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A Literature Review on The Evaluation and Improvement of The International Competitiveness of China's Aerospace Manufacturing Industry

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Abstract: Taking the international competitiveness of China's aerospace manufacturing industry as the research object (Hereinafter abbreviated as IC-AMI), this paper classifies and sorts out the relevant literature of industrial international competitiveness, China's aerospace manufacturing industry and China's IC-AMI, and believes that the existing research still has expandable potential. First of all, no scholar has yet conducted a quantitative analysis of the factors influencing China's IC-AMI. Second, there is a lack of international competitiveness assessment of China's aerospace manufacturing industry based on horizontal comparison. Finally, no scholars have used data from 2008 to study China's IC-AMI.

Keywords: Aerospace manufacturing, International competitiveness of the industry, Literature review.

1. Research on the International Competitiveness of The Industry

Since the 80s of the 20th century, especially since the 90s, economic globalization has entered a stage of all-round development, and many developed and developing countries have enjoyed the dividends of globalization development, but at the same time, economic globalization has also made industries and enterprises in various countries around the world face an unprecedented international competition pattern. In the following three decades, many outstanding theories and views emerged from governments and related scholars, among which the research on international competitiveness assessment indicators and influencing factors was the most concentrated.

1.1. Research on evaluation indicators

The most famous indicators are the World Economic Forum (WEF) and the International Institute for Management Development (IMD) in Lausanne, Switzerland. In 1986, the WEF issued the Report on International Competitiveness, which initially formed an independent theoretical concept and statistical system in terms of international competitiveness; In 1989, WEF cooperated with IMD to carry out international competitiveness research and regularly published the World Competitiveness Yearbook every year. WEF and the IMD in Lausanne, Switzerland, have given a large number of evaluation indicators, and the study of international competitiveness has made significant progress in collaboration between the two sides.

There are three main types of evaluation indicators for the evaluation of the international competitiveness of domestic and foreign industries: the first type is indicative indicators. It mainly includes the indicative comparative advantage index RCA, trade competitiveness index TCI, international share, price ratio, and indicative competitive advantage. The index of indicative comparative advantage is the most widely used, first proposed by Liesner (1958), and developed and perfected by Michaely (1962), Balassa (1965), Rooyen et al. (2000)[1-4]. It reflects the actual results of a country's comparative advantage and competitive advantage of a certain type of product or service (Zhang Xiaodi and Sun Jingwei, 2006), and is widely used in the primary industry (Matkovski et al., 2021; Chen Zhiheng and Sun Tongtong, 2019; Gao Haixiu and Wang Mingli, 2018; Liu et al., 2018), the secondary industry (Wang Houshuang and Sheng Xinyu, 2020; Wang Jiexiang et al., 2019) and the tertiary industry (Yin Feng and Chen Xian, 2009; Zhang Tiemo, 2021; Guo Mingying, 2019; Xuan Shanwen, 2019) in the study of international competitiveness [5-15]. The second category is analytical indicators. There are two main methods of specific operation, one is the "production method" proposed by the ICOP (International Comparison of Output and Productivity) project team of the University of Gringen in the Netherlands, represented by Vanark (1996), Wagner and Ark (1996) [16-17]. The other is the "expenditure method" represented by Jorgenson and Kuroda (1991), which is more complex and can also calculate the purchasing power assessment of input factors[18]. Domestic scholars mainly apply analytical indicators to the study of the international competitiveness of the manufacturing industry (Ren Ruoen, 1998; Chen Limin and Tan Liwen, 2004; Liu Lei and Guan Quan, 2019; He Zhengchu et al., 2018) [19-22]. The third category is comprehensive assessment indicators. It is a weighted assessment of a variety of factors affecting the international competitiveness of the industry. Jin Bei et al. (2006) used the proportion of exports of various industries to the country's total exports, export growth rate advantage index, indicative comparative interest index, international market share of various industrial products, market penetration, trade competition index and other indicators to study China's IC-AMI[23]. Zhou Xing and Fu Ying (2000) analyze and evaluate the overall international competitiveness of a country's industry from four aspects: the quality of the industry, the current situation and development trend of the industrial structure, the environmental system factors of industrial development, and the degree and ability of industrial internationalization[24]. Some scholars used the comprehensive assessment method to evaluate the international competitiveness of the primary industry (Gan

Lin et al., 2022; Liu Chenyang et al., 2022; Zhao Xia et al., 2021; Xiong Sihao et al., 2020; Song Xinyang et al., 2020), the secondary industry (Tang Hongxiang et al., 2019; Yang Chengyu, 2018), and the tertiary industry (Wan Xucai et al., 2001; Sun Shaoyan et al., 2020; Wu Xiaoyi and Zhang Yajing, 2020), and improved the comprehensive assessment method. The application of the integrated valuation method in international competitiveness assessment has been promoted [25-34].

