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The Study on the Development of High-Tech Industry in China

On the Basis of Manufacture of Electronic Equipment and Communication Equipment

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***Abstract*—Along with the development of high-tech industries, it is playing an increasingly important role in solving constrains of resource and environment. This paper discusses the development of China's high tech industry characterized by capital intensive and knowledge intensive. To this end, statistics of manufacture of electronic equipment and communication equipment are collected ,current situation and problems of enterprises, industries, regions and the whole of high-tech industries are shown through transverse and lengthways contrast, and corresponding feasible suggestions and countermeasures are proposed.**

Keywords—high-tech industries; development; challenge; countermeasures

I. INTRODUCTION

Since 1970s, the development of high-tech industry has brought about profound changes in technology, and has played an undoubted role in the changes in the international division of labor and the growth of the global economy. The world has given priority to the development of high-tech industries, while it is the same in China. Start from 1980s, the implementation of "863 Program" and "Torch Plan", the high and new technology industrial park construction policy and so on, gives high technology industry rapid development, as a result, during the period of the 13th Five-year Plan, the export of China's high-tech products has remained the world's largest. However, China is not a powerful country in high-tech industries, there are still some problems and challenges with enterprises, industries, regions and macro levels of high-tech industries. In order to better promote the development of high-tech industry, this paper makes full use of data in the statistical yearbook of the high technology industry, put forward corresponding suggestions based on the comprehensive analysis of the status of the development of high-tech industry represented by manufacture of electronic equipment and communication equipment.

II. THE PRESENT SITUATION AND CHALLENGE OF HIGH-TECH INDUSTRY

A. The Scale and Output of High-Tech Enterprises Are Growing, But the Value of Products is still in the Lower End of the Chain

Since 2005, the number of high-tech industrial enterprises in China has increased steadily, and the scale of industry has been expanding. In 2015, number of enterprises of high-tech industries reached to 29631, increasing 12104 more than that of 2005, got the average annual growth rate of 4.9%. Among them, manufacture of electronic equipment and communication equipment occupied a leading position in the high-tech industries, the number of enterprises changed from 7781 to 14634 during 2005 to 2015, got 5.9% annual growth rate of industry enterprises, which is higher than the overall average level of the industry. During this period, manufacture of electronic equipment and communication equipment had achieved share of revenue from principal business from 49.1% to 55.9%, with an annual growth rate of 15.1%. And total profits accounted form 45.7% to 48.4%, with an annual growth rate of 18.8%. Details are as "Table Ⅰ".

TABLE I. 2005-2015 SCALE AND OUTPUT OF MANUFACTURE OF ELECTRONIC EQUIPMENT AND COMMUNICATION EQUIPMENT

year	The Number of Enterprises		Revenue from Principal Business		Profits	
	Number (unit)	*account*	*Scale (billion yuan)*	*account*	*total*	*account*
2005	7781	0.44	16646.3	0.40	650.8	0.46
2006	8606	0.45	21068.9	0.42	886.3	0.50
2007	9963	0.46	24823.6	0.45	1036.3	0.43
2008	12871	0.50	27409.9	0.49	1059.1	0.39
2009	12831	0.47	28465.5	0.48	1309.6	0.40
2010	13425	0.48	35984.4	0.48	2233.7	0.46
2011	10220	0.47	43206.3	0.49	2161.9	0.41
2012	12215	0.50	52799.1	0.52	2679.5	0.43
2013	13465	0.50	60633.9	0.52	3326.8	0.46
2014	13973	0.50	67584.2	0.53	3744.4	0.46
2015	14634	0.49	78309.9	0.56	4348.9	0.48

From the overall value, the overall value of the industry rose from 16867.1 trillion to 43559.5 trillion during 2005 to 2011, with an increase of 14.5%. The above data shows that the total profits of the manufacture of electronic equipment and communication equipment is less than the growth of the number of enterprises and the growth of the main business income, which means the shortage of the qualification of enterprise and the gradual loss of the cost advantage. In addition, the fact that the labor productivity of manufacture of electronic equipment and communication equipment in 2013 was 828 thousand yuan per person, which is lower than the industry overall level of 908 thousand yuan per person, far more than the manufacturing level of 1 million 88 thousand yuan per person, reflects the relative lowness of high-tech industry's overall labor productivity. This kind of definition of low productivity and high scale showed that China's high tech products are worthless further. And the value mainly came from the course of processing and assembling, due to the cheap labor force in China.

