australia

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</table>

Sources: Oxford Economics, Euromonitor, LSE, Brookings, United Nations, PwC estimate.

July 2017
Agglomerations are territories of outperforming growth. Ranking of Top 20 agglomerations:

Comparison of the level of development of agglomerations and countries
**Agglomerations are drivers of national growth. For 11 out of 13 indicators, agglomerations outpace the countries where they are located**

### Excess of agglomerations’ development indicators over their countries

- **+3 migrants per 1,000 people**
- **+6 students per 1,000 people**
- **-69 residents of non-working age per 1,000 people**
- **+2.3 pp in the share of foreign students**
- **+0.5 pp of population growth**
- **<1 death per 1,000 inhabitants**
- **0 pp of the Gini coefficient**
- **+0.3 pp of GDP growth**
- **+20 employed per 1,000 people**
- **+USD 4,700 of average household income**
- **+12 pp of population using personal computers**
- **+2.2 pp of population using mobile phones**

### Ranking of Top 20 agglomerations:

<table>
<thead>
<tr>
<th>#</th>
<th>Name</th>
<th>Position</th>
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<tbody>
<tr>
<td>1</td>
<td>Beijing</td>
<td>1</td>
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<tr>
<td>2</td>
<td>Moscow</td>
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<td>2</td>
<td>Shanghai</td>
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<td>Tokyo</td>
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<td>3</td>
<td>Paris</td>
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<td>20</td>
<td>Dusseldorf</td>
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</table>

### Factors for agglomeration development

- The ranking aims at singling out the agglomerations which demonstrate the best growth dynamics compared to their countries.
- The Moscow agglomeration largely outperforms Russia by 11 of 13 indicators, including: growth of GDP (1.4 pp), population (1.2 pp) and migration (8 migrants per 1,000 people) and by the level of technology availability.
- Only Beijing agglomeration is ahead of the Moscow agglomeration scoring 12/13.
Over the past 10 years, agglomerations have been growing faster than countries

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<td></td>
</tr>
</tbody>
</table>

* Some of the agglomerations’ indicators are not available for comparison with the country. The total number of indicators is less than 13

Agglomeration is worse than the country
Agglomeration is better than the country

July 2017
Agglomeration cores in most cases show better dynamics than agglomerations as a whole

The economy of agglomerations grows 0.3 pp faster than the economy of countries.

The average GDP dynamics of agglomerations’ cores, agglomerations and other regions in 2004-2013**

Average GDP dynamics of agglomerations’ cores, agglomerations and other regions in 2004-2013**

In agglomerations, the households’ income from 2001 to 2016 grew by USD 4,700 compared to the nation’s population.

Households’ Income growth in agglomerations’ cores, agglomerations and countries, %, 2001-2016**

Despite a high income level in agglomeration’s core, the segregation is lower in the core than in the periphery. The segregation is higher in the periphery, because, on the one hand, migrants with lower income level move to peripheries, on the other hand, there are rich districts.

The Gini coefficient in agglomerations and countries is on the same level.

Gini coefficient in agglomerations and countries, 2016**

Average annual GDP change dynamics, 2004-2013*

Average annual dynamics of change in household income, 2001-2016*

Distribution of total income by household categories (Lorenz curve), 2016*

*Diagram provided for Top 20 agglomerations

**Diagram provided for Top 10 agglomerations

July 2017
Agglomerations are more attractive, because they create more job opportunities

Population growth in agglomerations is 0.5 pp faster than in countries on average.

In agglomerations, migration growth in agglomerations is higher than in countries – 3 migrants per 1,000 people on average.

In agglomerations and cores, the dependency ratio is lower than in country as a whole, which is likely a result of the inflow of young migrants and students into agglomerations.

Agglomerations are more attractive in terms of work conditions than the country, which is reflected in the higher growth of employed people per 1,000 people – by 20 more people.

*Diagram provided for Top 20 agglomerations
**Diagram provided for Top 10 agglomerations

Factors for agglomeration development

Average population dynamics of agglomerations' cores, agglomerations and other regions, 2001-2016**

Average migration growth in agglomerations' cores, agglomerations and countries per 1,000 people, 2010-2015**

Average dependency ratio in agglomerations' cores, agglomerations and countries, unemployed people per 1,000 employed people, 2016**

Employed people growth per 1,000 people ratio in agglomerations' cores, agglomerations and countries, 2001-2016**
Factors for agglomeration development. Ranking of Top 10 agglomerations:

Detailed comparison of agglomerations among themselves in terms of development factors
**The Moscow agglomeration is the leader in the group of developing countries’ agglomerations**

### Approach to analysing Top 10 agglomerations

In our further analysis, we have set the following objectives:

a) to disprove one of the theses alleging that agglomerations are inefficient and "devour resources";
b) define factors of agglomeration development;
c) rank agglomerations which have implemented these factors to maximise their effectiveness.

For this purpose, we have:

a) defined agglomerations’ areas of influence on countries’ regions;
b) elaborated six factors for agglomeration development that, together with influence areas, helped compile the ranking of Top 10 agglomerations (except the factor "Governance").

With regard to each factor, we determined the key areas for analysis and manually collected an extensive list of indicators for 10 agglomerations for comparison.

### Ranking outcomes: positions of the Moscow agglomeration

**The Moscow agglomeration leads by:**

- intellectual capital (education);
- creative sector;
- transaction costs;
- areas of influence (created jobs outside the agglomeration).

**falls behind the group leaders by:**

- labour productivity and income level (devaluation of ruble and lower parameters of the Moscow Region considerably lowered the positions of the Moscow agglomeration);
- level of transport development - high concentration of economic activity has a negative impact on the transport accessibility and labour productivity;
- level of housing affordability (low housing supply and high mortgage rates make the housing less affordable for the population).

<table>
<thead>
<tr>
<th>Final ranking</th>
<th>Specialisation</th>
<th>Transaction costs</th>
<th>Intellectual capital</th>
<th>Quality of life</th>
<th>Transport and housing</th>
<th>Influence on the country's economy</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Labour productivity</td>
<td>Average income</td>
<td>Inbalances in labour market</td>
<td>Creative sector</td>
<td>Business conditions</td>
<td>Education</td>
</tr>
<tr>
<td>I</td>
<td>1</td>
<td>2</td>
<td>4</td>
<td>4</td>
<td>3</td>
<td>2</td>
</tr>
<tr>
<td>II</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>2</td>
<td>6</td>
<td>9</td>
</tr>
</tbody>
</table>

I - developed countries

II - developing countries

---

*July 2017*
**Each 10 residents of the Moscow agglomeration create 2 jobs outside the agglomeration owing to high level of local consumption**

