Study on the Development Path of Advanced Manufacturing Industry in Jiangsu

Li-Fan XU1,a* and Hong-Bing YOU2,b

1Research Center of International Economic & Trade Issues, Nanjing University of Science and Technology, 210094, Nanjing, P.R China
2School of Economics & Management, Nanjing University of Science and Technology, 210094, Nanjing, P.R China
a*xfemail@aliyun.com, bnungyou@126.com
*Corresponding author

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Abstract. If looked from the aspect of overall structure of manufacturing industry, there are great differences between Jiangsu manufacturing industry and Canadian manufacturing industry. But if we focus on the proportion development trend of advanced manufacturing industry, there are many similarities and comparisons between them. Therefore, studying the development trend, fluctuation reasons, experience and lessons of Canada's advanced manufacturing industry, as well as the government's strategic deployment of advanced manufacturing industry, has certain reference significance for Jiangsu's advanced manufacturing development strategy, direction, and specific feasible measures. On the basis of defining the concept of advanced manufacturing industry, this paper compares the similarities and differences between Canada and China in the development of advanced manufacturing industry, analyses the experience and lessons of Canada in the development of advanced manufacturing industry, tries to draw lessons from them, and explores the further cultivation and development path of Jiangsu's advanced manufacturing industry.

Introduction

The advanced manufacturing industry is a kind of manufacturing industry integrated with advanced concepts, advanced industries, advanced technologies, advanced operation modes and advanced management. In accordance with The Classification of High-tech Industries (Manufacturing Industries) by the National Bureau of Statistics in 2013, the paper takes those eight types of manufacturing industries as advanced manufacturing industry including railway, shipping, aerospace and other transportation equipment manufacturing industries; petroleum processing, coking and nuclear fuel processing industries; chemical raw materials and chemicals manufacturing; pharmaceutical manufacturing; specialized equipment manufacturing; automobile manufacturing; computer, communications and other electronic equipment manufacturing; instrument manufacturing industry. Up to now, there has been no classification method of advanced manufacturing industry in Canada. In order to make a comparative study, this paper adopts the above classification method of advanced manufacturing to investigate the development trend of manufacturing industry in China and Canada.

Basic Situations of Advanced Manufacturing Industry in Canada and Jiangsu Province

As one of the most economically developed countries in the world, Canada boasts of vast territory and extremely abundant natural resources, and it is also one of the ten major manufacturing countries in the world. Although manufacturing accounts for only about 10 percent of Canada's GDP, advanced manufacturing accounts for about 50 percent of its manufacturing. Since the financial crisis swept across western developed countries in 2008, “industrial return” has occurred in many countries, Canada included. Despite the Canadian appreciation, the rapid rise of labor cost,
the restriction of the rise and fall of world petroleum price on the petroleum industry, the acquisition of large manufacturing enterprises by foreign countries and many other factors, manufacturing industry is still Canada's wealth source. Statistics shows that every C $1 output adds C $3.15 to its overall economy, which brings about 30% of taxes to Canadian government. Therefore, the Canadian government has taken diversified measures to promote the development of manufacturing. Since 2013, Canada's manufacturing industry as a whole has remained in the rise. However, if from the perspective of advanced manufacturing industry, under the background of overall good development of manufacturing industry, advanced manufacturing industry in Canada shows a sharp decline in the most competitive industries and slight increase or decrease in other industries.

The Current Situation & Experience of the Advanced Manufacturing Industry in Canada

The Current Situation of the Advanced Manufacturing Industry in Canada

According to the data from the official website of Statistics Canada, Canada’s manufacturing industry as a whole showed steady growth from 2013 to 2017. However, from the perspective of advanced manufacturing industry, the proportion of advanced manufacturing revenue in the overall revenue of manufacturing industry was on the decrease each year.