B. The Competitiveness and Innovativeness of High-tech Industry Are Gradually Strengthened, but the Strength of Innovation and Digestion and Absorption Are still Insufficient

Theory of industrial organization shows that market concentration is closely related to the degree of competition in the market. So, in order to display the market vitality of manufacture of electronic equipment and communication equipment, this paper select the proportion of the number of enterprises of manufacture of electronic equipment and communication equipment in that of the whole high-tech industries. According to the data, concentration Ratio in the industry raised from 44.4% to 49.8% during 2005 to 2015,of which in 2013-2014 years, the highest market concentration is as many as 50%. At the same time, the ratio of the number of enterprises having R&D activities (unit) is increasing with a growth rate of 8.5%, much higher than the average manufacturing sector, which means industry innovation climate gradually improved. Absolutely, the industry is enjoying a good momentum, the industry's innovation atmosphere has gradually become better. However, the intensity of R& D investment and the degree of digestion and absorption are the important indexes of technology innovation and technology diffusion, having different performance. From the intensity of R& D investment, an increasing trend showed in 2008 to 2013, the specific data changed from 0.46 percent to 1.73percent, and in 2013 the data is 2.33 times than that of other manufacturing averages. When compared with the United States in 2009 (19.74%), Japan (10.5%) in 2008, and South Korea in 2007 (5.86%) and other developed countries, obviously, a big gap and the lack of capital investment exposed. In terms of technology import, the aim is to digest and absorb the technology so as to cultivate the core R & D capability of the industry and reduce the dependence on importing technology. In the period from 2005 to 2015, the ratio of the cost of expenditure for assimilation of technology and expenditure for acquisition of foreign technology in China's manufacture of electronic equipment and communication equipment decreased from 0.34 to 0.10, indicating that the industry in the development process focuses on the introduction of advanced technology, and despise the digestion and absorption.

C. The Regional Development of High-tech Industry Is Relatively Stable, but the Problem of "Location Difference" and "Structural Homogenization" Is Obvious

By calculation, during the period of 2012 to 2015, the annual growth rates of the profits of manufacture of electronic equipment and communication equipment in the eastern, central, western and northeastern regions were 14%, 10%, 7%, -0.08%, in addition to the northeastern showed a negative growth due to its prostrate economy, other regions have maintained steady growth. Especially in the eastern region, its annual growth rate has exceeded the national average (13%), fully embodies the comparative advantage. It is worth noting that in the western region the manufacture of electronic equipment and communication equipment is developing rapidly, the rate has followed the central region.

TABLE II. 2012-2015 TOTAL PROFIT OF ELECTRONIC AND TELECOMMUNICATION EQUIPMENT MANUFACTURING IN VARIOUS REGIONS (BILLION YUAN)

region \ year	2012	2013	2014	2015
eastern	2009.10	2623.98	2990.75	3451.82
central	397.60	385.77	468.17	580.46
western	201.90	180.24	207.70	266.34
northeastern	70.90	69.63	77.76	50.29

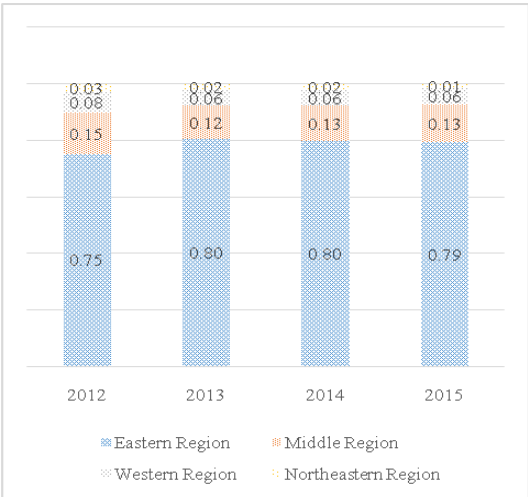

Fig. 1. 2012-2015 The Ratio of Total Profit in Regional Manufacture of Electronic Equipment and Communication Equipment.

From "Table II" and "Fig. 1", while the regional of manufacture of electronic equipment and communication equipment is maintaining a certain growth rate, but the regional difference between western and central, northeast

region and the eastern region is gradually expanding. At the same time, because of government support funds focused on electronic information, biotechnology, new materials, new energy and other industries, always resulting in similar products in economic and technological development zone of different economic and technological origins, and industry structure of "homogeneous" problem in different degree there. Besides, the lack of reasonable division of labor between enterprises makes the industrial parks not forming a benign industrial agglomeration effect, lacking characteristics.

D. The International Status of the High-tech Industry Is Increasing Continuously, but There Is Still a Gap in the Quality of Its Development