**Structure of agglomeration consumer expenditures, 2016**

<table>
<thead>
<tr>
<th>Category</th>
<th>Sydney</th>
<th>Moscow</th>
<th>New York</th>
<th>Beijing</th>
<th>Shanghai</th>
</tr>
</thead>
<tbody>
<tr>
<td>Expenses for food and beverages (including alcohol and tobacco)</td>
<td>13%</td>
<td>7%</td>
<td>16%</td>
<td>33%</td>
<td>30%</td>
</tr>
<tr>
<td>Clothes purchases</td>
<td>7%</td>
<td>6%</td>
<td>10%</td>
<td>5%</td>
<td>10%</td>
</tr>
<tr>
<td>Expenses for durable goods</td>
<td>15%</td>
<td>9%</td>
<td>25%</td>
<td>16%</td>
<td>13%</td>
</tr>
<tr>
<td>Expenses for mandatory services (housing rent, transport, communication, healthcare, education)</td>
<td>29%</td>
<td>8%</td>
<td>25%</td>
<td>30%</td>
<td>44%</td>
</tr>
<tr>
<td>Nonessential service expenses (leisure time and other services)</td>
<td>28%</td>
<td>27%</td>
<td>34%</td>
<td>42%</td>
<td>35%</td>
</tr>
</tbody>
</table>

**Share of consumption of goods imported from other regions of a country, %**

<table>
<thead>
<tr>
<th>Agglomeration</th>
<th>Share of consumption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sydney</td>
<td>64%</td>
</tr>
<tr>
<td>Moscow</td>
<td>36%</td>
</tr>
<tr>
<td>New York</td>
<td>26%</td>
</tr>
<tr>
<td>Beijing</td>
<td>27%</td>
</tr>
<tr>
<td>Shanghai</td>
<td>39%</td>
</tr>
</tbody>
</table>

**Volume of goods imported from other regions of a country, thous. USD per 1 person, 2016**

<table>
<thead>
<tr>
<th>Agglomeration</th>
<th>Volume of goods imported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sydney</td>
<td>7,3</td>
</tr>
<tr>
<td>Moscow</td>
<td>4,2</td>
</tr>
<tr>
<td>New York</td>
<td>1,9</td>
</tr>
<tr>
<td>Beijing</td>
<td>1,6</td>
</tr>
<tr>
<td>Shanghai</td>
<td>1,3</td>
</tr>
</tbody>
</table>

**Consumption per 1 citizen of an agglomeration creates jobs outside the agglomeration**

<table>
<thead>
<tr>
<th>Agglomeration</th>
<th>Consumption per 1 citizen creates jobs outside the agglomeration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sydney</td>
<td>0,08</td>
</tr>
<tr>
<td>Moscow</td>
<td>0,04</td>
</tr>
<tr>
<td>New York</td>
<td>0,02</td>
</tr>
<tr>
<td>Beijing</td>
<td>0,09</td>
</tr>
<tr>
<td>Shanghai</td>
<td>0,03</td>
</tr>
</tbody>
</table>

**Volume of goods imported from foreign countries, thous. USD per 1 person, 2016**

<table>
<thead>
<tr>
<th>Agglomeration</th>
<th>Volume of goods imported</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sydney</td>
<td>1,2</td>
</tr>
<tr>
<td>Moscow</td>
<td>4,8</td>
</tr>
<tr>
<td>New York</td>
<td>4,6</td>
</tr>
<tr>
<td>Beijing</td>
<td>0,8</td>
</tr>
<tr>
<td>Shanghai</td>
<td>0,6</td>
</tr>
</tbody>
</table>

**Factors for agglomeration development**

- Consumer expenditures represent a key driver of economic growth.
  - A part of the goods consumed within an agglomeration is also produced here. The other part is imported from other country’s regions and from abroad. The more goods are imported from other regions and countries, the higher is the agglomeration’s influence on their economies.
  - Sydney (USD 7,300) and Moscow (USD 6,100) agglomerations have the most significant influence on a country’s economy, which is caused by a low share of consumption of domestic goods and goods imported from abroad. New York agglomeration, despite a low share of consumer goods (16%) in the total structure of consumption and relatively low share of consumption of goods imported from other country’s regions (36% of total consumer goods) also ranks third by this indicator (USD 4,200).
  - The Moscow agglomeration is the absolute leader by creation of jobs in country’s regions. 1 agglomeration resident ensures creation of 0.19 job outside the agglomeration. This is primarily a result of low labour productivity in other Russia’s regions.
  - Conversely, Sydney agglomeration with its significant influence in absolute terms ensures creation of only 0.08 jobs outside the agglomeration, which is caused by a high average level of labour productivity in Australia’s economy as a whole – less employees are required to create the required volume of goods.
  - The example of Chinese agglomerations – Beijing and Shanghai – is noteworthy for the fact that with the relatively low level of influence (USD 1,600 and USD 1,200, respectively), they ensure creation of more jobs outside the agglomerations (0.12 and 0.09 jobs) due to a lower level of labour productivity in the country as a whole.

*Source: Oxford Economics, PwC analysis*
The Moscow agglomeration annually imports goods worth USD 39 billion creating almost 3.5 million jobs in Russia’s regions.

The Moscow agglomeration*

Factors for agglomeration development

For the Moscow agglomeration, the turnover is specified for Moscow and other Russia’s regions, because the Moscow Region statistics service does not provide such data.

July 2017
Specialisation of agglomeration’s economy on the financial and business services sector stimulates the growth of labour productivity

### Average level of labour productivity, thousand USD, PPP, 2016

<table>
<thead>
<tr>
<th>Rank</th>
<th>Country</th>
<th>Core</th>
<th>Agglomeration</th>
<th>Country</th>
<th>Core</th>
<th>Agglomeration</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>N</td>
<td>176</td>
<td>47%</td>
<td>N</td>
<td>345</td>
<td>8%</td>
</tr>
<tr>
<td>2</td>
<td>Pa</td>
<td>129</td>
<td>39%</td>
<td>Pa</td>
<td>166</td>
<td>13%</td>
</tr>
<tr>
<td>3</td>
<td>L</td>
<td>122</td>
<td>34%</td>
<td>L</td>
<td>183</td>
<td>25%</td>
</tr>
<tr>
<td>4</td>
<td>Sy</td>
<td>113</td>
<td>47%</td>
<td>Sy</td>
<td>144</td>
<td>8%</td>
</tr>
<tr>
<td>5</td>
<td>M</td>
<td>99</td>
<td>37%</td>
<td>M</td>
<td>126</td>
<td>16%</td>
</tr>
<tr>
<td>6</td>
<td>T</td>
<td>91</td>
<td>41%</td>
<td>T</td>
<td>125</td>
<td>18%</td>
</tr>
<tr>
<td>7</td>
<td>Bu</td>
<td>99</td>
<td>37%</td>
<td>Bu</td>
<td>152</td>
<td>17%</td>
</tr>
<tr>
<td>8</td>
<td>I</td>
<td>83</td>
<td>31%</td>
<td>I</td>
<td>182</td>
<td>19%</td>
</tr>
<tr>
<td>9</td>
<td>T</td>
<td>73</td>
<td>28%</td>
<td>T</td>
<td>109</td>
<td>28%</td>
</tr>
<tr>
<td>10</td>
<td>Bu</td>
<td>56</td>
<td>21%</td>
<td>Bu</td>
<td>80</td>
<td>27%</td>
</tr>
</tbody>
</table>

**Average labour productivity by sectors, USD thousand, PPP, 2016**

<table>
<thead>
<tr>
<th>Sector</th>
<th>Core</th>
<th>Agglomeration</th>
</tr>
</thead>
<tbody>
<tr>
<td>Financial and business</td>
<td>161</td>
<td>94</td>
</tr>
<tr>
<td>Manufacturing</td>
<td>82</td>
<td>64</td>
</tr>
<tr>
<td>Trade</td>
<td>82</td>
<td>64</td>
</tr>
<tr>
<td>Social and public services</td>
<td>82</td>
<td>64</td>
</tr>
</tbody>
</table>

- In the Moscow agglomeration, the share of manufacturing industry in the economy is fairly low (17%). However, subject to the constant growth of labour productivity in the sector, it is important to continue development of Industry 4.0 purposing the improvement of the economy’s poise.

