ASSESSMENT OF INNOVATION POTENTIAL FOR RUSSIAN REGIONS: INVITATION TO DISCUSSION

Stepan Zemtsov
Senior researcher

Russian Academy for National Economy and Public Administration
Institute of applied economic research
Why assessment of regional innovation development is important?

- **Federal funding** (it is important for effective distribution)
- Assessment of regional innovation policy (indicators)
- Regional strategy (which sectors in innovation system are underdeveloped)

... 

Anything else?
C

Criticisms of other approaches

Seven theses-questions

1. **Foreign methodology** (e.g. European innovation scoreboard) without verification on Russian data – **is it true that Russian statistical indicators and their relation are the same as in Europe?**

2. **Too many indicators** (more than 15: High school of economics, Association of innovation regions, NAIRIT, etc.) – hard to compose, hard to understand the purpose and results, results can be averaged (6-8 region-leaders and lagging regions are the same, but most of the regions can change their position dramatically) – **is it true that number of indicators should be 6-7 times less than number of objects (Guz, 2002)?**

3. **Very doubtful indicators** (share of technical innovation in GDP, share of innovation production, etc.) and results of leadership (Chechnya, Mordovia, Magadan, etc.) – **is it true that some indicators cannot be used at all?**

4. **Some indicators are not correlated** (Pearson correlation coefficient is less than 0.1 (Pilyasov, Zubarevich, HSE, etc.) – **is it true that not-correlated indicators actually do not influence the final index?**

5. **Some indicators are highly correlated** (Pilyasov, NAIRIT) – **is it true that results have a bias?**

6. **No inner structure of regions**, although 80-90% of innovation is concentrated in the regional capitals – **is it true that innovation assessment should be done on municipal level?**

7. **No formal verification** – **is it true that indeces should be verified by robustness and sensitivity analyses?**
The first look: patent activity as a main indicator of innovation activity?

- National patents are not inventions (remember Yulia Shchepochkina from Ivanovo with 2500 patents)
- Strange behavior of regional patenting (coefficient of variation by year is higher than 0.3)
- 6-7% of national patents were commercialized in 2000th
- PCT-applications are in small amount for most regions and are used for trade and not for commercialization

- What we should do? Assess innovation potential, because it is impossible to clearly evaluate innovation activity on regional level
The first look: patent activity as a main indicator of innovation activity?

Equation of **potential field** (gravity model)

\[ V_j = P_j + \sum P_i / D_{ji} \]

where \( P_j \) is a value of an indicator (number of granted patents per 100,000 urban citizens) in point \( j \), \( P_i \) is a value of the indicator in a point \( i \); \( D_{ji} \) is a distance from a point \( j \) to a point \( i \), km.

Equation for **territorial diversity** of innovation activity between regions (Shannon entropy):

\[ E = \sum S_i \times \log(1/S_i) \]

where \( S_i \) - a percentage of granted patents in a region \( i \) of the total number of granted patents in Russia.
Innovation potential and activity in Russia from 1989 to 2012

Innovation activity and regional diversity of innovation activity in Russia

Potential of patent field in 1989 and 2010

- Density of patent field in 2010 (patent / 100 th. urban citizens)
- Density of patent field in 1989 (patent / 100 th. urban citizens)
- Innovation centres in 2010 r. (> 20 patent / 100 th. urban citizens)
- Largest innovation centres in 2010 r. (> 30 patent / 100 th. urban citizens)
Methodology. Algorithm

1. Data collection

2. Data harmonization

3. Descriptive statistics and check for normal distribution

4. Cross-correlation analysis

5. Data reduction (component analysis)

6. Data normalization (max-min)

7. Data transformation (power function)

8. Weighting

9. Aggregation

10. Visualization

11. Robustness test

12. Sensitivity analysis

13. Additional verification
Methodology

1. **38 indicators** of innovation activity, based on expert interviews, existing literature and indices (from Rosstat)

2. Indicators were divided using **conceptual model**:
   - Conditions of social economic space (SESP: economic geographical position)
   - Development factors of territorial socio-economic system (SES), according to spheres of social life (economic, political, social, cultural)
   - Resources of regional innovation system (RIS), according to stages of innovation cycle (education – basic science – applied science – production – consumption)

