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SERVICE-DRIVEN QUALITY: INVESTIGATING SERVITIZATION'S EFFECTS ON EXPORT STANDARDS

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Abstract: In recent years, China's manufacturing industry has been a cornerstone of its economic development and global trade dominance. Despite its impressive achievements in manufacturing value added and exports, there are significant challenges and vulnerabilities that demand attention. China's manufacturing export prowess has predominantly been in resource-intensive and labor-intensive industries, leaving it dependent on developed nations for the core aspects of the manufacturing value chain. Furthermore, China is grappling with demographic challenges, including a rapidly aging workforce, which erodes the traditional advantage of abundant cheap labor.

By the end of 2021, China had officially entered the ranks of severely aging societies, with a substantial portion of its population aged 60 and above. This demographic shift presents a threat to the traditional labor-driven manufacturing model. Additionally, other countries like India, Vietnam, and the Philippines, offering competitive labor costs, have been seizing market share in manufacturing. Moreover, the "reindustrialization" policies in Europe and the United States pose further challenges as they limit China's access to high-end technologies.

To overcome these challenges, China must transition away from a reliance on low-cost factors and explore avenues to enhance its international competitiveness in the long term. This necessitates a fundamental shift in the development approach, focusing on innovation, technological advancement, and value-added manufacturing processes to maintain its global manufacturing leadership.

Keywords: China, manufacturing industry, aging workforce, international competitiveness, value-added manufacturing.

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Introduction

As the lifeblood of national economic development, the manufacturing industry provides the main economic support for the development of a country's economy. Since 2010, when China's manufacturing value added exceeded that of the United States for the first time, China has become one of the world's largest manufacturing countries for 12 consecutive years. At the same time, China has been the world's top exporter of goods trade for 14 consecutive years. In terms of total volume, whether it is the value added of manufacturing or the total amount of export trade, China occupies an important position in the world economy. However, the competitive advantage of China's foreign exports is mainly concentrated in resource-intensive and labor-intensive industries, and the core link of manufacturing value chain is still mainly dependent on developed countries such as Europe and America. The manufacturing industry is at the bottom of the "smile curve" in the international status, facing the dilemma of low end for a long time. At the same time, China's manufacturing industry is facing a continuous slowdown in population growth and an aging workforce structure. By the end of 2021, China's population aged 60 and above reached 267 million, accounting for 18.9% of total population, far exceeding the aging society standard (7%) set by the 1965 United Nations "Population Aging and its Socio-Economic Consequences". The population aged 65 and above exceeded 200 million, accounting for 14.2% of the total population, exceeding the criteria for a severely aging society (10%) set by the World Assembly on Aging in Vienna in 1982. These two figures mean that China has entered a severely aging society and the advantage of cheap labor is weakening. At the same time, the rise of India, Vietnam, the Philippines and other cheap labor countries seize the share of China's manufacturing industry in the international market; the "reindustrialization" policy of Europe and the United States increases the difficulty of China's manufacturing industry to introduce high-end technology. In order to break through the dilemma faced by China's manufacturing industry, it is necessary to break the development mode driven by cheap factors and look for ways to enhance China's international competitiveness in the long run. The global economy is gradually transforming from "manufacturing economy" to "service economy", and the role of service economy is becoming more and more important in the world. Servitization of manufacturing has become a new trend in global economic development, which enables the transformation of production factor inputs from tangible physical factors to intangible service factors and realizes the transformation and upgrading of enterprises[1]. Services as intermediate inputs, especially productive services, embed highly specialized human and technical capital and other factors into tangible manufactured products, which helps improve product quality. Servitization of manufacturing also plays a key role in promoting the transformation and upgrading of manufacturing industry and pushing the industry up to the middle and high end of the value chain[2]. This provides an opportunity for the transformation of China's manufacturing industry.

Based on the above background, it is clear that to getting rid of the low-end dilemma faced by China's manufacturing industry and improving the quality of export products need to rely on the transformation and upgrading of domestic manufacturing enterprises. Furthermore, the overall development of the manufacturing industry driven by the tertiary industry becomes an important step in the upgrading of manufacturing products. Therefore, it is important to study how China's manufacturing industry uses service factor inputs to improve the quality of export products and get rid of the low-end dilemma of manufacturing industry.