- The average labour productivity of Moscow (USD PPP 103,000), the agglomeration’s core, is above that of the Moscow Region (USD PPP 65,000), agglomeration’s periphery, by 37%. In the agglomeration, as a whole, – USD PPP 89,000.

- Despite the fact that the share of manufacturing sector in the economy has been reducing, its size considerably increased in 2001-2016 by all compared agglomerations (from 31% in Paris agglomeration to 595% in Buenos Aires agglomeration).

- Creative sector’s specialities will prevail in the structure of future economy - the Moscow agglomeration may concentrate on creation of new jobs in this area.

- In this regard, the application of the “smart specialisation” approach shall be deemed promising. This approach implies looking at the structure of the economy in terms of developing the “industries portfolio”. At the level of agglomerations, it is necessary to constantly think about their transformation at the next stages and, accordingly, as well as to adjust the educational programmes for the training of personnel.

*The financial and business services sector also includes creative industries (IT, engineering and other) which are characterized by as high added-value industries.

**The public services sector includes, among others, healthcare, education and social services, even if they are provided by private organizations.*
Creative sector is a new driver of economies’ growth centering in agglomerations

Average annual growth rate of gross value added (GVA) by sector, %, 2010-2015

Creative sector industries are one of the most dynamically growing sectors of economy.
- In most agglomerations, the gross value added growth rates generated by the creative sector for the last 5 years outperformed growth rates for the rest of the economy.
- The Moscow agglomeration’s creative sector growth rates (+22% a year) are 1.7 times above the dynamics of other sectors of economy (+13%).

Contribution of creative economy in agglomeration’s GDP and its ratio to national level, % of GDP, average value for 2010-2015

It is agglomerations who act like drivers of this growth and hubs for the national creative economy, concentrating creative industries there.
- Across all agglomerations, the creative economy’s share in GDP is much higher than at the national level: 1.4-3.4 times higher. The share of creative sector in the economy of studied countries stands at up to 6% of the GDP, while in agglomerations’ GDP structure it reaches 12%.

Main drivers for creative economy growth (% of GVA growth for 2010-2015)

The main driver for creative economy growth is information technology.
- Information technology provides almost half of the growth of creative economy’s GVA.
- The Moscow agglomeration demonstrated the most significant GVA growth in digital technology: +210% in 2010-2015 (RUB 105 billion in 2010 to RUB 323 billion in 2015).
In agglomerations of developed countries, the labour market is more balanced - it is easier to find scarce specialists here than averagely in the country.

<table>
<thead>
<tr>
<th>Developing countries</th>
<th>Place in ranking</th>
<th>Indicators for relative intensity of disproportion in scarce specialities in an agglomeration compared to a country</th>
</tr>
</thead>
<tbody>
<tr>
<td>Moscow</td>
<td>1</td>
<td>20</td>
</tr>
<tr>
<td>Beijing</td>
<td>2</td>
<td>11</td>
</tr>
<tr>
<td>Shanghai</td>
<td>3</td>
<td>17</td>
</tr>
<tr>
<td>New York</td>
<td>4</td>
<td>22</td>
</tr>
<tr>
<td>Sydney</td>
<td>5</td>
<td>9</td>
</tr>
<tr>
<td>Buenos Aires</td>
<td>6</td>
<td>40</td>
</tr>
<tr>
<td>Seoul</td>
<td>7</td>
<td>26</td>
</tr>
<tr>
<td>London</td>
<td>8</td>
<td>45</td>
</tr>
<tr>
<td>Paris</td>
<td>9</td>
<td>39</td>
</tr>
<tr>
<td>Moscow</td>
<td>1</td>
<td>20</td>
</tr>
</tbody>
</table>

Legend:
- Developing countries
- Place in ranking
- Indicators for relative intensity of disproportion in scarce specialities in an agglomeration compared to a country

Differences between the agglomeration and the country - the indicator demonstrates by what % the situation in the agglomeration is better than in the country. Positive number means that the agglomeration is better.

- Labour surplus in the Moscow agglomeration helps specialists with no demand find a job faster than in most other agglomerations.
- In agglomerations related to developed countries, the difficulty of finding a scarce specialist by the employer is lower than in the countries where they are located, i.e. it is easier to find such specialists in the agglomeration than in the country. Developing countries have the opposite results.
- Most agglomerations face the problem of increasing number of positions with no demand with toughening competition among highly-qualified specialists. The labour market can be rebalanced by retraining specialists holding surplus positions for work in fast growing industries, for example, creative sector industries.

- The scarcest (most in-demand) specialists are specialists in software design and development, mathematical analysis and experienced doctors in different practices. They show the least number of CVs per one vacancy.
- The least in-demand specialists are from the administrative sphere, banking sector and entertainment industry. These are first of all the positions which are disappearing as a result of automation and digitalisation.
High concentration of resources in largest agglomerations creates optimal conditions for developing business activity

### Business conditions, 2016

<table>
<thead>
<tr>
<th>Rank</th>
<th>Agglomeration</th>
<th>Number of enterprises (per 1,000 people)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Seoul</td>
<td>38.7</td>
</tr>
<tr>
<td>2</td>
<td>Tokyo</td>
<td>22.2</td>
</tr>
<tr>
<td>3</td>
<td>Moscow</td>
<td>21.4</td>
</tr>
<tr>
<td>4</td>
<td>Beijing</td>
<td>19.6</td>
</tr>
<tr>
<td>5</td>
<td>Shanghai</td>
<td>18.5</td>
</tr>
<tr>
<td>6</td>
<td>Paris</td>
<td>18.2</td>
</tr>
<tr>
<td>7</td>
<td>Buenos Aires</td>
<td>16.2</td>
</tr>
<tr>
<td>8</td>
<td>Moscow</td>
<td>16.0</td>
</tr>
<tr>
<td>9</td>
<td>Shanghai</td>
<td>14.6</td>
</tr>
<tr>
<td>10</td>
<td>Buenos Aires</td>
<td>12.9</td>
</tr>
</tbody>
</table>

### Number of enterprises (per 1,000 people), 2016

- Seoul: 38.7
- Tokyo: 22.2
- Moscow: 21.4
- Beijing: 19.6
- Shanghai: 18.5
- Paris: 18.2
- Buenos Aires: 16.2
- Moscow: 16.0
- Shanghai: 14.6
- Buenos Aires: 12.9

### The ratio between the number and average size of enterprises and the level of urbanisation, 2013

#### Number of enterprises (per 1,000 people)

- S. Korea: 184
- Australia: 103
- France: 28
- Japan: 72
- UK: 32
- China: 18
- USA: 39
- Sweden: 95
- Austria: 16

#### Ratio between the number and average size of enterprises

- S. Korea: x1.15
- Australia: x3.33
- France: x2.16
- Japan: x5.83
- UK: x3.74
- China: x2.12
- USA: x1.63
- Sweden: x0.65
- Austria: x1.55

### The ratio between the number of enterprises in an economy and business conditions in agglomerations, 2016

#### Number of enterprises (per 1,000 people)

- Seoul: 16
- Paris: 31
- Tokyo: 39
- Shanghai: 72
- Moscow: 28
- Buenos Aires: 32
- London: 18
- Sydney: 3
- New York: 1.15

#### Average size of enterprises

- S. Korea: 56
- Australia: 11
- France: 10
- Japan: 7
- UK: 6
- China: 7
- USA: 5
- Sweden: 6
- Austria: 5

### Factors for agglomeration development

- The Seoul agglomeration confidently leads the rating in terms of doing business thanks to:
  - higher consumer purchasing power;
  - lower office space rental, cost of electric power and salary level;
  - lower cost of borrowed capital;
  - minimum number of administrative procedures.

