

Khomenko O.V.,
*leading specialist on management of projects
and programs of innovative technologies in higher school
Institute of Higher Education
SHEI "Kyiv National Economics University
named after Vadym Hetman"*

DISPROPORTIONS OF INNOVATIVE DEVELOPMENT OF CHINESE PROVINCES UNDER NATIONAL ECONOMIC SECURITY

Formulation of the problem. Under conditions of deepening globalization process China leads the way on indicators of economic development and innovation performance. Thus, in 2013, China is the second largest economy in the world after the U.S., the first country by volume of exports and the share of high-tech exports is 25% of the world. China is one of the leaders in patenting and international publications and citations. However, despite its success, the problem of cohesion of regions and ensuring national economic security is currently urgent for China.

Analysis of recent research and publications. Issues of innovation and competitiveness of China are revealed in the papers of foreign scientists and researchers, including Johnston W., Crookes I., Li Peng, Ramesh S., Su Y, Hausmann A., Zhang, Zhi, Chung and others. Disparities of Chinese economic development are disclosed in the writings of Atsmon Y., Dixit W., Cai W., Pang Z., Song W., Funke M., Zhao, Zhu and others. Studies and data from authoritative international organizations, including INSEAD, OECD, The World Intellectual Property Organization, The World Bank, legislation and government statistics offices and ministries of China are the source base of the thesis.

The aim of research. The Aim of research is a profound analysis of economic disparities and innovative regional development in China. The object is the alignment of current processes of economic and innovative development of Chinese provinces. Further research is needed to identify the impact of reforms on the development of Chinese provinces.

Statement of main materials. Reformation of the economy and Chinese innovation policy began in 1978 starting from the policy of openness. According to the government's plan on the gradual recovery of the country in the early stages of reform, most attention was given to the development of the eastern and southeastern provinces of China; this part was the engine of the Chinese economy and innovation centers. Thus, in 2013, the coastal provinces of China accounted for 58.4% of GDP and 87.7% of patents in 2012 [7]. Due to the development of China's coastal regions, the central, northern and eastern parts of China experienced a significant gap comparing with the eastern region. Therefore, in 1999 by the Government of the PRC adopted the policy of reconstruction and development of the northwestern, central China. The aim of this policy was the development of transport, energy and telecommunications infrastructure in the region, attracting foreign investment, supporting of green growth, improving the system of higher education. During six years of the program, the government had spent about 1 trillion Yuan. In 2010, the Government of China summarized the results of the alignment policy of regional development; the key result was modernization of transport and communications infrastructure in the provinces of Shaanxi and Gansu, rising incomes per capita, green growth and development of high-tech clusters [6].

The government investment in modernization of transport and communications infrastructure over 10 years in the provinces of Shaanxi and Gansu was respectively 1842.8 billion Yuan and 738.4 billion Yuan, with annual average growth of 25% and 18.67%. These investments were aimed at the implementation of three large-scale infrastructure projects, which had been successfully realized.

The success of the government's policy of north-western provinces of China is improving living standards and quality of higher education. During the 14 years of this policy an increase of income per capita, pensions, reduction of unemployment and improvement of healthcare and social security in cities and villages was observed. Rising standards of living in the north-western provinces of China provides an increase of purchasing power and consumption.

Government policy of China in the northwestern provinces aimed at improving the environment, such as green growth. Thus, the control of air, soil and water was introduced in the provinces. In order to solve environmental problems leading technologies were introduced. In the 12th Five Year Development Plan of China the key areas of "green" growth were identified. According to the plan, a system of "green" technologies and materials consists of three parts: advanced materials, leading industrial processes and "green" process. The overall goal of "green" technologies is that through upgrades and intellectualization the industry ensured a highly efficient use of resources and energy, and reduction of the environmental impact, transition from the mechanism of "man-machine" to automation. The main objectives for 2050 in the system of leading materials and "green" technologies are: meeting the needs of high-tech, renewable energy and resources, environment, development of new "green" technologies and production processes [6].

Despite the implementation of alignment policy of the Chinese provinces, still there are asymmetries in both economic and innovation development. In the western provinces of China the level of GDP per capita is

lower compared to the eastern part of the country. Thus, the gap between GDP per capita is 76.5%: the highest amount of GDP per capita is in Tianjin (99607 Yuan), the lowest – in Guizhou (22922 Yuan). This gap is connected to the intensity of GDP growth in the western and eastern provinces of China due to the underdevelopment of rural areas compared to cities. Thus, the main factor that affects the difference is too high revenue growth, which is associated with the capital, significant revenue growth in monopoly industries in eastern China (Fig. 1).

