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Enlightenment of american advanced manufacturing to economic zone on the west side of the straits

Xuan Liu*, Xiangqian Zhang, Wumei Xiao
Business Administration College, HuaQiao University, (P. R. CHINA)
E-mail: xqzhang1998@163.com

ABSTRACT

America mainly uses national policy support, encouraging small and medium-sized enterprises innovation, establishing leading position of high-tech industry and other measures to make their advanced manufacturing ahead in the world. The current problems of manufacturing industry in economic zone on the west side of the straits are irrational industrial structure, backward management, low information and others. Economic zone on the west side of the straits can learn advanced manufacturing industry development experience from America by rational adjustment of industrial structure, improving the management level and the innovation ability, introducing and training manufacturing talents and other measures, that can promote advanced manufacturing industry toward advanced, orderly, information and other direction.

KEYWORDS

Advanced manufacturing; Economic zone on the west side of the straits; Enlightenment



INTRODUCTION

As everyone knows, the manufacturing industry is an important source of economic growth and a powerful force to promote social progress and development of human civilization. In recent years, with the wide use of information technology and advanced manufacturing technology in manufacturing, as well as economic globalization and trade competition, the degree of advanced manufacturing industry development has become the important influence factor of each country to maintain international competitiveness. The advanced manufacturing industry means the manufacturing industry which synthetically applying latest achievements of machinery, electron, information, computer, energy, modern management and using high-tech and advanced applicable technologies to transform traditional manufacturing technology to keep advanced level in manufacturing technology and R & D^[1]. The "advanced" is the progressiveness of industry, technology and management. American manufacturing after revitalization is at the forefront of the world and become the key object of study, such as Yong Xue^[2], BaoSen Chen^[3] believe that America revives its manufacturing through transformation and development of high - tech industry; MingZhi Zhang^[4], Wei Chen^[5], ShuLi Dong^[6] believe that America must transform organization, innovate technology and constantly adjust and develop to develop advanced manufacturing industry; Culture and knowledge has become the main factor for development, cooperation has become an inevitable choice for double - wins, Xiao Kun Wang^[7] wrote the culture factor is an important factor for America manufacturing revitalization in his essay. China is a big manufacturing country rather than a strong country, if China wants to become a strong manufacturing country, absorbing excellent experience from foreign countries is necessary, JiangSui Zheng, ShuLi Dong^[8], LiYing Zhao, JingHui Zhao^[9] puts forward that government should issue a series of policies and decrees for manufacturing training and talents cultivating to support the development of advanced manufacturing; ZongShui Yu^[10], LeiYu^[11], RongHui Wang, NaLiu^[12] also believe that American advanced manufacturing industry has the important enlightenment to China. In recent years, economic zone on the west side of the straits has become important strategic point, DeJin Wu^[13], XuHong Xu^[14] believe that economic zone on the west side of the straits need develop advanced manufacturing industry, especially in QuanZhou.

PRESENT SITUATION OF AMERICA ADVANCED MANUFACTURING AND THE MAIN MEASURES

Present situation of America advanced manufacturing

From the beginning of the two industrial revolution, American manufacturing grew and developed ceaselessly, after World War II, America manufacturing became synonymous with "advanced" and had an absolute advantage in international market, it accounted for about 40% in global manufacturing. In the 70's of the last century, because of the rise of manufacturing in Europe, East Asia and other parts of the country, such as automobile and semiconductor in Japan, position of the America was challenged seriously. Manufacturing was the cornerstone of the civilization development for a country, American competitiveness significantly decreased after thump, foreign trade was imbalance, so many scholars appealed to revive American manufacturing, America government had also made a series of plans to develop advanced manufacturing. At present, America stood in the forefront of the world again and led the trend of advanced manufacturing by formulating and implementing a series of measures. American manufacturing's contribution to economic growth rate was 29% from 1992 to 1997, the manufacturing in 2006 provided more than 20 million jobs for the community, its influence was much more than other industry. Technological improvements was also very obvious, two-thirds of R&D spending were from manufacturing, Manufacturers had advanced production technology, high labor efficiency, information and high degree of automation, electronic commerce transaction volume in 2001 of manufacturing products reached 7250 billion dollars, accounted for 68% of America; They completed upgrading of the industrial structure and formed a complete industrial chain, the majority of enterprises controlled design and marketing links with high added value and high technology content, status of small and medium enterprises also improved.