- The Moscow agglomeration as among the leaders by the business conditions (19.6 – 4/10), which is supported by one of the highest business activity indicators (72 enterprises per 1,000 people). The Moscow agglomeration leads by the level of consumer purchasing power and shows low cost of doing business.

- The higher the level of urbanisation, the higher the business activity in the country is. The size of agglomerations enable them to concentrate key resources required for doing business: first of all, human and financial resources.

- The Moscow agglomeration needs to implement consistent steps to increase the ease of doing business ranking: harmonise the legislation, reduce administrative procedures etc. Also, it is necessary to pay attention to the fund-raising for the businessmen.
Concentration of universities in agglomerations improve their efficiency due to high intensity of communications

Sydney agglomeration leads the ranking of agglomerations in education and science due to the high quality of applicants and students, and the openness of higher education.

The Moscow agglomeration is ranked fourth thanks to:
- good dynamics of the number of citations per article in 2012-2016 (84%);
- one of the highest scores at International School Olympiads (8.7 points per 1 million population);
- high share of foreign students and joint international articles.

The high quality of secondary education in the Moscow agglomeration is supported by the large number of points earned by pupils at International School Olympiads.

The Moscow agglomeration accounts for a half of the points earned by all agglomerations at the Olympiad in Linguistics and one fifth of all points at the Olympiad in Biology.

Factors for agglomeration development

PwC

July 2017
The Moscow agglomeration has a relatively efficient healthcare system with significant differences between Moscow and Moscow Regions.

### Ranking of agglomerations

<table>
<thead>
<tr>
<th>Final agglomeration index</th>
<th>Agglomeration comparison index</th>
<th>Country comparison index</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1,1</td>
<td>4,7</td>
</tr>
<tr>
<td>2</td>
<td>1,7</td>
<td>5,3</td>
</tr>
<tr>
<td>3</td>
<td>1,9</td>
<td>4,7</td>
</tr>
<tr>
<td>4</td>
<td>2,0</td>
<td>4,1</td>
</tr>
<tr>
<td>5</td>
<td>2,5</td>
<td>6,0</td>
</tr>
<tr>
<td>6</td>
<td>2,5</td>
<td>4,7</td>
</tr>
<tr>
<td>7</td>
<td>3,0</td>
<td>5,3</td>
</tr>
<tr>
<td>8</td>
<td>3,0</td>
<td>6,0</td>
</tr>
<tr>
<td>9</td>
<td>4,5</td>
<td>7,1</td>
</tr>
<tr>
<td>10</td>
<td>5,0</td>
<td>7,9</td>
</tr>
</tbody>
</table>

ПwC

### Mortality statistics, per 1,000 people

<table>
<thead>
<tr>
<th>Cardiovascular diseases</th>
<th>Oncological diseases</th>
<th>Mortality at working age</th>
</tr>
</thead>
<tbody>
<tr>
<td>0.8</td>
<td>1,3</td>
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High mortality rate for cardiovascular diseases in the Moscow agglomeration requires further improvement of aid at heart and brain attacks, and development of prevention and early diagnosis programmes.

### Availability of emergency medical care in agglomerations, min

The Moscow agglomeration has substantial reserves to improve the efficiency of emergency medical aid.

- The availability of emergency medical aid first of all can be raised through improving the performance of medical teams in Moscow Region.
- One of the levers to improve the efficiency of emergency aid in Moscow Region can be to create a network of remote ambulance stations and a system of dynamic relocation of medical teams so as to reduce the arrival time without building new stations by the example of Moscow.

The Moscow agglomeration is ranked five in the overall ranking. The key features of how the agglomeration’s healthcare system is organised are:

- The Moscow agglomeration significantly outperforms Russia’s average healthcare indicators.
- There are substantial differences in key mortality indicators, availability of medical aid and emergency medical aid between Moscow and Moscow Region.
High concentration of economic activity reduces the transport accessibility and has a negative impact on the labour productivity

### Factors for agglomeration development

<table>
<thead>
<tr>
<th>Average travel time to work*, min., 2016</th>
<th>Concentration of economic activity, %, 2016</th>
<th>Level of labour productivity, USD thousand, 2016</th>
<th>Comparing labour productivity for a model agglomeration with low and high concentration of economic activity</th>
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The more evenly the jobs are distributed across an agglomeration, the lesser time the residents spend to get to work and the higher the labour productivity is.

- In **Beijing and Shanghai agglomerations**, where the average travel time to work is the highest and, on average, amounts to more than 45 minutes, the bulk of jobs is concentrated in the central districts of agglomerations.
- Creation of additional jobs in the periphery of the Moscow agglomeration for the purpose to “redirect” workforce flows from the central part of the agglomeration to its suburbs may have a positive impact on the transport accessibility of Moscow and improve the labour productivity.

For two identical agglomerations with different concentration of economic activity (4.3% and 14.5%), the difference in labour productivity may amount up to 25% or USD 15,000 a year.

*According to TomTom Traffic Index"
In most agglomerations the indicator “extra time spent in traffic jam” increased over past 10 years

<table>
<thead>
<tr>
<th>Index of relative travel time, 2016</th>
<th>Ranking of agglomerations by indicator “index of relative travel time”</th>
<th>Change of the indicator “extra time spent in traffic jam” over the period 2008-2016*, %</th>
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<td>Волгоград</td>
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<td>Краснодар</td>
<td>40</td>
<td>9</td>
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<tr>
<td>Нижний Новгород</td>
<td>51</td>
<td>10</td>
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</table>

Travel time is one of the key indicators that determine the quality of life of citizens. For the last 8 years traffic congestion in Moscow has reduced by 4% unlike in other cities where the congestion and time losses have significantly grown.

* Source of the indicator: TomTom Traffic Index
The favourable economic conditions of agglomerations and high migration activity result in greater demand for residential real estate, leading to its higher cost when the supply is limited.

- The **more developed the economy** of the agglomeration is compared to the rest of the country, the **less affordable the housing**.
- The main reasons for the **low affordability of housing in the Moscow agglomeration** compared to other agglomerations include the **low supply which falls behind the growing demand** and **high mortgage interest rate**. Nevertheless, the Moscow agglomeration exceeds the majority of agglomerations by the pace of growth of affordability of housing. This is conditioned by the rising income of the population.