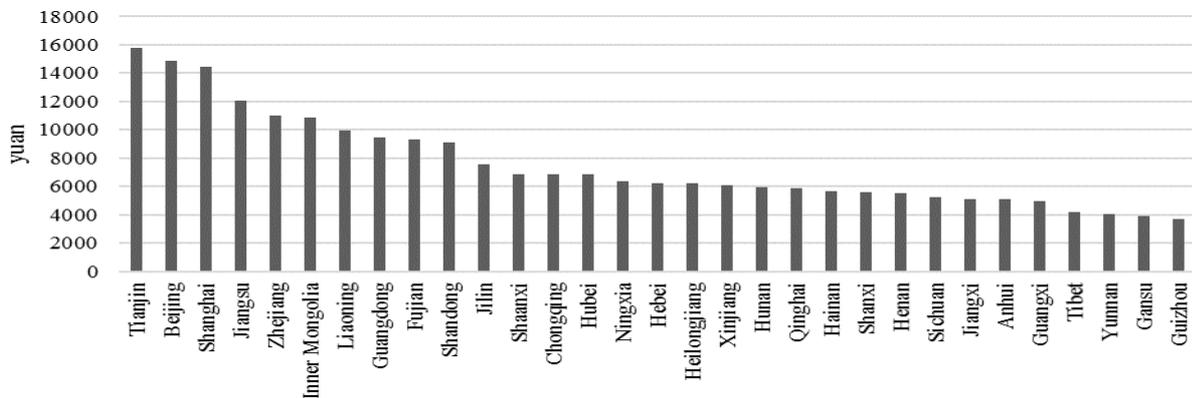


Figure 1. Chinese GDP per capita 2013, yuan

In addition, there is a gap in the innovation of China's provinces; this is due to differences in financing R&D and innovation activity intensity (Fig. 2). Thus, in 2012, the largest expenditure on research and development accounted for the provinces (106.5 billion Yuan), the least funded research and development provinces were such as Tibet, Hainan, Qinghai, and Ningxia. Financing innovation in eastern China is over 800 times more than that of the western provinces. Accordingly, the gross growth of high-tech products in the provinces of eastern China accelerated rapidly. The leader in high-tech products is Guangdong, and this province in 2012 is first in the number of patents in China, and two companies - Huawei and ZTE, operating in the areas of technical and economic development in Guangdong are the world leaders by the number of patents.