1.2. Research on influencing factors

Michael Porter's diamond model theory is one of the most basic theories in international competitiveness research. Poter (1990) proposed the "4+2" diamond model in the study of the formation of the international competitive advantage of a country's industry, taking the four basic elements and two key elements as the basis for the formation of the international competitive advantage of the industry, and comprehensively and systematically studying the conditions for the formation of the international competitiveness of the industry[35]. Since then, many scholars have continued to improve diamond models, and diamond models have also developed, including the "multi-factor diamond model" (Cartwright, 1993), the "international diamond model" (Dunning, 1993), the "double diamond model" (Rugman and D'cruz, 1993), the "nine-factor model" (Cho, 1994), the "generalized diamond model" (Moon et al., 1998), and the "new diamond model" (Rui Mingjie, 2006). It improves the applicability of diamond models and promotes the rapid development of research related to the international competitiveness of the industry [36-41].

Diamond models are widely used in the analysis of factors influencing the international competitiveness of various industries. It mainly includes three categories: the first category is agricultural products. Chen Weiping (2003) divided agricultural production factors into traditional agricultural production factors and modern agricultural production factors, and with the development of economy and the improvement of productivity level, modern agricultural production factors will play a decisive role in the international competitiveness of agriculture [42]. The slow progress of China's agricultural modernization has led to the decline in the international competitiveness of China's agricultural products (Yao Wen, 2014), and the construction of agricultural product supply chains is conducive to eliminating the shortcoming effect of industrial development and improving the international competitiveness of agricultural products (Ji Lianggang and Mi Xinli, 2017) [43-44]. Huang Zuhui et al. (2010), Fu Juan (2008), Wang Xi and Lan Yong (2007) discussed the scheme of improving the international competitiveness of regional agricultural products based on the research on the international competitiveness of agricultural products in specific regions[45-47]. Some scholars have studied the factors influencing the international competitiveness of agricultural products from a specific industry, including citrus products (Tao Yanhong and Xiong Wei, 2016), pig breeding (Yin Zhiyang et al., 2016), corn (Zhao Honglei and Jia Jinrong, 2010), tea (Xu Guoquan and Chen Chungen, 2007), etc. [48-51]. The above studies analyze the influencing factors of agricultural international competitiveness from different perspectives, and promote the development of agricultural international competitiveness. The second category is manufacturing. Manufacturing is one of the important indicators to measure the comprehensive strength and competitiveness of the country, the comparative advantage of China's manufacturing labor cost tends to weaken, increase human capital investment, actively cultivate innovative talents, improve labor productivity is the fundamental way to maintain the competitiveness of China's manufacturing industry (Chen Fenglan and Huang Meibo, 2018) [52]. As far as technology-intensive industries are concerned, the focus of enhancing their international competitiveness is to continuously increase R&D and innovation investment (Yu Bo and Pan Aimin, 2021) [53]. At the same time, in the information age, the substitution of information factors for labor, land, capital and other factors can save resources, reduce costs and improve efficiency (Ge Jiping, 2010), the limitations of primary production factors are relatively amplified, while the importance of advanced production factors is accelerating (Lin Li et al., 2012) [54-55]. The measures to develop a low-carbon economy can make up for the shortcomings of the low labor quality and knowledge intensity of China's manufacturing industry (Zhao Hao and Liu Hang, 2010), and the industrial agglomeration of China's manufacturing industry has promoted the improvement of international competitiveness as a whole, especially on technology-intensive industries (Du Qinghua, 2010), and the rapid development of related industries and supporting industries is an important measure to enhance the international competitiveness of China's advanced manufacturing industry (Chen Hong and Li Zhiquan, 2019)[56-58]. In short, increasing investment in human capital and R&D innovation is the only way to enhance the international competitiveness of China's manufacturing industry. Some scholars have further confirmed the above view through research on the international competitiveness of industries such as the paper industry (Qiu Xiaolan et al., 2015), the sporting goods manufacturing industry (Li Bifang and Cao Guannan, 2010), and the textile industry (Tong Xia and Gao Shenrong, 2013; Cheng Xin, 2009) [59-[62]. The third category is trade in services. The openness of service trade has a great impact on the competitiveness of China's service trade (Chen Hong and Zhang Guorong, 2010), Lan Qingxin and Dou Kai (2019) verified this conclusion through research on the digital cultural industry [63-64]. To accelerate the development of China's service industry, we must further improve the level of opening up of the service industry, and the government needs to further formulate relevant incentive policies in the field of modern productive services with high technological level (Xiaode and Ye Maosheng, 2010) [65]. In addition, more scientific and technological content should be added to labor-intensive service industries with comparative advantages or vigorously develop knowledge, technology and capital-intensive service industries (Wan Hongxian, 2005) [66]. China's cultural and creative industries lack senior human resources (Yang Li and Wang Xiaoxiao, 2018; Qu Guoming, 2012; Yang Xiuyun and Guo Yong, 2010), and some scholars have confirmed this view through research on the animation industry (Zhang Xiao and Wei Ting, 2009), the TV drama industry (Zhu Chunyang and Ma Haijiao, 2022), and the publishing industry (Huang Xianrong and Tian Changqing, 2012; Zhao Liang and Lv Jing, 2012) [67-73]. The role of government (Huang Manying and Deng Xiaohong, 2011) and the development of related industries (Zhang Wukang, 2017) also affect the improvement of international competitiveness of trade in services [74-75].