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1. The concept of Manufacturing Servitization

At present, scholars understand the concept of servitization of manufacturing from different aspects, so there are many different opinions which have different focuses. Vandermerwe and Rada[3] found that the business model of manufacturing enterprises is changing from only providing goods to providing service-oriented goods-services bundles. The complete bundles include goods, services, support, selfservice, and knowledge, and services are dominant in the whole bundle and are the main source of added value. This lead to the earliest introduction of the term SERVITIZATION. White et al. proposed the term SERVICIZING to further extend the understanding of Servitization. They defined servicizing as "a dynamic change in the role of the manufacturer from being a provider of goods to being a provider of services" and "a shift in the firm from being product-centered to being service-centered". Szalavetz[4], unlike above, uses the term TERTIARIZATION to describe servitization and further divides it into two categories: input servitization, which is based on the efficiency of services within the firm, and output servitization, which revolves around the goods and customers.

In summary, although scholars have different research perspectives, the idea is the same, that is, to emphasize the transformation of manufacturing companies from simply selling products to providing integrated solutions including products and services.

2. The Impact of Servitization of Manufacturing

Current research on the effects of servitization focuses on firm and social innovation and productivity, firm performance, value chain upgrading, export product quality, the environment and so on.

2.1. Promoting Innovation and Improve Productivity

Grossman and Rossi-Hansberg[5] found that the servitization of manufacturing inputs was able to reduce the production costs of firms through the supply of quality service factors, thereby increasing firm productivity. Li[6] found that the servitization of manufacturing has a significant positive impact on firms' innovation decisions, innovation inputs and innovation outputs, and this finding still holds after dealing with sample selection bias, changing input servitization measures and overcoming possible endogeneity problems. Chen et al.[7] concluded that manufacturing servitization has a significant positive impact on technological innovation, but there is industry heterogeneity in this impact effects -- the impact on laborintensive manufacturing is not significant, but on capital-intensive and technology-intensive manufacturing is significant. But there is no heterogeneity in the impact effect. Zhang and Jin[8] found that there is a significant inverted U-shape relationship between manufacturing servitization and enterprise R&D intensity, i.e., the rate of manufacturing servitization within a certain range promotes the enthusiasm of enterprise R&D and innovation, mainly through the financing constraint mechanism to influence enterprise R&D innovation enthusiasm. Gao and Zhang[9] found that manufacturing servitization is positively related to enterprise productivity. However, the positive correlation between manufacturing servitization and productivity is more obvious when the share of service is low, and the effect of manufacturing servitization on labor productivity has a threshold characteristic[10] .

2.2. Improving Business Performance

There are several different academic views on the relationship between manufacturing servitization and firm performance. First, manufacturing servitization improves firm performance. Liu and Ma[11] used Chinese listed manufacturing companies as the subjects of their study and found that the service orientation of manufacturing industry can significantly improve firm performance and government subsidies have a positive moderating role

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in it. Second, manufacturing servitization decreases firm performance[12]. Third, manufacturing servitization and firm performance are non-linear, including "Ushaped"[13], "inverted U-shaped"[14] and others. Finally, there is no significant effect of servitization of manufacturing on firm performance. Xiao[15] took some Chinese listed companies as a sample and found that the performance of manufacturing companies that implemented servitization was not significantly higher than that of manufacturing companies that did not implement servitization. And Chen[16], based on the differences in organizational characteristics, strategic goals and strategic needs of enterprises in different life cycles, divided them into three stages: growth stage, maturity stage and decline stage, and found that the relationship between maturity stage enterprises and enterprise performance is "U-shaped".

And the relationship between growth stage enterprises and enterprise performance is "anti-L-shaped".

2.3. Promoting Value Chain Upgrading

The servitization of manufacturing can contribute to value chain upgrading, but there are differences in different industries. Liu et al.[17] found that manufacturing servitization deepens the degree of enterprise value chain participation and enhances the status of division of labor in the value chain. Moreover, transportation servitization, financial servitization, and distribution servitization had significant enhancement effects on the upgrading of enterprise value chain, while the impact of telecommunication servitization on it was not significant. Wu and Ma[18] argued that as the trend of manufacturing servitization strengthens, its contribution to China's participation in GVCs is marginal decreasing, while it has a significant positive contribution to the status of division of labor. Unlike Liu et al.[17], Wu and Ma[18] argued that the relationship between different service inputs and China's manufacturing participation in GVCs and the status of division of labor is somewhat different. Modernized service inputs (telecommunications and financial servitization) plays a more significant and important role in upgrading the value chain than traditional service inputs (retail, and transportation servitization).