Main experience of American advanced manufacturing development

(a) Strong support of the government

First, policy support. American government support is an important factor of America advanced manufacturing development quickly, American government not only gives great support and guidance, but also spares no expense to develop advanced manufacturing. Second, state financial support. American government was aware of importance of economic development, in order to revive the dominance of American manufacturing, American government not only gave policy support, but also spared no effort in the fund, in order to transform traditional industries and improve the level of manufacturing information, in 1990, America's department of energy formulated "Five Year Plan" (1994 - 1999) of "Implementing agile manufacturing" and invested 150 billion dollars per year^[6]; These government investment greatly promoted the American advanced manufacturing revitalization process and made it stand in high-point of the world quickly..

(b) Encouraging innovation and increasing investment in research and development

American government attached great importance to research and development input and constantly improved the R&D investment proportion in the government budget, annual budget was 756 billion dollars in 1993; R&D investment in civilian technology also increased ceaselessly, it accounted for about 20% to 50% before 1993 and increase in amounts was 70 billion dollars; In order to promote scientific research achievements commercialization, America government encouraged enterprises, research center, university and government laboratories strengthen cooperation and joint exploitation, now,

America has built 8 national manufacturing center and national manufacturing designing center, 26 cooperative research centers, 7 manufacturing technology centers and more than 100 advanced manufacturing technology service center^[6].

(c) Support for innovation and technology development of small and medium sized enterprises

Small and medium-sized manufacturing enterprises are important part of the American advanced manufacturing industry, the quantity accounted for 99% total manufacturing enterprises in America, the output value was more than half of manufacturing total output, which attracted 2/3 manufacturing talents,

America began to pay attention to the role of small and medium-sized manufacturing enterprises for a long time, they founded small business administration in 1953 and implemented *small enterprises law*, after that, the government implemented *small business innovation development law* and small enterprises technology innovation program, government appropriated funds for the small business innovation research; In the last 1990s, government increased investment in small and medium-sized enterprise technology development and technology transformation, they also established enterprise incubator, which accelerated the pace of development of small and medium-sized enterprises and improved manufacturing industry development.

Establishing high-tech industry leading position

The twenty-first Century is the era of information, the Internet is everywhere, in the process of reviving advanced manufacturing, America transformed traditional manufacturing by using high and new technologies and established industrial structure with high and new technology as the leader. America applied information technology in traditional manufacturing industry and promoted the development of the equipment manufacturing industry, which achieving the comprehensive upgrading of enterprises in management, decision making, design, processing and other aspects, that made a lot of heavy industry realize production automation, reducing the labor cost and improving production efficiency; Moreover, America attached great importance to the development of high technology, information, medicine industry and others, they focused on the development of environmental technology, vigorously developed the circular economy, improved the utilization ratio of resources and energy and maintained the sustainable development of economy.

RESTRICTING FACTORS AND PRESENT SITUATION OF MANUFACTURING IN ECONOMIC ZONE ON THE WEST SIDE OF THE STRAITS

Present situation of manufacturing in economic zone on the west side of the straits

In recent years, economic zone on the west side of the straits developed rapidly and has made great progress in manufacturing. Fujian province and cities promoted construction of advanced manufacturing industry base and introduced various industry development policy, for example, The government of Quanzhou has formulated the policy "promoting the manufacturing and creation, industrialization and information fusion, advanced manufacturing industry and modern service industry integration", LongYan committed to build "A world-class engineering machinery manufacturing base, national environmental protection equipment R&D and production base and commercial vehicle and parts processing base". In economic zone on the west side of the straits, the information industry developed rapidly in recent years, the average annual growth rate was more than 20%, in 2009, sales income was 4000 billion, petrochemical industry was stronger than before and spawned a large number of well-known enterprises. The equipment manufacturing industry has been built up; Fujian's traditional labor-intensive industries are developing constantly, and industrial cluster are also getting more and more in many places; In addition, the province continually relies on independent innovation and optimizes the industrial structure, industry development gradually realizes independent innovation and integrated innovation^[15].

