How Far Is China From An Innovative Country? -Based on the evaluation of international authorities and the observation of China's reality

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Abstract. Based on the evaluation of China's national competitiveness and innovation capabilities and the investigation of China's economic development reality, WEF, IMD and WIPO's three international authoritative evaluation agencies have revealed that China's national competitiveness and innovation capabilities have been greatly improved. However, there are still considerable distances compared to the development goals of innovative countries. Based on this understanding, this paper believes that the implementation of innovation to drive China's economic development strategy, to achieve the goal of building an innovative country, and China's innovation needs to pay more attention to “basic innovation”, choosing more “cross-border innovation”.

1. Introduction

The history of innovation of the Chinese nation has been extremely brilliant and has made significant contributions to the development of human society. The leaders of the new generation of China, the Chinese Communist Party and the Chinese government attach great importance to innovation.

In the 1950s, the People’s Republic of China, which was just born, was in a hurry and was ready to go. Mao Zedong, the leader of the first generation of New China, resolutely “move to science” and use the power of the whole country to independently develop “two bombs and one star” (atomic bomb, hydrogen bomb, artificial satellite) and achieved great success, thus laying a new China's great power in the world. In the late 1970s, China stepped out of the decade of catastrophe caused by “Cultural Revolution” and put forward to reform and opening up. In the 1980s, Deng Xiaoping, the chief architect of China's reform and opening up, put forward the scientific argument that “science and technology are the primary productive forces”; in the 1990s, Jiang Zemin pointed out “Innovation is the soul of a nation”; at the beginning of the 21st century, Hu Jintao advocated “building an innovative country”; since 2012, General Secretary Xi Jinping has formulated and implemented a great strategy of “innovation-driven development”. Since the 1980s, China has implemented a series of major scientific and technological education innovation projects: in 1986, the “863 Program” was formulated and implemented. In 1995, the state implemented the strategy of “rejuvenating the country through science and education” and launched the “211 Project” (1995). “985 Project” (1998), “Double-Class Construction” (2015) and other university innovation strategies and “Technology Innovation Project” (1996), “Knowledge Innovation Project” (1998),

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“Innovation Driven Development Strategy” (2012) Innovative engineering and strategy, “Made in China 2025” (2015) is the assembly number of comprehensive innovation and building an innovative power. Innovation has become the most “bright” cause of our country since the founding of New China, especially since the reform and opening up.

Building an innovative country has become an important area of competition among countries in the new era. China's construction of an innovative country and the implementation of the “three-step” strategy: to enter the ranks of innovative countries by 2020, to enter the forefront of innovative countries by 2030, and to build a world of science and technology by 2050. With the coming of 2020, the first step of China's construction of an innovative country is how effective it is. This article attempts to examine this.

2. International Evaluation of Competitiveness and Innovation

Building an innovative country, the country's global competitiveness and innovation capabilities are important indicators of display. Research and measurement of the relationship between innovation and the country's global competitiveness and innovation capabilities is an important area of innovation research. Many well-known institutions and international organizations publish relevant research results on a long-term and regular basis, such as the European Innovation Scoreboard (EIS) issued by the European Union (EU), the Innovation Union Scoreboard (IUS), and Global Innovation Scoreboard Index (GISI), Summary Innovation Index (SII)[1~3]; The Global Competitiveness Index (GCI) released by the World Economic Forum (WEF)[4~5];The World Competitiveness (WCI) released by the International Institute for Management Development (IMD)[6~7]; The Global Innovation Index (GNI) issued by Cornell University (CU), World Intellectual Property Organization (WIPO), and INSEAD[8~10]; United Nations Conference on Trade and Development (UNCTAD) issued Innovation Capability Index (ICI)[7], World Bank (WB) released Knowledge Economy Index (KEI), Organization for Economic Co-operation and Development (OECD) publishes Science, Technology and Industries Scoreboard(STIS)[11], China National Institute of Science and Technology Development Strategy National Innovation Index NII (National Innovation Index) [12]. IUS and GEI, GCI, WCI, GII, NII, etc. are the authoritative rankings of global competitiveness and innovation index [13~17].

It has become a global consensus to examine whether a country (or an economy) has become an innovative country by its overall competitiveness and ability to innovate. The same consensus is that if a country's evaluation of the authoritative organization is in the top 20 for many years, the country can be considered to have become an innovative country. According to the results of the three evaluation agencies, the international community divides the socio-economic development of a country or an economy into three types: factor-driven, efficiency-driven, and innovation-driven. The socio-economic development of an innovative country is mainly driven by innovation factors, that is, innovation-driven development.