We can find of the advanced manufacturing industries in Canada, the revenue rank of them is petroleum processing, coking and nuclear fuel processing industry; railway, shipping, aerospace and other transportation equipment manufacturing industries; automobile manufacturing; chemical raw materials and chemicals manufacturing; specialized equipment manufacturing; computer, communications and other electronic equipment manufacturing; pharmaceutical manufacturing; instrument manufacturing industry, with the top four industries in the first class of revenue, the fifth industry in the second class of revenue and the last three industries in the third class of revenue.

Seen from the development trend, petroleum processing industry experienced the most obvious decrease, showing a sharp decline from 2013 to 2017. Because of the decreased world oil prices, the revenue decline of petroleum processing industry reached nearly 30% in 2015, 14% in 2016, and narrowed further to 6.5% in 2017. The sharp decline in petroleum processing industry outpaced the growth of the automotive manufacturing and rail, shipping, aerospace and other transport equipment manufacturing industries, which directly led to the decline of the proportion of advanced manufacturing industry in manufacturing industry when other advanced manufacturing industries developed smoothly.

Canada's Experience on the Development of the Advanced Manufacturing Industry in Canada

Encouraging Innovation. The Canadian government has taken a series of policy and measures to make advanced manufacturing more knowledge & technology-intensive and create more high-level employment. On the one hand, in the context of high wages, measures are taken to further increase labor productivity to ensure the profit of the existing advanced manufacturing industry. On the other hand, efforts are made to develop high and new technologies, such as artificial intelligence, 3D printing and so on, so as to firmly occupy the high end of the manufacturing value chain in the new round of technological revolution.

Providing Financial Support. Investment companies and universities are encouraged to support new high-tech enterprises. There are currently more than 100 start-up incubators in Canada, including the University of Wyason, the University of Toronto and the University of York, and angel investments are incubators and accelerators for high-tech start-ups. To use a metaphor, this makes Canada became the world's top launcher for start-ups. The government also actively advances the capital for all kinds of science & technology and innovation. In 2013, for example, the government announced that the Mobile Innovation Fund, which had been in place for five years, would be effective for another five years. Up to now, investment on automobile has reached around C$2 billion. In 2017, the Canadian government has launched a strategic innovation fund in its
budget to ensure that Canada continues to be one of the best destinations of investment, growth and job creation for companies in the world.

**Pursuing Diversified Economies.** Due to the multiple effects of geographical location, resource stock, historical background and political alliance, it is obviously not realistic for Canada’s economy to break away from America and petroleum. But the federal government of Canada is strategically strengthening trade and economic diversification. On the one hand, it actively promotes trade relations with China, Germany, Japan, Brazil, India and other countries, emphasizing trade ties and cooperation in the innovation of advanced manufacturing. On the other hand, it actively seeks a breakthrough, trying to break the spell “No Other Industries Except Petroleum” of the development of advanced manufacturing industry in the three grassland provinces and even the whole Canada. At present, Canada works on the distribution of 3D printing, instrument processing and transportation equipment manufacturing.

**The Current Situation of Jiangsu's Advanced Manufacturing Industry and Its Comparison with Canada's Advanced Manufacturing Industry**

**The Current Situation of Jiangsu's Advanced Manufacturing Industry**

Jiangsu’s manufacturing industries showed steady growth from 2013 to 2017. From the perspective of advanced manufacturing industry, Jiangsu’s revenue of advanced manufacturing accounted for more than 42% of the overall manufacturing revenue from 2013 to 2017, with a big increase in 2016. Compared with Canada’s three-leveled advanced manufacturing, Jiangsu’s advanced manufacturing industry can be roughly divided into two classes. The first class is industry of computer and other electronic equipment manufacturing and industry of chemical raw materials and chemicals manufacturing. Among them, industry of computer and other electronic equipment manufacturing ranked the first, accounting for more than 1/3 of the total proportion of advanced manufacturing industry, and had become the backbone in increasing Jiangsu’s share of advanced manufacturing industry. Chemical raw materials and chemical products manufacturing ranked the second. The revenues of the first two industries both dropped in 2017.