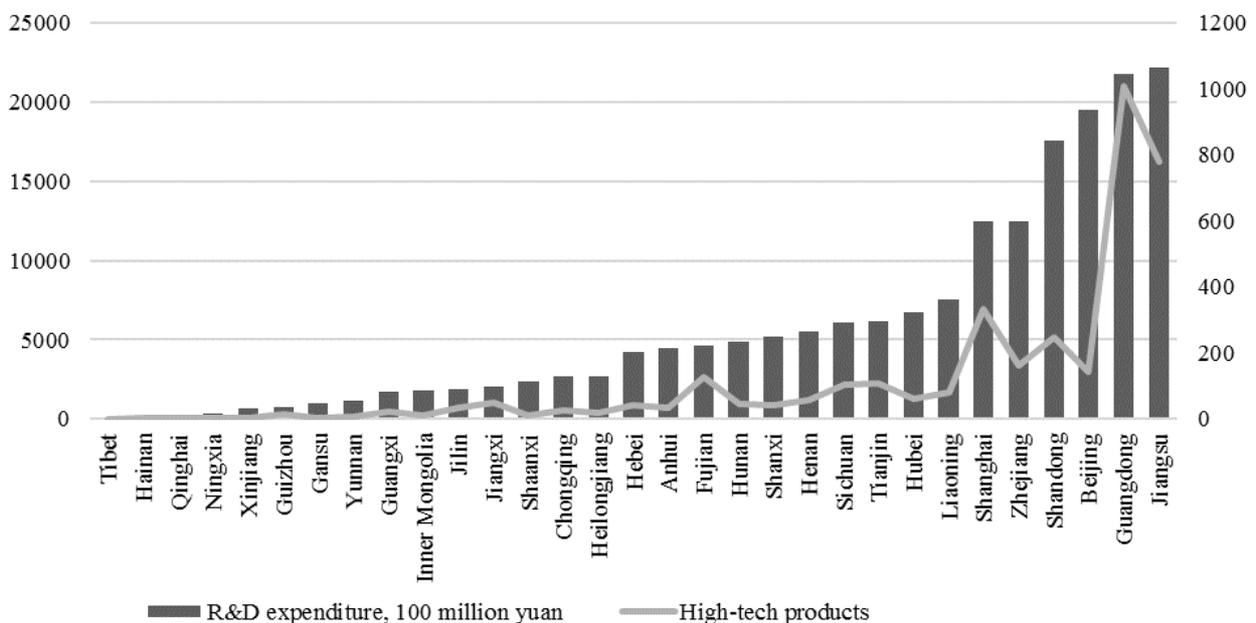


Figure 2. R&D expenditure and high-tech products in 2012, 100 million yuan

The growth of innovative activity in the eastern part of China is also associated with a number of research personnel and preparation basis. Thus, in 1986 the reforms of the higher education in China were initiated, it was decided to create a world-class university, or Chinese "Ivy League". Chinese government developed programs and projects to support leading universities, including project 211 and project 985. The

implementation of these programs helped 9 universities in China to get in the top 200 in the authoritative universities' rankings. For example, according to the QS 2013 Ranking, Peking University is 46th, Tsinghua University – 48th, Fudan University - 88th, Shanghai Jiao Tong University 123rd, Nanjing University 175th, Zhejiang University – is 165th. Thus, training of research personnel is conducted in the eastern part of China, and therefore the amount of them out there is higher. Thus, the largest proportion of research personnel - 14.25% is in Guangdong, the lowest – in Tibet (0.04%).

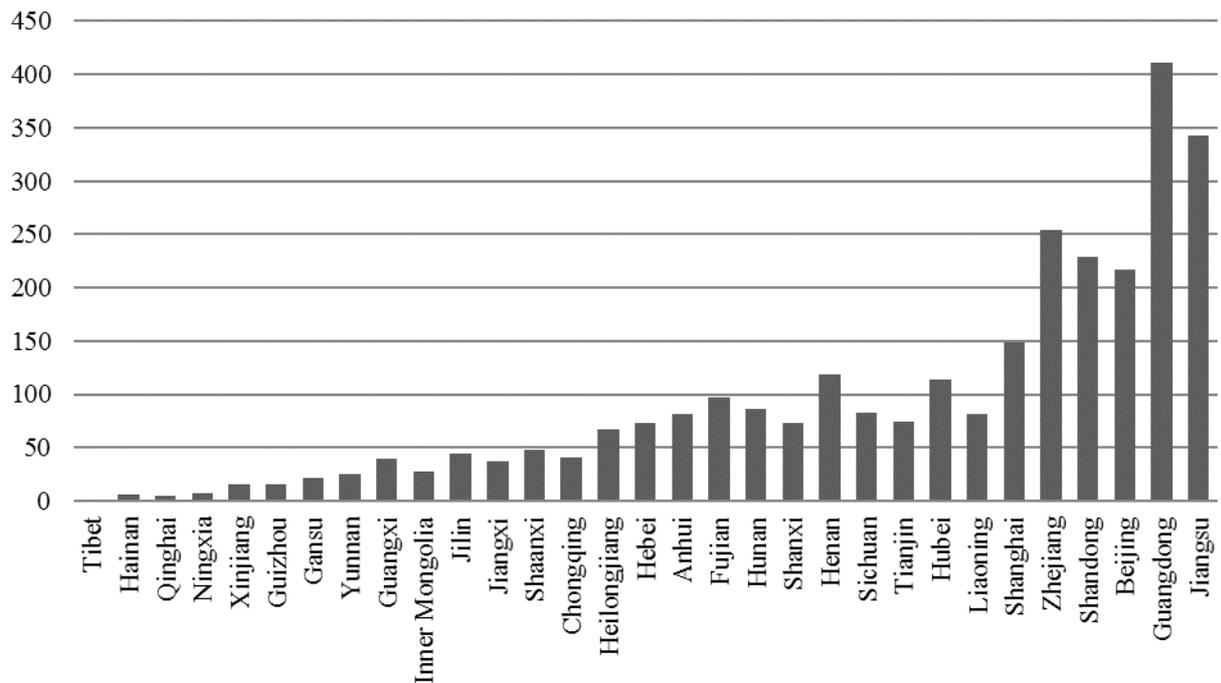


Figure 3. R&D personnel in the provinces of China, 2012

Based on the level of GDP per capita and indicators of innovative regional development of China we have conducted a cluster analysis, which allowed us to group the closest provinces in terms of development. This analysis was conducted using the software SPSS Statistics 22.0 and based on hierarchical clustering method (Fig. 4).