3. Evaluation of China's Competitiveness and Innovation

The year of 2018 is the 40th anniversary of China`s reform and opening up. In the 40 years of reform and opening up, China's development performance has been brilliant: in 2010, China's total economic output surpassed Japan and ranked second in the world. In 2013, China's total R&D expenditure exceeded Japan, becoming the second largest R&D expenditure country of the world. Has China moved to an innovative country? This paper examines the evaluation results of three major national competitiveness and innovation capability of China which given by the evaluation

agencies such as WEF, IMD and WIPO (see Table 1).

Table 1. The ranking of China's global competitiveness and innovation capabilities

Year	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017
GDP①	4	3	3	2	2	2	2	2	2	2
GCI②	30	29	27	26	29	29	28	28	28	27
ICI③	25	22	21	23	23	30	40	49	45	44
Number⑥	131	131	133	142	144	148	144	140	138	137
WCI④	17	20	18	19	23	21	23	22	25	18
Number	55	57	58	59	60	60	60	61	61	63
GII⑤	37	37	43	29	34	35	29	29	25	22
Number	130	130	130	129	128	130	129	129	128	127

Note:①GDP(Gross Domestic Product),The ranking of GDP according to the IMF(International Monetary Fund;②GCI(Global Competitiveness Index),The overall ranking according to'the Global Competitiveness Report'of the World Economic Forum (WEF);③ICI(Innovation Capacity Index),The ranking according to 'the Global Competitiveness Report'of the World Economic Forum (WEF);④WCI(World Competitiveness index),The ranking according to the'World Competitiveness Yearbook'of the IMD(International Institute for Management Development in Lausanne of Switzerland);⑤GII(Global Innovation Index),The ranking according to 'The Global Innovation Index'of the Cornell University, INSEAD, WIPO(World Intellectual Property Organization). ⑥Number, number of countries or economies being evaluated.

Source of Data: The authors organized according to the WEF, IMD and WIPO annual reports.

In the authoritative rankings of the three global competitiveness and innovation indices such as WEF, IMD and WIPO, China's global competitiveness and innovation index have significantly improved, especially in terms of market volume and economic scale, R&D expenditure, and participation. The number of innovative scientists and engineers, and the number of patent applications, etc. have increased significantly [7, 8]. On the other hand, China's relative indicators of innovation and per capita indicators are relatively lagging behind, especially in the quality of higher education, the business environment and the market environment and institutional environment with Western colors [4,13], seriously affecting China on the global competitiveness and innovation index ranks globally.

Based on the above evaluation results, China's social and economic development is in the rank of efficiency-driven; based on innovation performance, the world's major economies can be divided into four types: innovation leading countries, innovation following countries, moderately innovative countries and low-innovation countries, moderately innovating countries [10]. Based on the evaluation results of the three international authoritative evaluation agencies, there is still a considerable gap between China and the goal of building an innovative country. More seriously, from Table 1, people can clearly see that China's WEF-based Innovation Capacity Index(ICI) has continued to "slow down". Obviously, China's global competitiveness, especially the innovation competitiveness, has been slow.

4. Realistic Observation of China's Economic Development

For the scenario in which China's global competitiveness and innovation index shown in Table 1 lags far behind GDP rankings, ordinary Chinese people can certainly have "ideology bias" in these rankings or the design of their indicators is not compatible with China's national conditions. In fact, that is redundant worry. Because China held high the banner of "rejuvenating the country through

science and education" as early as the 1990s, it vigorously promoted innovation-driven development. So, what is the reality of China's economic development? This article has been examined.

(1)China's development and resource consumption

Table 2 China's development and resource consumption

2017year	Population	GDP	Crude steel production	consumption		CO_2 emissions
				Primary energy	Coal	
	Billion	Billion dollars	Billion tons	Billion tons of oil equivalent		Billion tons
China	1.386	12237.7	8.317	3132.2	18.93	9232.6
World	7.53	80682.3	16.912	13511.2	33.72	33444
Proportion	18.41	15.17	49.2	23.18	56.14	27.6

Source of Data: The authors organized according to the'China Statistical Yearbook','BP Statistical Review of World Energy', etc.

Taking 2017 as an example, China accounts for 15.17% of the world's GDP with a population of 18.41%, and per capita output is lower than the global average. While gaining this economic output, China consumes 23.18% of global energy source,49.2% of crude steel and 56.14% of coal, the proportion of energy and resources consumption is far greater than China's population and economic output, indicating that China's economic development has obvious characteristics of resource elements; it is precisely because of China's economic development. For the resource factor driving characteristics, China's economic development with a output of 15.17%, emissions of 27.6% of the world's CO2, the environmental cost is even greater (see Table 2).