3. **Factor, correlation and normal distribution analysis** have done to select the proper indicators
<table>
<thead>
<tr>
<th><strong>Socio-economic space</strong></th>
<th><strong>Territorial socio-economic system</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.1. Economic-geographical position (capital, agglomeration, coastal area)</td>
<td><strong>Technological sphere</strong></td>
</tr>
<tr>
<td>1.2. Population density</td>
<td>2.1. Percentage of ICT expenditure in GDP</td>
</tr>
<tr>
<td>1.3. Percentage of urban citizens (urbanization)</td>
<td>2.2. Computers per capita</td>
</tr>
<tr>
<td>1.4. Percentage of population in cities with more than 200 th. people</td>
<td>2.3. Computers with Internet per capita</td>
</tr>
<tr>
<td><strong>Economic sphere</strong></td>
<td>2.4. Percentage of organizations with web-site</td>
</tr>
<tr>
<td><strong>Social sphere</strong></td>
<td>2.5. Percentage of organizations with special programs</td>
</tr>
<tr>
<td>3. GDP per capita</td>
<td><strong>Cultural sphere</strong></td>
</tr>
<tr>
<td><strong>Informational sphere</strong></td>
<td>5.1. Percentage of households, where members are of different ethnic group</td>
</tr>
<tr>
<td>6.1. Percentage of Internet users</td>
<td><strong>Education</strong></td>
</tr>
<tr>
<td><strong>Science</strong></td>
<td>7.1. Number of university students per capita</td>
</tr>
<tr>
<td>8.1. Number of scientists per capita</td>
<td><strong>Transfer (R’n’D)</strong></td>
</tr>
<tr>
<td>8.2. Number of registered patents per 1000 employees</td>
<td>9.1. Percentage of employees in R &amp; D sector in total employment</td>
</tr>
<tr>
<td><strong>Production</strong></td>
<td>9.2. Percentage of R’n’D expenditure in GDP</td>
</tr>
<tr>
<td>10.1. Percentage of technological innovations expenditure in GDP</td>
<td>9.3. Percentage of R’n’D organizations</td>
</tr>
<tr>
<td>10.2. Number of new technologies per 1000 employees</td>
<td><strong>Consumption</strong></td>
</tr>
<tr>
<td>10.3. Percentage of innovation active organizations</td>
<td>11.1. Service access to information via the Internet, GB per year, per urban citizen</td>
</tr>
<tr>
<td>10.4. Innovative production percentage in total production</td>
<td><strong>Regional innovation system</strong></td>
</tr>
</tbody>
</table>
Index of innovation potential

The second factor: urbanization (%), computers with Internet access per 100 employees, GDP per capita, percentage of multinational families (%), percentage of Internet-users (%), and mobile phones per capita.

The first factor (Index of innovation potential):

\[
I_{IP} = \frac{I_{E_{GP}}^{0.1} + I_{U_{RB}}^{0.1} + I_{H_{E}}^{0.8} + I_{S_{C}}^{0.4} + I_{P_{AT}}^{0.1} + I_{W_E_{B}}^{0.001}}{7}
\]

SESP:
- economic-geographical position (points)

TSES:
- percentage of residents in cities with population more than 200 thousand people (%)
- percentage of people with a higher education in the population (%)

RIS:
- number of university students per 10 thousand people
- percentage of employees in R & D sector in total employment (%)
- number of registered national patents per 1000 employees
- percentage of organizations with a website (%)
Clusters of integral innovation potential

Clusters of integral innovation potential:

1. (1 - 0.4)
2. (0.39 - 0.3)
3. (0.29 - 0.24)
4. (0.24 - 0.21)
5. (0.2 - 0.16)
6. (0.15 - 0.04)
Assessment of development potential of regional innovation systems
Results and their policy implication

1. **High concentration of capacity** in the largest metropolitan areas and research centers, which are both major centers of high-tech industry: Moscow, St. Petersburg, Moscow, Tomsk, Novosibirsk, Samara and Nizhny Novgorod region (index above 0.6). The first group of regions also include the Republic of Tatarstan and the Chelyabinsk region. Regions are characterized by the presence of existing regional innovation systems.

2. The second and third group consisted of **high-urbanized regions with favorable geographical position**: regions with "millionaires" cities in Urals (Sverdlovsk, Perm region and the Republic of Bashkortostan), Moscow and St. Petersburg agglomerations neighbors (Leningrad, Kaluga, Tula, Vladimir, Ryazan region) and having access to external innovation centers (Kaliningrad, Murmansk region, Krasnodar, Primorsky and Khabarovsk Krai). Support of RIS can be considered as an effective tool of regional policy.

3. Most of medium regions (Belgorod, Sakhalin, etc.) with an average value of the potential (0.3 - 0.5) is characterized by **poor development of the individual components of RIS**. This is due to their remoteness, low population density and low-tech-oriented sectors of the economy (Sakhalin, Kamchatka region, Komi Republic, autonomous districts of Tyumen region), as well as with a focus on production (Krasnoyarsk and Altai region, Lipetsk, Tambov, Orel, Penza region). Regions are characterized by a gap between scientific and production stages, to overcome which require intensive development of innovation infrastructure. Perhaps the development of innovation clusters in certain sectors of the scientific and industrial specialization of regions is appropriate.

4. In the peripheral regions (less than 0.3) there are **several missing components of the innovation cycle**, due to the low level of development (Republic of Altai, Chukchi, Tuva) and primitive structure of the economy (Kostroma, Amur, Chita region). Creation of innovation centers and innovation support from the federal center is inappropriate.
Integral index of innovation potential for Russian regions in 2010
Potential field of integral index
Comparison

Index of innovation potential

Index of innovation potential

High school of economics

Index of association of innovation regions

1 0.8 0.6 0.4 0.2
Conclusion

- Methodology of indeces is not clear, it is possible for potential assessment, but is it possible for innovation development assessment?

- The complex algorithm was introduced, which could help to overcome many difficulties, but not all of them.

- Russian innovation space can be described by simple core-periphery model: the largest cities are the centres for generation of innovation on the northern and southern agrarian peripheries.

- After the collapse of the Soviet Union the innovation space was divided into a number of isolated and poorly connected centres, concentration increased, variety of functions declined, and "lifeless" periphery was formed. These negative processes have not been overcome, despite the economic achievements of the 2000s.
References

Thank you for your attention!