Comprehensive development of agglomeration’s territory leads to lowering the difference between the cost of housing in the core and periphery.

Green and comfortable suburbs become the centre of attraction not only for residents but also for investors: multi-functional territories are formed, whose quality of life is not inferior, and in many ways exceeds the possibilities provided in the core.

- If **jobs are homogeneously distributed across the agglomeration** (for example, Tokyo – 2.6%), the difference in the cost of residential real estate in the core and at suburbs will be less (Tokyo - x 1.7), which contributes to the formation of a more homogeneous system of agglomeration distribution.
- The Moscow agglomeration has **high concentration of economic activity** (12.8%), in which regard there is a significant difference in the cost of housing in the agglomeration’s core and periphery (x 4.6). There are districts in the Moscow agglomeration where the cost of housing is significantly below the average across the agglomeration. These districts make up 9% of the total number of municipal units.
In order to form the polycentric development model of Moscow stimulates creation of jobs at core’s periphery, while Moscow Region develops economic zones and industrial parks.

Formation of business activity clusters beyond the core helps reduce time costs and improve labour productivity of employed population.

- Moscow implements a focused policy to form the polycentric structure of the city through a more balanced development of residential and non-residential real estate. The new housing constitutes approximately half of the total volume of commissioned buildings, which shows that there is plenty of social infrastructure, commercial and production real estate. The new commercial real estate is mainly developed outside the central administrative district of the capital.

- The territory of “New Moscow”, to which nearly half of the city’s housing under construction is attributed, is also characterised by high potential for creating new jobs. However, development of Moscow within the old boundaries is mainly limited by the supply of land plots available for housing. While developing the territory redevelopment projects (including renovation of the existing apartment blocks), the principle of multifunctional use of territories is applied, including development of commercial real estate.
Appendices
Some of agglomerations are home to half of the country's population and produce up to half of the national GDP

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- Monocentric
- Polycentric
- Value trending toward maximum
- Value trending toward minimum

PwC
July 2017
Profiles of Top 20 agglomerations

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Monocentric | Polycentric | Capital | Not capital
**The Moscow agglomeration**

**Key indicators (2016)**

- **Population**
  - 19.5 million people

- **Gross agglomeration product**
  - USD 334 billion

- **Average population income**
  - USD 27,000, PPP

- **Dependency ratio**
  - 41%

---

**The Tokyo agglomeration**

**Key indicators (2016)**

- **Population**
  - 37.1 million people

- **Gross agglomeration product**
  - USD 1,569 trillion

- **Average population income**
  - USD 26,000, PPP

- **Dependency ratio**
  - 58%
The London agglomeration

Key indicators (2016)

Population 8.8 million people.

Gross agglomeration product USD 610 billion

Average population income USD 37,000, PPP

Dependency ratio 47%

The Paris agglomeration

Key indicators (2016)

Population 12.6 million

Gross agglomeration product USD 774 billion

Average population income USD 30,000, PPP

Dependency ratio 52%
The Buenos Aires agglomeration

Key indicators (2016)

- Population: 14.6 million people
- Gross agglomeration product: USD 218 billion
- Average population income: USD 17,000, PPP
- Dependency ratio: 52%

The Beijing agglomeration

Key indicators (2016)

- Population: 22.4 million people
- Gross agglomeration product: USD 385 billion
- Average population income: USD 17,000, PPP
- Dependency ratio: 23%
The Shanghai agglomeration

Key indicators (2016)

Population
25.3 million people

Gross agglomeration product
USD 459 billion

Average population income
USD 17,000, PPP

Dependency ratio
24%

Population density (people / km²)

Agglomeration transport map

The Seoul agglomeration

Key indicators (2016)

Population
25.3 million people

Gross agglomeration product
USD 397 billion

Average population income
USD 21,000, PPP

Dependency ratio
34%

Population density (people / km²)

Agglomeration transport map
The Sydney agglomeration

Key indicators (2016)

- Population: 5 million people
- Gross agglomeration product: USD 265 billion
- Average population income: USD 37,000, PPP
- Dependency ratio: 49%

Population density (people / km²)

The New York agglomeration

Key indicators (2016)

- Population: 20.3 million people
- Gross agglomeration product: USD 1.672 billion
- Average population income: USD 55,000, PPP
- Dependency ratio: 48%

Population density (people / km²)

Agglomeration transport map
Methodology
## Indicators for ranking of growth dynamics of world agglomerations

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<tr>
<th></th>
<th>The Moscow agglomeration</th>
<th>Russia</th>
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<tr>
<td>GDP (2004-2013)*</td>
<td>15.5%</td>
<td>14.2%*</td>
</tr>
<tr>
<td>Population (2001-2016)*</td>
<td>0.9%</td>
<td>-0.3%*</td>
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<tr>
<td>Absolute change in number of employed people per 1,000 inhabitants, 2001–2016</td>
<td>+46 employed per 1,000 people</td>
<td>+42 employed per 1,000 people</td>
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<tr>
<td>Absolute gain in household income in 2001–2016 (thousand USD)</td>
<td>+ USD 7,200**</td>
<td>+ USD 9,900**</td>
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<td>The index reflects concentration of income with certain groups of population</td>
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<tr>
<td>Dependency ratio in agglomerations and in countries in 2016</td>
<td>412 residents of non-working age per 1,000 people</td>
<td>445 residents of non-working age per 1,000 people</td>
</tr>
<tr>
<td>Migration growth per 1,000 people in 2010–2015</td>
<td>+9.8 migrants per 1,000 people</td>
<td>+1.6 migrants per 1,000 people</td>
</tr>
<tr>
<td>Number of THE university students per 1,000 inhabitants of agglomerations and countries in 2016.</td>
<td>10 students per 1,000 people</td>
<td>7 students per 1,000 people</td>
</tr>
<tr>
<td>Share of foreign students in total number of THE university students in 2016</td>
<td>14%</td>
<td>11%</td>
</tr>
</tbody>
</table>

* Indicates are calculated for all country’s regions, except the agglomeration  
** The use of Oxford Economics’ indicators is required to keep the used data sources consistent  

Sources: Rosstat, Oxford Economics, Euromonitor, UN, Times Higher Education
**Ranking indicator calculation methodology**  
*areas of influence*

**General**
Two major groups may be distinguished in the structure of consumer spending: expenses stimulating the development of the internal economy and expenses stimulating the development of the external economy.

The expenses stimulating the **development of the agglomeration’s internal economy** include:
- Housing expenses;
- Transport expenses;
- Healthcare expenses;
- Education expenses;
- Communications services expenses;
- Entertainment expenses.

In general, the expenses related to the creation of added value within the agglomeration’s territory.

The expenses stimulating the **development of the agglomeration’s external economy** include:
- Food and beverages;
- Clothing and durable goods.

In general, the expenses most often related to the creation of added value outside the agglomeration’s territory.

**For the purpose of this analysis, we examine only the external expenses.**

A part of the goods consumed within an agglomeration is also produced here. The other part is imported from abroad.