(2)Fund-driven for China's economic development

Table 2 reveals only the specific characteristics of China's economic development. In order to examine the longer-term development characteristics of China's economy, this paper's GDP (economic development) since the founding of the People's Republic of China and the fixed assets investment (capital investment) of the whole society Data, for example, it reveals the capital-driven characteristics of China's economic development (see Table 3).

Table 3 China's economic development: Comparison of investment and GDP

Year	GDP	FSIOWS	FSIOWS/GDP
	billion yuan	billion yuan	Yuan/100yuan
1950	48.4	4.5	9.30
1960	145.7	41.7	28.62
1970	225.3	38.0	16.87
1980	465.6	91.1	19.57
1990	1866.8	451.7	24.2
2000	9921.5	3291.8	33.18
2010	40110.2	25168.4	62.75
2018	90030.9	67900.0	75.42

Note: FAIOWS: Fixed asset investment of the whole society.

Source of Data: The authors organized according to the'China Statistical Yearbook'.

In 1949, the People's Republic of China was established. During the 70 years from 1949 to 2018,

China's FSIOWS/GDP was calculated for each integer year except separate statistics for the year of 2018. As can be seen from Table 3, in addition to such a crazy great leap forward in 1960, China's FSIOWS/GDP ratio is showing an upward trend. The FSIOS/GDP in 2018 is 8.11 times that of FSMOWS/GDP in 1950. The evolution of the FSIOWS/GDP ratio in the 70 years since the founding of New China clearly shows that China's economic development has a strong capital-driven character.

5. Brief thinking and enlightenment

China's rapid economic development, China attaches great importance to innovation, and huge investment in innovation. However, the evaluation price of international authoritative evaluation agencies and the investigation of China's economic development reality have revealed a common phenomenon: there is still a considerable gap between China and the goal of building an innovative country. What is the reason for the low performance of China's innovation? Scholars at home and abroad have conducted extensive analysis and have a good opinion. The author of this article will analyze the reasons in depth. Here is a brief description of the thinking and enlightenment obtained from the above phenomena.

(1)More Attention to " Fundamental Innovation"

The history of China's long-term backward beatings has made people have more "cutting pains" in terms of economic backwardness. Therefore, China's direct driving force for innovation is more about developing the economy and more from direct real needs. The focus of innovation is more on "technology and product development" (i.e. "application research" and "experimental development" in R&D). For the original, theoretical, and basic "basic research", due to the lack of direct practical needs, most of them are undertaken by "public welfare" universities and national research bases (institutions). The study of the history of science and technology reveals that innovations that can truly enhance a country's and society's competitiveness and innovation index, and thus promote social science and technology progress and social development, coming from major, original, theoretical and fundamental innovations. Therefore, the support of "basic research" greatly affects the "performance" of innovation.

Fundamental research is the foundation of science, the source of technology, and the source of power for innovation-driven development. The most important supporting force for national innovation capability and global competitiveness comes from original innovation and from basic research. An important reason why China's innovation performance failed to meet expectations was the imbalance in our investment structure in research and development. China's university scientific research institutions are the main body engaged in basic research. However, due to the structural imbalance of China's research and development funds, the basic research accounts for 30% of the R&D expenditures of university research institutions in China, and applied research and experimental development account for 70%. In the composition of R&D expenditures in American universities, basic research has been around 65%, and in the field of science and engineering, which is as high as 75%. The basic research of colleges and universities in China is seriously inadequate. The proportion of basic research in China's research and development funds is only about 5%, while the proportion of innovative advanced countries ranks 15~30%.

(2)More Preference for "Cross-Border Innovation"

After the founding of the People's Republic of China, it was first blocked by the Western camp

headed by the United States. Later, it was blocked by the Soviet-led Eastern camp. The “ten-faced containment” was blocked and isolated by two superpowers headed by the United States and the Soviet Union. Beyond the international community, New China's innovation is forced to be independent, self-reliant and independent, and to create its own new things with its own strength. However, independent innovation is a “double-edged sword”. Long-term and excessive “independent innovation” may lead to “self-enclosure” of innovation and “path dependence” and “innovation ceiling” of innovation, which will worsen innovation performance. China is implementing an “innovation-driven development strategy” to build an innovative country. This requires vigorously carrying out world-class major fundamental, theoretical, original, and revolutionary innovations to enhance China's global competitiveness and global innovation index, leading the fourth industrial technology and revolution. To this end, in the era of globalization, networking, and information, China not only needs to gather innovative resources across the country, but should also actively gather global innovation resources, form global innovation communities, and maximize cross-border, open, and collaborative cooperation in the fundamental innovation.

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