The calculations allowed to distinguish four clusters of innovation and economic development of China. This allowed us to identify the provinces with specialization in high-, medium- and low-tech industries. The first cluster includes the following administrative areas of China: Tibet, Hainan, Qinghai, Gansu, Yunnan, Guizhou, Xinjiang, Ningxia, Guangxi, Jilin, Jiangsu, Shanxi, Chongqing, Heilongjiang, Hebei, Anhui, Shanxi, Henan, Sichuan and Hubei. The second cluster groups Inner Mongolia, Fujian, Liaoning, Zhejiang, Shandong; third cluster - Hunan, Tianjin, Jiangsu Province; fourth cluster - Shanghai, Beijing, Guangdong. These clusters were grouped by indicators such as GDP per capita expenditures on research and development, research staff and high-tech products.

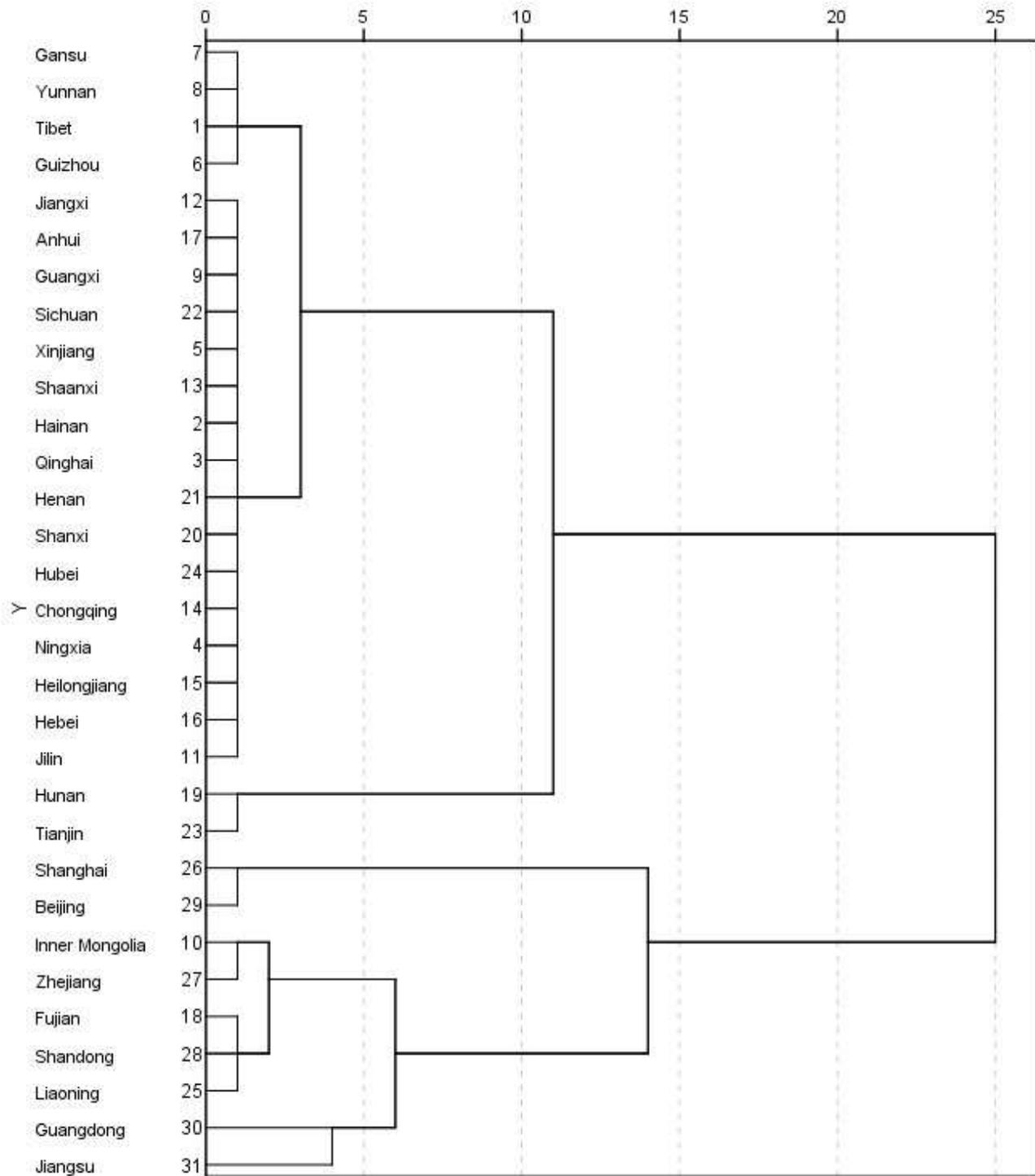


Figure 4. Dendrogram using Average Linkage (Between Groups)