Restricting factors of manufacturing in economic zone on the west side of the straits

(a) Disparate development of manufacturing in different area

First, the number of industrial cluster is fewer and spatially uneven. At present, the traditional manufacturing industry has developed well in economic zone on the west side of the straits, compared with other provinces, industry cluster is fewer, as shown in TABLE 1.

Data sources:FuLong He. Industrial clusters and embedded research in FuJian[J]. Xiamen science and technology,2006(6):21-23

As can be seen from the table, industrial cluster in Fujian mainly concentrates in Quanzhou, Xiamen and Fuzhou, other places are relatively fewer, manufacturing strength is relatively weaker, manufacturing industry development is not balanced, which restricts the proportionate development of advanced manufacturing industry. Second, the enterprises within the cluster are mainly family enterprises. Most of the enterprises are family businesses, family once successes, they will make the other family members drag in, which forming a lot of family enterprise derived cluster. Family enterprises are engaged in low cost production, their management level is relatively lower, so, industrial clusters management level is relatively lower too, competitiveness is weaker, they are mainly engaged in labor-intensive and low tech activities.

(b) Unreasonable industrial structure

Manufacturing in economic zone on the west side of the straits mainly is the traditional labor-intensive industries, such as textile and garment, shoes, hat industry, oil processing industry, paper industry and so on, processing level and

additional value is lower, they lack high technology content and high value-added industries, From TABLE 1, shoes and stone industry are mainly in QuanZhou, electronic are mainly in Fuzhou, while the mechanical industry concentrates in Xiamen, other local manufacturing is fragmented, which leads to the uneven distribution of industry in Fujian; enterprises are mainly small and medium-sized in Fujian, they lack large and strong competitiveness industry, which lead to irrational industrial structure and restricting the rapid development of advanced manufacturing industry.

TABLE 1: Industrial cluster distribution in Fujian Province

FuZhou	Electronic display in MaWei	Software Park in FuZhou	
	PC peripheral in RongQiao FuQing	Cars in QingKou	
	Spinning in ChangLe	Ceramics MinQing	
	Stone processing in LuoYuan		
QuanZhou	Clothing in JinJiang	Clothing in ShiShi	Shoes IN JinJiang
	Stone in ShuiTou	Stone carving in HuiAn	Ceramics in DeHua
XiaMen	Electronic industry cluster	Ship building and engineering machinery	
	Petrification in HaiCang	Auto parts	
	Machinery and equipment	Loader-unloader	
Others	BSG in FuAn	Electric wire in NanPing	Ship repair in FuAn
	Metallurgy and rolling, Machinery and auto parts in SanMing		

(b) Backward management and low information

Fujian is the main part of the economic zone on the west side of the straits, and its development level are related to the level of economic zone on the west side of the straits, enterprises are mainly small and medium-sized private enterprises, they mainly rely on resources, the traditional skills and geographic advantage to implement backward family style management, managers are stubborn and lack of strategic vision, they are unwilling to spend money in the information construction and manufacturing equipment renewal, which lead to unsound enterprise system, division chaos and higher employee turnover rate, it's bad to enhance the competitiveness of enterprises and advanced manufacturing industry.

(d) Lack of production - study - research cooperation system

There has many colleges and universities in economic zone on the west side of the straits, there are a lot of research center in school, but these did not play important role in promoting the economy. The enterprise in in economic zone on the west side of the straits are relatively weaker in product development and technical innovation, they often invest in research and development by themselves and do not cooperate with school or research center, so innovation level is low, universities and research centers do not cooperate with enterprise, so research results do not easily transform into commodities, which lead to lower innovation and conversion rate of research results in economic zone on the west side of the straits.