The consumer spending volume allows to assess the level of influence exerted by each resident of an agglomeration on the national economy. The volume of goods purchased from the country’s regions engaged in the commerce of consumer goods net of the goods manufactured within the agglomeration’s territory and imported from abroad determines the degree of the agglomeration’s influence on the national economy.

**Calculations**
1. We have determined the **amount of consumer spending** falling under external expenses (2016, according to Oxford Economics).
2. We have determined the **amount of imported goods** falling under consumer goods (2015-2016, according to municipal statistics agencies).
3. We have determined the **scope of production of industrial and agricultural goods within the agglomeration’s territory** falling under consumer goods (agricultural goods are accounted for in full; industrial goods are accounted for pursuant to the structure of manufactured goods by each agglomeration, i.e. if the Seoul agglomeration manufactures textile, it does not mean that such production is only intended to meet the agglomeration’s internal demand).
4. We have subtracted from the external consumer spending the amount of imported goods and the **volume of production within the agglomeration’s territory**. We have divided the resulting figure by the number of the agglomeration’s residents and arrived at the final influence on the national economy per resident – the indicator we use to create the ranking of top 10 agglomerations in this section.
5. In order to calculate the number of employee population, we have determined the average labour productivity in the country (2016, Euromonitor). Then we divided the previous calculation of influence per resident of an agglomeration by the labour productivity. As a result, we arrived at how many jobs outside the agglomeration are created by one resident of the agglomeration through his/her consumption.
**Agglomeration ranking methodology for creative sector**

**Determination and makeup of creative industries**

**Creative industries** mean the industries that envisage activities based on individual creativity, skills or talent and that carry a potential of creating the added value and jobs by manufacturing and operating intellectual property*. The creative sector’s makeup was based on the classification of the World Intellectual Property Organization (WIPO) as its makeup is built on the International Standard Industrial Classification (ISIC) prepared by the United Nations and used by many nations. If a certain type of activity is absent from one of the national classifiers (OKVED in Russia), a higher level aggregation data has been used. The final list of activity types was broken down into four areas.

**Index calculation**

The final value of the index was the arithmetic mean of two sub-indices:
1. creative sector’s contribution to the GRP, and
2. creative sector’s contribution to employment.

Each sub-index included three indicators:
1. Average share of the creative sector in the agglomeration’s GRP / employment in 2010-15 (%);
2. Ratio of the creative sector’s share to the nationwide value (coefficient);
3. Creative sector’s growth rate as compared to the dynamics of the other sectors of economy (coefficient).

The data for each indicator within a sub-index has been divided by its maximum value among agglomerations. The sub-index has been calculated as an arithmetic mean of resulting values. In such an approach, the spread of values for each indicator and sub-index has stayed in the range from 0 to 1.

The ranking’s final value was multiplied by 100 for better visual clarity.

**Sources of data and evaluation of the creative sector’s volume**

The sources of data included official statistical portals and executive authorities of relevant countries and agglomerations responsible for social and economic policies.

The data included details of gross value added / volume of shipped own-produced goods / basic prices and the average employment level in a detailed selection of economic activity types. Data time series – from 2010 to 2015.

In some agglomerations, the gross value added data was presented only at the national level. Input-output balances of their countries have been used to calculate the gross value added of such agglomerations’ creative sector. They represent ‘Input-Output’ tables containing information about the output of goods and services: the volume of intermediate consumption and added value elements. Thereby, they permit to determine the added value in the nationwide output volume. Given that agglomerations’ contribution to the national creative sector comprises up to one third of the volume, estimated shares of the added value to a large extent reflect the agglomeration’s standing.

* A classical definition of creative industries was formulated in a British mapping document titled ‘Creative Industries Mapping Document’ in 1998.

---

**Area** | **Makeup of WIPO creative industries** | **Relevant OKVED codes (2001 classification)**
--- | --- | ---
**Arts and culture** | - Visual and performing arts  
- Photography  
- Crafts  
- Cultural, recreational and exhibition activities  
- Activities in the sphere of cultural heritage (museums, libraries, etc.) | 20.09 Manufacture of other wooden and suberic products, straw and braiding materials  
26.15.84 Manufacture of statuettes and other glass decorations by blowing melted bulk glass  
36.2 Manufacture of jewellery and technical products from precious metals and precious stones, coins and medals  
36.61 Manufacture of jewellery from non-precious materials  
74.81 Photography  
92.3 Other show business activities  
92.5 Other cultural activities  
92.72 Other recreation and entertainment activities

**Design and architecture** | - Architecture  
- Design (interior, graphic, industrial, environmental, product)  
- Publishing  
- Films and videos (production, distribution and screening)  
- Sound recording  
- Mass media and public relations  
- Advertising  
- Television and radio | 74.2 Activities in the field of architecture, design engineering  
74.84 Other services (goods and interior design)  
74.13 Market trend research and public opinion surveys  
74.4 Advertising  
92.1 Production, distribution and exhibition of films  
92.2 Broadcasting and television activities  
92.4 Activity of news agencies

**Media and communications** | - Developing software and consulting in this area  
- Development and use of databases and information resources  
- Data processing  
- Advertising  
- Television and radio | 72.1 Consulting on computer hardware  
72.2 Developing software and consulting in this area  
72.3 Data processing  
72.4 Activity to create and use databases and information resources, including Internet resources  
72.6 Other activities related to the use of computers and information technologies
Agglomeration ranking methodology for labour market

of specialists / employment for specialists with no demand against the median level of competition.

Common specialist – any position whose level of competition is in the median labour market.

Median level of competition - a level of competition dividing the total into two equal parts: level of competition in one part of specialties is not above the median level, and, in the other part, is not below the median level.

Easiness of finding scarce specialists (sub-index 1) – shows how many times more difficult it is to find the most sought-after specialists as compared to the common specialist. Calculated as the ratio of the median competition level to the average competition level for ten scarce vacancies.

\[
CB_j = \frac{P_{m/2}/B_{m/2}}{(\sum_{i=1}^{10} P_i/B_i)/10}
\]

Legend

\(j = 1, ..., 9\) – agglomeration

\(i = 1, ..., m\) – number of specialty arranged by the level of competition (CVs per vacancy) from the lowest \((i=1)\) to the highest \((m)\)

\(m/2\) – position with median level of competition

\(P_i\) – number of CVs for specialty \(i\)

\(B_i\) – number of vacancies for specialty \(i\)

Easiness of finding employment for specialists with no demand (sub-index 2) – shows how many times more difficult it is for least sought-after specialists (with the maximum number of CVs per vacancy) to find themselves a job as compared to a common specialist. Calculated as the ratio of the average competition level for ten vacancies with no demand to the median competition level.

\[
CHB_j = \frac{(\sum_{i=m-9}^{m} P_i/B_i)/10}{P_{m/2}/B_{m/2}}
\]

In order to arrive to the value of each sub-index which will be included in the final rating, the derived values among the agglomerations shall be divided by the group’s minimum values (CB, CHB). Under this approach, the sub-index value is distributed within the range of \([1;+\infty)\) and reflects, how many times more difficult it is to find employment in the agglomeration than in the group’s leader (the one which scores “1”).