Thus, the first group of provinces specializes in low-tech sectors, the second cluster provinces – in middle-tech sectors, and the provinces of the third and fourth clusters in high-tech industry. A significant portion of research institutions, research and scientific personnel is located in provinces of the third and fourth clusters, accounting for a significant proportion of high-tech exports and imports, and the largest share of funds from the state budget of the PRC, private sector research and development is invested in these provinces. Thus, in the context of globalization the government of China faces a problem of leveling disparities in the development of Chinese regions as well as providing national economic security. Thus, according for KPMG study "Future State 2030: Global megatrends and their impact on the government" the challenge for the governments of the world stands - solving debt, population, resource, environmental problems, and the development of effective technologies to protect national economic security [9]. For China,

all these problems are urgent and should be addressed to, especially in the context of regional asymmetries, issues of urbanization, resources, demography, ecology etc.

Conclusions of research. Thorough research disparities of innovative and economic development of the Chinese provinces allowed the author to determine that the greatest influence on it was made by government policy, namely the reforms started in 1978, which were directed to the formation of the Eastern China, and that led to degradation of the Northwestern Regions of China and high-tech specialization in the South-eastern provinces. Cluster analysis allowed to confirm the retrospective analysis and to identify the groups of provinces with low, medium and high-tech specialization, as well as to demonstrate the impact of innovation on economic growth of Southeastern provinces of China.

References

1. Atsmon, Y. and Dixit, V. (2009), "Understanding China's wealthy", *McKinsey Quarterly*, available at: http://www.mckinsey.com/insights/marketing_sales/understanding_chinas_wealthy,
2. China Science & Technology Statistics Data Book (2013), *National Bureau of Statistics of China*, available at: <http://www.stats.gov.cn>
3. Funke, M. and Yu, H. (2009), "Economic growth across Chinese provinces: In search of innovation-driven gains", Suomen Pankki, Helsinki, Finland.
4. Hausman, A. and Johnston, W.J. (2014), "The role of innovation in driving the economy: Lessons from the global financial crisis", *Journal of Business Research*, no. 67, pp. 2720–2726.
5. Main Science and Technology Statistics OECD (2014), *OECD*, available at: <http://www.stats.oecd.org>
6. NDRC Western Development Division, *Government of People's Republic of China*, available at: <http://www.chinawest.gov.cn/>
7. Northeast Revitalization Plan (2007), *China State Council*, available at: http://www.gov.cn/gzdt/2007-08/20/content_721632.htm
8. Zhao, S.L. (2013), "Evaluating China's regional collaboration innovation capability from the innovation actors perspective", *Technology in Society*, 35, P.182–190
9. Future State 2030 (2014), *KPMG*, available at: <http://www.kpmg.com/UA/en/IssuesAndInsights/ArticlesPublications/Documents/future-state-2030-v1.pdf>

Khomenko O.V. DISPROPORTIONS OF INNOVATIVE DEVELOPMENT OF CHINESE PROVINCES UNDER NATIONAL ECONOMIC SECURITY

Purpose. Deep analysis of economic disparities and innovative development in Chinese regions.

Methodology of research. Several methods of scientific research were used, such as synthesis and analysis - retrospective analysis of economic policy reform and innovation, and economic-mathematical, method of analogy and system analysis - cluster analysis of innovative development of China's provinces. Cluster analysis was performed using statistical software SPSS 22.0. Statistics from Organization for Economic Cooperation and Development, the World Bank, UNCTAD, the National Bureau of Statistics of China, as well as reports from the international consulting firms - KPMG, Ernst&Young, Price Waterhouse Coopers were used as (are) the source base of this paper.

Findings. Thorough research disparities of innovative and economic development of the Chinese provinces allowed the author to determine that the greatest influence on it was made by government policy, namely the reforms started in 1978, which were directed to the formation of the Eastern China, and that led to degradation of the Northwestern Regions of China and high-tech specialization in the South-eastern provinces. Cluster analysis allowed to confirm the retrospective analysis and to identify the groups of provinces with low, medium and high-tech specialization, as well as to demonstrate the impact of innovation on economic growth of South-eastern provinces of China.

Originality. This paper deals with the analysis of regional disparities of the PRC, the PRC government policies disclosed for leveling the economic and social disparities, and for innovation. Preconditions and factors of asymmetric development of the provinces of Eastern and Western China are identified; cluster analysis of the innovative development of the provinces is performed.

Practical value. The obtained results can serve as the basis for further research of innovation asymmetries of economic development in China, and can be implemented to analyze disparities of regional development in Ukraine.

Key words: innovation development, asymmetry, Province of China, cluster analysis, policy reforms, national economic security.