(e) Lack of manufacturing industry talent and innovation

Compared with other coastal provinces, the well-known colleges and universities in economic zone on the west side of the straits are fewer, high level occupation technical schools are fewer too, so, they cannot provide a lot of professional talents for enterprises, the welfare system is not perfect, the wage level is relatively low, the preferential policies are fewer, most of professional manufacturing talents flow to economic areas, which lead to talents shortage; enterprises are relatively small, they are insufficient in personnel training and R&D investment, that makes the enterprise innovation shortage. As shown in TABLE 2.

TABLE 2: Research and development (R&D) activities in large and medium-sized industrial enterprise (2008) by region

Region	Number of items (Items)	Personnel number (people, year)	R&D funds (Million yuan)
Beijing	6730	26892	709676
Tianjing	4765	21799	897905
Hebei	3477	25365	728740
Shanghai	5465	36692	1811127
Jiangsui	11631	119553	4090217
Zhejiang	7115	79366	1935081
Fujian	2560	32199	647190
Shandong	10653	107535	3453962
Guangdong	11316	177500	4109579

Data sources: State Statistical Bureau of people's Republic of China. The annual data, Chinese statistical yearbook - 2009

<http://www.stats.gov.cn/tjsj/ndsj/2009/indexch.htm>

As can be seen from TABLE 2, compared to other coastal provinces, R&D investment is relatively less than others in Fujian, innovation ability is insufficient.

ENLIGHTENMENT OF AMERICAN ADVANCED MANUFACTURING TO ECONOMIC ZONE ON THE WEST SIDE OF THE STRAITS

The state and the government's policy guidance

First of all, the manufacturing development is not balanced in economic zone on the west side of the straits, government should introduce various measures to ensure that balanced development in each area; Secondly, the small and medium-sized enterprises did not play key role, the government should guide small and medium enterprises move toward a rational direction, so as to enhance the status of small and medium enterprises; Finally, advanced manufacturing industry base is the strategic problem, government is needed to guide and supervise.

Adjusting industrial structure of manufacturing reasonable

First, improving professional level of the enterprise, optimizing manufacturing industry chain, increasing the number of longitudinal development industrial clusters and perfecting the chain of product design and development- assembling-distribution;

Second, optimizing the industrial level, vigorously developing hi-tech industries, improving the modern industries (such as information industry, low carbon industry) proportion and achieving industrial structure of the modern industries first and traditional industries second; Third, traditional industries should be taken seriously when optimizing industrial structure and be taken as a role of creating a lot of jobs.

Improving the management level and innovation ability of the enterprise

Enterprises must change the backward management methods if they want to have competitive power, such as introducing advanced management mode, recruiting occupation managers, reforming enterprise management process, using ERP and other information system to improve the management level of enterprise; At the same time, enterprises should increase investment in research and development, cooperate with universities and research centers to develop new products and new technology, improve the transformation of research result and form developing system of production - study - research.

Introducing and cultivating talents in manufacturing industry

First of all, colleges and universities should improve the talents' professional level and moral standards, they can provide advanced manufacturing enterprise service after getting out of school; Second, government should invest and establish or encourage private person establish occupation technical school to increase the number of manufacturing personnel supply; Finally, the enterprise must raise the welfare level of employees to retain and introduce professional talent, at the same time, reeducation is important to enhance their quality.

Strengthening the advanced manufacturing industry cooperation between Fujian and Taiwan

Economic zone on the west side of the straits and Taiwan are adjoining, cultural difference is fewer, geographic and cultural advantages should be full used to make advanced manufacturing cooperation development strategy, introduce advanced technology and advanced talents from Taiwan, accelerate industrial environment upgrading and attract investment, so as to enhance exchanges and cooperation and promote common development.

CONCLUSION

The government in economic zone on the west side of the straits should learn from America and combine with the development status to take measures of developing advanced manufacturing, government provide policy support, adjust industrial structure reasonably, improve enterprise innovation level and other effective action to develop advanced manufacturing in economic zone on the west side of the straits.

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