Subindex \(\cdot CB_j = \frac{CB_j}{CB_{\text{min}}}\); \(CB_{\text{min}} = \min_{1 \leq j \leq 9} \{CB_j\}\)

The final value of the index was the arithmetic mean of the two sub-indices:

\(\langle c_j \rangle = \frac{\sum \text{Subindex}}{2}\)

The index value is also distributed within the range of \([1;+\infty)\), where 1 could be given to an agglomeration with the least, compared to the others, difficulties in finding specialists of both categories. The final place in the ranking of agglomerations by the level of labour market equilibrium is inversely proportional to the index value, i.e. an agglomeration with the maximum index value takes the last place in the ranking.

List of job positions

Initially, a list of 1,160 job positions has been compiled, covering all sectors of the economy.

Subsequently, a semantic analysis was conducted and the job positions similar in their required skills and competencies were aggregated. For example, job positions Electromechanician / Electrician / Electric Fitter / Electrical Technician have been combined into one search entry. The final list had 405 positions.

Data sources

In order to obtain information regarding competition, data has been collected as to the number of vacancies and CVs for positions in the list. The number of CVs for a profession includes only those CVs in which the profession sought after was one’s latest work experience. The data source in each country was one of the most widely used employment platforms, enabling to use logical operators (AND, OR, NOT etc.) to make a complex search query.

Data on professions has been collected in one iteration and reflects the labour market situation as of late March 2017. Therefore, it is impossible to make any conclusions as to the labour market situation for one year and longer based on available data.

The criteria to select information resources included:

- Total number of CVs presented on the website;
- Website traffic (Alexa Internet, Google Analytics, JobboardFinder.com);
- No website specialisation in a specific professional area.

Country | Source used
---|---
China | ChinaHR.com (one of the top 3 job search websites in China by traffic)
Russia | HeadHunter.ru (one of the leading job search websites in Russia)
USA, UK | Indeed.com (world’s largest aggregator of job search websites, total number of CVs and vacancies across the country exceeded the largest of local job search websites)
Korea | JobKorea.co.kr (the oldest and most visited job search website in Korea)
Australia | Seek.com.au (the oldest and most visited job search website in Australia)
Argentina | bumeran.com.ar (the largest job search website in South America)
**Ranking indicator calculation methodology**  
*(transaction costs and complementarity)*

**General**
For the purposes of calculating business activity, data on the number of registered enterprises in the economy is used (2016, according to Euromonitor) net of the self-employed divided by the number of an agglomeration’s residents. Data for various agglomerations has been used for verification, including the Moscow agglomeration.

The urbanisation level in a country is taken as a share in the country’s population residing in cities.

The rating of conditions of doing business is composite and reflects the process of taking an investment decision to set up a company. The calculations are shown below.

**Calculations**
Approach to the investment-related decision-making:

1. At the first stage, an investor evaluates the size of a potential market – we take the volume of trade in each agglomeration per one thousand residents (2016, according to Oxford Economics). Benefit indicator.

2. At the second stage, an investor evaluates the amount of potential operating expenses. This is a composite indicator in the rating which includes basic expenses for doing business – office space rental, price of electric power consumption, level of salaries. Cost indicator.

3. At the third stage, an investor evaluates the possibility of raising debt financing – we take the cost of borrowing indicator – the bank discount rate (2016, according to World Bank). Cost indicator.

4. At the fourth stage, an investor deals with government authorities when undergoing administrative procedures. The data for evaluation has been taken from the Ease of Doing Business rating, World Bank, in which all agglomerations are presented as evaluation units for countries. Cost indicator.

Each stage in the taking of an investment decision has the same weight – 25%.

Agglomerations with lowest costs have the best rating in cost indicators. It is the other way around for benefits indicators. Agglomerations with highest benefits have the best rating.
Agglomeration ranking methodology for education

Ranking in education is performed based on an integral indicator calculated as the average of rankings of three sets of indicators: efficiency of researchers, quality of applicants and students and openness of higher education.

1. Efficiency of researchers ranking is calculated as the average of four indicators:
   - Number of articles per lecturer. Universities included in The Higher Education international rating ("THE universities"). The articles published by THE universities in Scopus international citation base ("Scopus") in 2012-2016 have been aggregated through SciVal analytical add-on ("SciVal"). The number of lecturers in THE universities for 2016 has been accounted for 2016 according to THE 2017 rating;
   - Number of citations per article. The number of citations and the number of articles of THE universities have been aggregated by SciVal add-on based on Scopus data from 2007 to 2016;
   - Citation dynamics calculated through InCites analytical add-on based on data from Web of Science international citation base from 2001 to 2016;
   - Number of patents per researcher. Number of patents according to World Intellectual Property Organization (WIPO) from 1 January 2007 to 1 January 2017 in relation to estimated number of researchers (specialists engaged in R&D) according to FDI Intelligence for 2016.

Notes to calculations

For normalisation of the number of articles in THE universities the number of lecturers in such schools is used because for this category of employees of institutions of higher learning writing scientific articles is an important efficiency evaluation parameter as such a parameter is an important element of efficiency evaluation for universities according to THE. Furthermore, the focus on the international rating allows to level out national differences in approaches to the organisation of science due to similarity of goals, objectives and metrics for evaluation of rated universities.

2. Quality ranking of applicants and students is calculated as a weighted average of two indicators:
   - Number of points earned by the agglomeration’s representatives during five major international school Olympiads in Physics (IPhO), Chemistry (IChO), Biology (IBO), Mathematics (IMO) and Linguistics (ILO) from 2012 to 2016 (except for Mathematics Olympiad where the time range was from 2011 to 2016);
   - Number of points earned by the agglomeration’s representatives during the international student Olympiad in ACM/ICPC programming for 2012-2016. ACM/ICPC is the World Championship of Competitive Programming among students. This is one of the most well-known contests in the technical area having the broadest representation of teams from the agglomerations in question.
   - The data on the agglomerations’ population for normalisation of the number of points was taken as average by years within the relevant time interval during which the points were earned. Source – Oxford Economics.
   - The weight of indicators is calculated based on the number of Olympiads they cover and constitutes 5/6 and 1/6 respectively.

Notes to calculations

Points earned by pupils during international Olympiads were calculated as follows: each gold medal awarded in an agglomeration was worth three points, silver medal – two points, bronze medal – one point. Points earned in all Olympiads for all years were summed up and normalised as per the agglomeration’s population.

Points earned by students during international Olympiads were calculated as follows: results of an agglomeration’s representatives during each year were normalised for the maximum point earned during this year. The points earned were summed up to arrive at the total score for the agglomeration. The resulting value was normalised for the agglomeration’s population.

3. Openness of higher education rank is calculated as the average of two indicators:
   - Share of foreign students among all students at THE universities (2016), and
   - Shares of joint international articles in Scopus citation base among all articles for the period from 2012 to 2016.

Notes to calculations

In order to calculate the share of foreign students in an agglomeration, students and foreign students were summed up separately in all THE universities and their ratio was found.

In order to calculate the share of international joint articles among all articles, articles and international joint articles were summed up separately for a selected time period and their ratio was found.

July 2017
Methodology for determining efficiency index of healthcare organisation in studied agglomerations

Agglomeration’s efficiency in the healthcare was estimated on the basis of (I) agglomeration ranking by key objective indicators of availability and effectiveness of primary care, and (II) comparing agglomerations against countries of agglomerations’ origin to determine the impact of agglomeration effects.