2.4. Improving the Export Products Quality

Most studies have concluded that servitization of manufacturing can improve the quality of export products, but this effect is confounded by a number of factors. Zhu et al.[19] found that manufacturing servitization has a significant positive "U-shaped" effect on export product quality, and technological innovation plays an important intermediary role. However, the effect is heterogeneous depending on the trade mode, ownership type, factor intensity and financing constraints. Similarly, according to Long and Yin[20], the servitization of manufacturing inputs can significantly improve the quality of export products, and the effect varies according to the heterogeneous characteristics of enterprises' trade mode, ownership form, technology intensity and geographical distribution. The servitization of manufacturing has a positive impact on the upgrading of export product quality through improving total factor productivity and innovation efficiency.

3. Measurement of Export Products Quality

Product quality is a relatively abstract concept involving factors such as product quantity, unit price, and the country of export, etc. How to measure export product quality that is comparable across countries at different times has been a difficult problem in international trade and is the basis of this study. Schoot[21] first uses the unit price method as a proxy variable for export product quality, with the intrinsic logic that higher unit prices are associated with higher product quality. However, product quality may suffer from factors such as firm productivity and policy subsidies in addition to price[22]. Hallak and Schott[23] use data on market share, price, and

the environment in which the product is sold to derive the quality of exported products using an ex-post backward-looking approach. This approach exists under the
assumption that product quality is positively correlated with market sales per unit of price. Khandelwal[24] states that in the supply and demand relationship in the market, after removing the price element, what remains to influence the quantity of products sold is the quality of goods. Under this assumption, the authors use the nested logit method to isolate product quality from unit price. Feenstra and Romalis[25] proposed the summation of supply and demand information method, which takes into account both supply and demand information of the product and provides a new perspective on product quality measurement. However, this method sums up firm-level data to obtain macro-level data, and the obtained export product quality is mainly used for comparison between different countries and is not applicable to micro-level studies.

4. The impact of Export Qroducts Quality Factors

Product quality is influenced by a variety of factors. Regarding the quality of export products, scholars have mostly analyzed and studied from three perspectives, as follows:

4.1. Policy Perspective

Hu[26] pointed out that the development zone policy has a significant positive effect on manufacturing firms' exports, but this policy is not conducive to improving firms' production efficiency, and there is heterogeneity in the regional distribution of trade patterns and firms by the industrial policy led by the development zone. Meanwhile, Sun and Dai[27] also pointed out that the industrial policy led by nationallevel development is more effective in promoting the quality of export products than the industrial policy led by provincial level. Zhu et al.[28] pointed out that government environmental information disclosure can promote the improvement of export product quality, and enterprises can use environmental information to make differentiated adjustments to product quality, which in turn optimizes the internal resource allocation and promotes product quality improvement. Liu[29] found that the degree of trade openness affects domestic market segmentation, which changes the effect on the quality of manufacturing export products, and that domestic market segmentation in a country without open trade markets can hinder the improvement of export product quality. Duan et al.[30] found that the upgrading of export product quality is affected by trade facilitation from the perspective of intermediate goods import and enterprise R&D.

4.2. Factor Perspective

Tie and He[31] found that the rise in urban labor force can effectively improve the quality of exported products, but the strength of this improvement is negatively affected by the cost of labor. Starting from the theory of product quality heterogeneity, Liu and Tie[32] investigated the variables of product quality and find that export product quality can be improved with the relationship upgrade of employment in manufacturing enterprises, and such an improvement effect also presents a positive correlation with the intermediate inputs in enterprise production. With the development of industrial technology, Cai[33] found that industrial robots can improve the labor efficiency and reduce the marginal cost of enterprises, and the effect is stronger for large-scale enterprises and non-state enterprises. Fan et al.[34] found that the type of intermediate goods imported by manufacturing enterprises showed a positive correlation with the quality of the final products they produced, but at the same time, the higher the amount of wages paid to laborers. Shen and Yuan[35] found that increasing the motivation of enterprises to import

intermediate goods and enhancing the protection of innovative technologies also improves the quality of export products of manufacturing enterprises.