**Advantages and Disadvantages of Jiangsu's Advanced Manufacturing Industry Compared with Canada**

**The Development Trends of Various Industries.** Similar to the basic situation of Canada's advanced manufacturing industry, Jiangsu’s advanced manufacturing industry from 2013 to 2017 was also dominated by two industries, with other industries showing steady growth. Revenues of the two leading industries dropped to a certain extent in 2017. Computer, communication and other electronic equipment manufacturing industry in China witnessed overall good development. In recent years, the western cities represented by Sichuan and Chongqing have shown a strong development trend with the advantage of human cost, with Shanghai and Guangdong Free Trade Zone as the center, industrial agglomeration under the framework of Belt and Road Initiative gradually came into effect. Jiangsu’s computer, communication and other electronic equipment manufacturing industry was affected by industrial agglomeration effect, labor cost and market share. The chemical raw material and chemical manufacturing industry showed steady growth, but suffered decreased revenue in 2017 mainly because of a decline in capital spending as a result of the leading overall thinking of the low-carbon economy. Auto manufacturing enjoyed increased revenue year by year, and reaches its revenue peak in 2015. Other advanced manufacturing industries were stable, with a slight growth trend.

**Advantages of Jiangsu's Advanced Manufacturing Industry Compared with Canada.** (1) Promising market demand at home and abroad. Unlike Canada with sparse population, China has large domestic consumption demand for its advanced manufacturing products. At the same time, even if labor costs are on the rise, China's export products of advanced manufacturing still have advantages of quality and price over those of foreign competitors. Especially under the framework of Belt and Road Initiative, foreign demand for advanced manufacturing products increases a lot.
Great optimism for learning, hard work and innovation. China, as a developing country with consciousness of learning and hard work, can rationally recognize the development gap and work hard to catch up with developed countries. Under the active advocacy of General Secretary Xi Jinping, the government and society have more consciousness and motivation of innovation. "To speed up the development of advanced manufacturing." was specially proposed in the report of the 19th CPC National Congress. Thanks to the guidance and support of the government, the high-tech innovation mechanism of advanced manufacturing enjoys advantages of height, breadth, depth and continuity. Canada, as a high-welfare state, lacks strong aspiration for progress, consciousness of hard work and capacity of innovation. Led by enterprises, Canada’s high-tech development of independent development & research is short of long-term planning and mechanism.

Finite independence on foreign industries and market. Unlike Canada’s advanced manufacturing industry that is heavily dependent on the American industry, market and policy, Jiangsu’s advanced manufacturing industry has gradually got rid of being restricted by foreign funds and market, but it’s still under the influence of various foreign environmental regulations. This has affected the revenue of some industries in the short term, but in the long term, it is in line with the future orientation of the strategic development of Jiangsu's advanced manufacturing industry, and it is an inevitable pain for sustainable development.

Disadvantages of Jiangsu’s Advanced Manufacturing Industry Compared with Canada. (1) Rising unit labor cost. For a long time, the advantage of low labor cost gave rise to the rapid development of Jiangsu’s manufacturing industry. However, in recent years, the development and export of Jiangsu’s manufacturing industry, especially the advanced manufacturing industry have been facing the challenges of rising labor costs. In terms of Jiangsu, real wages per unit in cities and towns have almost doubled from about USD350 in 2010 to USD600 per capita in 2018. But Canada's advanced manufacturing industry is highly dependent on natural resources and thus suffers little influence from rising labor cost. Although Canada’s overall labor cost stayed high because of its low population, it showed a slow decrease, partly because of increased productivity that offsets the cost of labor. However, Jiangsu’s labor cost kept increasing.