I) Agglomeration comparison index (60% of the specific weight)

Calculated as the average of the agglomerations’ standing by three representative indicators of healthcare efficiency: (1) availability of primary care, (2) availability of emergency medical care and (3) critical mortality indicators. The weight of each indicator in the general index amounts to 33% and when comparing agglomerations to each other each agglomeration, both in the general index and by separate indicators, was assigned a rank from 1 (highest rank) to 10 (minimum rank), denoting the agglomeration’s standing.

1) The availability of primary care index comprises two indicators: availability of doctors and beds in inpatient facilities in an agglomeration. The weight of each indicator amounts to 50% and is calculated based on the ranking in relevant indicators. The rank of availability of doctors was calculated based on the number of all doctors per 100,000 population and the rank of availability of beds in inpatient facilities was based on the total number of beds in inpatient facilities per 1,000 population.

2) The availability of emergency medical care index is calculated as the average of two ranks by the following indicators: actual time of ambulance arrival and the number of ambulance stations ensuring that teams arrive on call.

3) The mortality index was calculated by us based on average ranking values for the following types: deaths from cardiovascular diseases, deaths from oncological diseases and deaths in the working age. The rank within each mortality type is determined by recalculating the number of relevant deaths in an agglomeration for a year per 100,000 population.

We have also analysed data on the availability of hi-tech diagnostic equipment in agglomerations to analyse availability of hi-tech medical care, however, as data was unavailable for some agglomerations, the ranking by these indicators was not calculated or taken into account to determine the final standing. Furthermore, the availability of hi-tech care data is for reference only.

II) Country comparison index (40% of the specific weight)

All of the agglomerations have been ranked by us in relation to the countries where they are located to determine the agglomeration effect. To determine an agglomeration’s standing, we used the margin of key mortality indicators and the margin of availability of primary care in an agglomeration and relevant countries. The higher the margin between an agglomeration and a country in favour of an agglomeration, the higher is the rank of the agglomeration in the country comparison index.
Methodology for assessment of agglomeration’s transport system

**General**

The analysis of the transport system of agglomeration is based on an assessment of the level of its congestion in terms of the satisfaction of the inhabitants of the agglomeration. The key indicator reflecting the residents' satisfaction is the average time on the way to work. This indicator is collected manually for each agglomeration.

One of the key influences on the average travel time is the level of concentration of economic activity. The level of concentration is calculated as the sum of the squares of the number of employed in each municipal formation of the agglomeration from the total number of employees in the agglomeration. The higher it is, the greater the average time on the way to work, because with a high concentration, the residents go to one point of the city every day (for example, the Central Administrative District of Moscow) and increase the load on the transport network.

We also determined the dependence of the level of labor productivity on the concentration of economic activity. In general, for the agglomerations to be compared, the dependence is inverse. The higher the concentration, the lower the productivity.

**Cost-benefit analysis model**

1. Having determined the necessary dependencies, we estimated the economic effects on the example of a model situation - an agglomeration with the same conditions of provision of transport infrastructure and public transport, but with different levels of concentration of economic activity. In one case, the concentration was 4.3%, in the second case - 14.5%. The population of the model agglomeration is 9.3 million people.

2. For the basic calculation, we made the assumption that the time to work and the work of one inhabitant of the agglomeration is 10 hours or 600 minutes.

3. Having determined the relationship between the concentration level and the time taken to work, we found the coefficients for calculating the mean travel time for a given concentration level. Thus, knowing the level of concentration, we have calculated the average travel time to the work of 1 inhabitant of the agglomeration. In the low-concentration model, 76 minutes (round-trip), in the high-model - 102 minutes (round-trip), which is confirmed by the statistics collected from the comparative agglomerations.

4. Having determined the time on the way to work on two models, we were able to estimate the time left for work. In the model with low concentration - 524 minutes, with high - 498 minutes.

5. Next, we calculated the average level of labor productivity for a given level of concentration. It also differs. In a low-concentration model, $ 0.65 per minute, in a high concentration model $ 0.56 per minute.

6. Multiplying the time left for work by the average level of labor productivity per minute and by the number of working days per year (on average for comparable agglomerations not less than 233 days), we found the average level of labor productivity per 1 employed in the economy per year. In the low-concentration model, $ 79,995 per year, with a high level of $ 65,072 per year. The difference was 15 thousand dollars a year.

Methodology for calculating the relative travel time index

**General**

To calculate the relative travel time index, the actual travel time has been adjusted to the size of the agglomerations. For this, the agglomerations were divided into 3 groups:

- The area is up to 10 thousand square meters. km (the metropolitan area of Shanghai, Buenos Aires and London)
- Area from 10 to 20 thousand square meters. km (agglomerations of Seoul, Beijing, Paris, Sydney and Tokyo)
- Area of more than 20 thousand square meters. km (the metropolitan area of New York and Moscow)

For each of the groups, the agglomeration area coefficient was determined. Relative travel time is the ratio of the actual time in the path and the area ratio of the agglomerations.
Methodology of calculating affordability index for purchasing housing with a mortgage

General

Housing Affordability Index shows the ratio of the average household income to incomes that must be available to purchase a standard flat through a mortgage made available on standard terms. The Index calculation methodology was developed by the U.S. National Association of Realtors.

The affordability of housing is primarily affected by the ratio of the cost of housing, the cost of mortgage (initial installment and interest rates) and the household’s aggregate income.

If the Housing Affordability Index:

- **< 100** - a household has income below the amount of required income to purchase a standard flat through a mortgage
- **= 100** - a household has income that precisely match the required income to purchase a standard flat through a mortgage
- **> 100** - a household has income exceeding the amount of required income to purchase a standard flat through a mortgage

Calculations

\[
\text{Index} = \frac{\text{MHI}}{\text{RI}} + 100
\]

MHI – median disposable household income per year (if the statistical data on the median household income is unavailable, the average household income in an agglomeration per year or the average income per household member multiplied by the average size of a household in the territory of the country in question are used)

RI – amount of required income to purchase a “standard” flat through a mortgage on standard terms. RI is calculated as the amount of mortgage payments for one year and other mandatory payments related to the purchase of real estate. Furthermore, the monthly mortgage payment amount should not exceed 25% of the family’s monthly income:

\[
\text{RI} = \text{PA} \times 12 \times 4 + \text{A}
\]

PA – monthly mortgage payments amount

12 – number of monthly payments per year

4 – coefficient of minimum requirement to income as compared to an annuity payment

A – amount of taxes and state duties payable for the purchase of housing
PwC Russia (www.pwc.ru) provides industry-focused assurance, tax, legal and advisory services. Over 2,500 professionals working in Moscow, St Petersburg, Ekaterinburg, Kazan, Novosibirsk, Rostov-on-Don, Krasnodar, Voronezh, Vladikavkaz and Ufa share their thinking, experience and solutions to develop fresh perspectives and practical advice for our clients. The global network of PwC firms brings together more than 208,000 people in 157 countries.

* "PwC" refers to OOO PricewaterhouseCoopers Advisory or, as the context requires, other member firms of PricewaterhouseCoopers International Limited (PwCIL). Each network firm is a separate and independent legal entity.

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