4.3. Financial Perspective

Wang and Huang[36] pointed out that credit constraints have a significant negative effect on the quality of firms' export products, and that industry capital allocation efficiency can accelerate the efficiency of capital allocation and thus improve the quality of export products. Yu et al.[37] pointed out that OFDI can promote the quality of firms' export products and this promotion effect will be insignificant on consulting service based capital sources. And Sheng, Bin and Wang, Hao[38] found that the increase in the presence of foreign banks can also improve the export product quality of manufacturing enterprises in the region where they are located. Based on a large sample, Kong et al.[39] analyzed the impact of China's manufacturing enterprises in financing constraints on export product quality, in which financing constraints can affect the upgrading of export products through the import of intermediate goods. With the development of digital economy, Yang[40] found that the enhancement of financial technology is conducive to reducing the dispersion of enterprise product quality and improving the efficiency of resource allocation.

5. The Impact of Manufacturing Services on the Quality of Export Products

The existing literature has studied the internal and external motivations of manufacturing service and the impact of manufacturing service on manufacturing enterprises. The existing literature has conducted a relatively in-depth study on the internal and external drivers of manufacturing servitization and the impact of manufacturing servitization on manufacturing enterprises, and has also conducted a lot of research on export product quality from the perspective of macro policies and micro enterprise factors. However, there is not much literature on the direct study of the relationship between the two. Sawhney[41] pointed out that the service element is useful for firms because it creates a deeper connection with customers, and servitization allows firms to maintain customer stickiness. The empirical study concluded that mature firms are more in need of the facilitating role of productive services. The direct effects include industry linkages and technology spillovers, while the indirect effects include resource reallocation, cost effects and total factor productivity. Wang and Zheng[42] measured the level of manufacturing servitization in 189 countries around the world, and concluded that there is a promotion effect by studying the effect of manufacturing servitization on export product quality. And Yuan et al.[43] explored the mechanism of action affecting product quality into using the intermediary model and found that manufacturing servitization can have an impact on export product quality through the innovation effect and international division of labor effect.

The transformation of servitization may not bring good benefits, because servitized enterprises not only fail to get competitive advantages, but also easily result in lower profits, but this drawback will gradually become weaker under the influence of a long time, and the servitization of manufacturing will bring more profits to enterprises[15]. The reason for this phenomenon is that, at the early stage of servitization, the manufacturing industry will be hindered by imperfections from various aspects, such as incomplete information and market scarcity, which makes enterprises face greater pressure, and in this case, the servitization of manufacturing industry does not make the export product quality show a good trend, but when the servitization of manufacturing industry is gradually improved, the strategic advantages of servitization will bring enterprises more than the expected harvest, and also drive the export product quality to continuously improve[19]. In addition, empirical studies show that

although service trade liberalization can positively promote the productivity of manufacturing enterprises, this effect is uneven, and the positive effect is more obvious in enterprises in the eastern region, foreigninvested enterprises, exporting enterprises, and enterprises with more input services[44]. From the perspective of export complexity, it can be found that the level of export product complexity will be increased with the continuous export servitization of manufacturing, and the impact of communication services and finance on the level of export complexity of a country is more obvious[42]. By allocating resources in the value chain, optimizing the industrial layout and enhancing the status of the global value chain, the servitization of manufacturing makes the coordinated development of various sectors, thus promoting the quality of export products. In addition, due to the "learning by doing" and technology spillover, the servitization of manufacturing makes the technology constantly updated, the production efficiency increased and the production cost reduced[45].

6. Conclusion

The complexity of manufacturing environment and the fierce competition in manufacturing industry make the service-oriented manufacturing mode integrating manufacturing and service an inevitable trend for the future development of manufacturing industry. The research on servitization of manufacturing industry at home and abroad in recent years can be seen that the research on this field is heating up, and servitization of manufacturing industry has become a research hotspot in the academic field. From the existing research literature at home and abroad, although scholars at home and abroad have conducted a lot of researches on the concept and evolution stage of manufacturing servitization, but because manufacturing servitization is a brand new topic both in theory and in practice. At present, it is necessary to further explore the specific implementation path of servitization of traditional manufacturing enterprises and how to determine the most suitable degree of servitization for different enterprises. There is no literature to assess whether the degree of servitization of manufacturing enterprises is optimal. The impact of servitization on the quality of export products of enterprises needs to be further explored. At present, there are many contradictory findings in the academic community regarding the impact of servitization on the quality of enterprise export products, and further research and discussion are needed in the future.

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