2. China's Aerospace Manufacturing Related Research

Research on China's aerospace manufacturing industry focuses on two aspects: technological innovation and industrial agglomeration.

2.1. Research on technological innovation in China's aerospace manufacturing industry

The most prominent feature of the development of China's aviation industry in the production function is that the huge growth of the industrial economy is driven by greater economic input, while the growth brought about by technological progress is not obvious enough (Yang Bei and Shi Zhanzhong, 2012) [76]. Zhang Jinle and Liu Tian (2012) believe that the technological efficiency of China's aerospace manufacturing industry is still at a low level, and it should continue to increase the intensity of scientific and technological innovation, should focus on improving the allocation efficiency of high-quality personnel, and should encourage the aerospace manufacturing industry to actively develop an export-oriented economy, expand the international market, and take into account the improvement of management level [77]. There is a significant interactive symbiotic relationship between the innovation process and the growth of aerospace manufacturing, and basic innovation, product innovation, and process innovation have a significant role in promoting the growth of strategic emerging industries (Liu Chunhui and Zhao Yulin, 2016), and the national technology policy is closely related to the technology leading strategy committed to independent innovation (Hong Jin et al., 2015) [78-79]. The improvement of the independent innovation capability of the western aviation industry depends on the innovation environment and innovation base (Xu Lihua et al., 2006) [80]. The improvement of innovation capability depends on the government's scientific research investment and the risk sharing mechanism of enterprises (Liu Penglin, 2013), market environment and economic environment (Zhang Jinle and Zhao Juan, 2014), and internal knowledge management (Yang Tong et al., 2008) [81-83]. Collaborative innovation is an important way of scientific and technological innovation in aerospace manufacturing, but the overall degree of technological innovation system coordination in China's aerospace manufacturing industry is at a low level, and the degree of technological innovation system coordination in aerospace manufacturing should be improved by building a technological innovation collaboration platform and supporting the cultivation of science and technology enterprises (Fang Wei and Zhao Jianjian, 2021) [84]. The depth of collaborative innovation is the degree of collaborative innovation in technological innovation, and the intensity of government R&D investment and enterprise development speed are positively correlated with the depth of collaborative innovation (Yu Liping, 2017) [85]. Zhang Jinle and Zhang Ke (2020) proposed that the positive correlation between government support and system coordination is the most obvious [86].

2.2. Research on China's aerospace manufacturing agglomeration

The agglomeration phenomenon of China's aerospace manufacturing industry is relatively significant (Xu Yingzhi and Zhu Yixi, 2010), and the agglomeration level shows a "W" shaped trend, and its agglomeration degree has a significant positive effect on the growth of industrial output and industrial total factor productivity (Zhao Yulin and Liao Mingyao, 2017)[87-88]. The agglomeration and social welfare development level of China's aerospace manufacturing industry mostly change in the same direction (Lu Jianfeng et al., 2014), and the improvement of agglomeration level depends on institutional innovation, scientific research mechanism and management system (Hu Hongan and Li Yang, 2014) [89-90]. At the same time, increasing investment in universities and research institutes (Zhang Jinle and Yi Chenchen, 2014) and strengthening the construction of industrial service platforms (Zhang Jinle et al., 2015) are conducive to improving the level of agglomeration[91-92].

3. Research on China's IC-AMI

Mu Rongping (2003) analyzed China's IC-AMI from three aspects: competitive strength, competitive potential and competitive environment, and believed that China's IC-AMI is low and it is difficult to participate in international competition [93]. Through empirical analysis of China's IC-AMI, some scholars have confirmed the view that China's IC-AMI is low, but the profit margin and labor productivity of China's aerospace manufacturing industry have grown rapidly, indicating that China's IC-AMI is rapidly improving (Qin Zhen and Qin Yonghe, 2007; Qin Zhen and Ni Yan, 2006) [94-95]. The ability of independent innovation has a decisive impact on China's IC-AMI (Dong Jie and You Yanan, 2012) [96].

4. Literature review

Academic research on China's aerospace manufacturing industry and international competitiveness is very rich, especially the international competitiveness of the industry, whether it is the selection of evaluation indicators or the analysis of influencing factors, it is very comprehensive, and it is applied to many industries, but the existing research is still expandable. First of all, no scholar has yet conducted a quantitative analysis of the factors influencing China's IC-AMI. Second, there is a lack of international competitiveness assessment of China's aerospace manufacturing industry based on horizontal comparison. Finally, no scholars have used data from 2008 to study China's IC-AMI.

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