High technology industry has been characterized by high research and development and high technical content, and has been given high hopes to solve the problems of resources and environment. Indeed, some industries, such as new materials and new energy development, have brought social benefits. But does the high-tech industry mean low energy consumption and low pollution? In the context of green development and circular economy, the quality of high-tech industry development is worth investigating. According to the statistics of the World Bank, since 2005, China has been the world's top exporter of high-tech products for 10 years in a row, and its international position is fairly stable. In 2012, China's exports of high-tech products exceeded 500 billion dollars for the first time, reaching 505.65 billion dollars. In 2014, the export of high-tech products in China was 3.58 times than that of the United States. Meanwhile, the FT quoted research group Euromonitor International data show that China's manufacturing industry average hourly earnings rose from 1.2 dollars per hour in 2005 to 3.6 dollars per hour in 2016, higher than any Latin American country except Chile, at about 70% level of the weaker EU member, is fast approaching Greece and Portugal. In the flying-geese Paradigm model, China's status as a world factory is being shaken, and of course, it has become a driving force for China's shift from low-end manufacturing to a high-end. In terms of energy utilization and consumption, the development of high technology industry in China is similar to the extensive economic growth, quality and efficiency still exist multiple level gap when compared with the developed countries such as the United States, Germany, Japan. According to the British BP company statistics, in 2014, China's unit GDP energy consumption were about the world average, the United States, Japan 1.9 times, 2.4 times and 3.65 times, while higher than Brazil and Mexico and other developing countries. In 2014, the energy consumption per unit GDP of China was about 1.9 times, 2.4 times and 3.65 times higher than that of the world average, the United States and Japan, while it was higher than that of developing countries such as Brazil and Mexico. Specifically, from 2005 to 2015 in the manufacture of electronic equipment and communication equipment the proportion of the total energy consumption to 6.8% growth is significantly higher than the same period the industry formed the growth rate of 4.9%. Therefore, we can see that energy utilization of manufacture of electronic equipment and communication equipment enterprises is not ideal, the development of the industry quality needs to be improved.

III. SUGGESTIONS AND COUNTERMEASURES

A. Enterprises: Improve the Quality of labor force and Grasp the Market Opportunity

According to statistics, more than 90% of enterprises have an average life span of 2-5 years, which means that enterprises need long-term planning and sustainable development if they want to improve their life expectancy. The gradual loss of the demographic dividend and the increasingly complex market situation remind entrepreneurs should pay attention to the change of market prospects and research risk, perfect the mechanism of promoting human capital training, cultivate professional and technical personnel. Enterprises need to develop short, medium and long term plan in different periods of scientific research, management, production according to their own actual situation, and then invest suitable R & D capital and human capital in the appropriate period, so as to further enhance the output efficiency of high tech industry development. When developing new products, the enterprise should start from the consumer demand, stick to the market effect, and give full consideration to the marketability and the feasibility of the new achievements and new patents, so as to enhance enterprise core competitiveness and gain sustainable operation.

B. Industry: Broaden Financing Channels, Pay Equal Attention to Innovation and Absorption

The system is another core factor to promote the development of industry in addition to technology, and the government as a system maker should be committed to establishing an institutional system to effectively promote technological progress and give play to the autonomy of the enterprise. Despite the current Government always support the development of high technology industry, the industry still need to widen the financing channel. In 2015, the proportion of self-raised funds by enterprises was as high as 94 percent, which told that capital from government funds and financial institutions was insufficient. At the same time, industrial policy should actively guide enterprises to carry out independent research and development and the introduction of absorption, emphasis on imitation, absorption and transformation when introducing advanced technology and suitable technology, so as to promote the enterprise research and development ability and gradually change the situation dependent on imported technology.

C. Region: Strengthen Regional Industrial Ties and Give Full Play to Regional Characteristic Advantages

Government policy should be to strengthen the regional industry and regional industry connection, form a specialized division of labor and cooperation mechanism, help to promote the agglomeration of industrial value forms in and between regional high tech development zone. Specifically, there must be clearly definition and limitation on the introduction of park enterprises, promote cultural

communication and mutual communication platform in the industrial park, thus forming the interdependence and mutual support between institution and enterprise clusters. The eastern region should strengthen its funding and technological exchanges with other regions and promote other regional development through investment, so as to narrow regional differences. At the same time, the local government should set out from the resource advantage, location advantage and development characteristics of the high technology industry or commit to transform traditional industries, then form linkage effect between the surrounding areas, so as to improve the product structure.

D. Macro:Improve the industry evaluation mechanism, perfect the Industrial Service and Institutional System

Economic development is closely related to the environment. While focusing on the economic effects of high-tech industries, environmental effects should also be concerned. Under the current industry evaluation mechanism, the local government takes the economic record, and the imported high-tech enterprises may not meet the requirements of ecological sustainable development in the process and products. Therefore, the industry evaluation mechanism should pay more attention to energy consumption rate and energy efficiency, as well as social effects such as the reduction of employment opportunities due to intellectualization and mechanization. As the development of industries and enterprises cannot do without the supporting service system, so the government should strengthen the research and design services, intellectual property services, inspection services, scientific and technological achievements into services, information technology services, digital content services, e-commerce services, biotechnology services and other eight areas of legal construction and infrastructure construction, promote the development of high-tech industry.

IV. CONCLUSION

In the future, China will become an important production base of global high technology products, the degree of dependence on the international market will be significantly improved, it also means that China's high technology industry will face the increasingly complex international environment, and be affected by the fluctuation of the market more. In this situation, the high-tech enterprise should actively expand innovation and market activities under the guidance of the government, gradually formed industry agglomeration forms based on value of the division, and reasonably build four regional economic linkage, information sharing, the rationalization of industrial structure layout, finally achieve effective breakthrough of high technology industry in China on the macro implementation.

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