Jiangsu’s advanced manufacturing industries, whether it is the leading industries of computer & communication & other electronic equipment manufacturing and chemical raw materials and chemical products manufacturing, or other industries, were still in the middle or even lower level in the international division of labor, with low added value of the product. In 2017, the profit to cost & expenses of Jiangsu’s computer, communication and other electronic equipment manufacturing was only 8.42, while its output value was still the first in the advanced manufacturing industries. This industry still relies on the expansion of the product scale to seek the competitive advantage, with increasingly intensifying contradictions between energy, land, labor, environment and advanced manufacturing industry.

(2) Low-leveled agglomeration of advanced manufacturing. Canada’s advanced manufacturing industry is of a high degree of agglomeration, with petroleum processing and coking industry mainly concentrated in Alberta, automobile manufacturing industry in Ontario, railways, ships, aerospace and other transport equipment manufacturing industries in Quebec etc., and it has relatively sound regional supporting systems and industries. But Jiangsu’s advanced manufacturing industry has not yet formed regional high agglomeration and regionally intensive industrial supporting systems, without any world-class enterprise group that gives full play to scale effect.

Path to Develop the Advanced Manufacturing Industry in Jiangsu
With Independence as the First, Firmly Seeking Relatively Independent Development under the Background of Economic Integration

Drawing lessons from Canada, the advanced manufacturing industry in Jiangsu and even China should prevent over-independence on and passive restrictions from foreign-related industries in the process of further development. The government should take a long-term vision, make strategic
deployment and provide policy guidance so as to improve the position of Jiangsu’s advanced manufacturing in value chain and provide support in aspects of law, regulation, market, fund, technology and so on to tamp the development foundation of Jiangsu’s advanced manufacturing industry.

**With Agglomeration as the Core, Creating "Landmark" Agglomeration of Advanced Manufacturing**

Jiangsu's advanced manufacturing industry should carry out multi-dimensional and multi-leveled overpass-like restructuring under the premise of reasonable deployment of the government, self-autonomy of industries and shared benefits and progress of enterprises, and integrate all the industries within the cluster area to create enterprises of their own focus, reasonable market distribution and advanced manufacturing clusters of the Peripheral Support that can share upstream and downstream supporting systems and system integration, such as regional cloud logistics and cloud distribution. All these will gradually form a landmark effect, attracting new advanced manufacturing enterprises of capital, technology, innovation capacity to join in and forming a virtuous circle.

**With Innovation as the Basis, Continuously Making the Advanced Manufacturing Industry More Advanced**

Jiangsu’s advanced manufacturing industry should constantly upgrade its technology and improve the system and environment of high-tech conversion. Independent and inclusive of cooperation, it should also vigorously strengthen international equal cooperation in science and technology while seeking independent innovation and develop value-added products or services for the international market with joint research and development of important scientific propositions and core technologies as the mainstream. At the same time, the government should perfect the transformation system of scientific and technological achievements, accelerate the construction of incubators for scientific research in colleges and universities and for start-ups of science and technology in industrial parks so as to constantly improve the labor productivity of Jiangsu’s advanced manufacturing industry, thus reducing the unit labor cost.

**With Mutual Benefit as the Target, Constantly Tamping the Development Foundation of Advanced Manufacturing Industry**

Jiangsu should constantly explore and find new ways to develop high-end service industry coordinates with advanced manufacturing industry. With increasing socialization and specialization of advanced manufacturing industry, advanced manufacturing industry shows more and more demand to high-end service industry. For example, the introduction and construction of cloud logistics system can greatly reduce the transaction cost, storage cost, default cost and time cost. When high-end service industry coordinates with advanced manufacturing industry, the former can propel the development of the former and enhance its appreciation potential. Meanwhile, the former can be pushed to develop rapidly. In this way, a industrial ecological circle that is cooperative and multilaterally beneficial gradually comes into being.

**Conclusion**

Stones from other hills, we can learn. Nowadays, Jiangsu is promoting the high-quality economic development, while to develop the advanced manufacturing industry is of great important to it. If we insist on the openness, the innovation and participate the economic globalization actively, we will achieve our goals in the near future.
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