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China and the United States Hierarchical International Competitiveness Analysis

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Abstract: In this study, novel methods were used to evaluate the international manufacturing competitiveness of China and the U.S. under the value-added statistical caliber. The results obtain indicated that China's manufacturing power was greater than that of the United States. However, the Chinese manufacturing index, performance, and international competitiveness were lower than those of the United States. The levels of low technology and medium technology in China were lower than those in the United States, but the level of high technology in China was the same as that in the United States. In addition, the Chinese and the United States three-level indexes were different, which indicated that China and the United States had differences in manufacturing.

Keywords: China; the United States; hierarchical international competitiveness; export value added

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1. Introduction

With the vigorous development of information and transportation technologies [1], the global mobility of production factors such as capital has improved significantly [2]. The traditional boundaries of country and regional division are being broken, while the industrial development is characterized by the division of labor in global value chains (GVC), forming a widely distributed global division of labor patterns and network architectures [3,4]. After joining the WTO, China's industrial system was gradually integrated into the global industrial chain, which is dominated by economically developed countries such as the United States, becoming the largest and most complete manufacturing sector in the world at a stroke [5]. According to statistical data from the World Bank, China's total export amount was 3.36 trillion dollars in 2020, and its global manufacturing output accounts for 28.5% of the GDP, which is higher than that of U.S., where the value is 17.34%. Therefore, in order to stop the export of Chinese products and reshape the competitive landscape, many economically developed countries have tried to move their production and manufacturing bases back or relocate to regions where primary resources are cheaper [6]. At the same time, they have set up trade barriers, imposed high tariffs, and executed trade sanctions [7].

The reality is that despite these sanctions, China's manufacturing output levels and global export value are still rising, especially in some high-tech industries [8]. Gaining a comprehensive and realistic picture of the competitiveness of the country's manufacturing sector could allow the authorities to adjust and improve relevant policies on trading and investment under the new international competitive situation [9].

However, in the old global value chain division system, there are serious problems, such as the double counting of statistical caliber and neglecting the measurement of technical media products such as assembly and processing [10]. It is no longer possible to conduct a good assessment of national manufacturing capabilities in today's world, with the increasing complexity of technical products [11].

Therefore, in this study, it is possible to conduct an empirical analysis and comparison through a suitable evaluation system from the perspective of value added in an attempt to not only accurately measure the competitiveness and international status of the manufacturing of China and the United States but also to make recommendations for relevant trade and investment policies.

2. Literature Review

As is known, mathematical models can be used to solve problems [12,13]. In order to accurately measure a country's position in the world trade competition and its competitive advantage, scholars have conducted numerous studies and calculated statistics through different indicators and calibers. Taking the concepts of aggregate and value added as a baseline, the existing studies can be divided into two categories.

The statistical caliber based on the aggregate concept focuses on traditional trade indicators. Earlier scholars have assessed the international competitiveness of countries by focusing on one or several indexes such as RCA (revealed comparative advantage), proposed by Balassa; CA (revealed competitive advantage), which was put forward by Balassa; production efficiency; IMS (international market share); and TC (trade-specific coefficient), proposed by Walrath et al. [14]. These index systems are widely used to this day. Tang Hongxiang et al. used data including both development quality and competitiveness from 2001 to 2016 to establish interactive indicators and coupled models to evaluate the international competitiveness of manufacturing industries [15]. The study conducted by Zhang et al. used the diamond model developed by Porter in 1990 to calculate the relative competitiveness of development determinants in the solar PV industry through this model and the analytical hierarchy process [16]. As the current level of international division of labor has been gradually refined to the production chain within the product, the scale of intermediate products has expanded and the concept of the "service" of manufacturing has emerged [17]. Although this research method is applicable to the analysis of specific industry segments, it generates large statistical errors at the macro level, making it increasingly difficult to reveal a country's true trade competitiveness.

The emergence of value-added caliber has occurred due to the increasing number of international organizations that have constructed and published cross-country non-competitive input–output tables in recent years. These data provide detailed input–output values and flows by country and industry, providing new methods and channels for research in related fields [18]. Francoins et al. used a method based on forward linkage decomposition and calculated the degree of value embodied in production and trade in third-party country participation in imported goods and services [19]. This will become increasingly important as a determinant of export competitiveness.

Koopman's Global Value Chain Position Index (GVC_position), proposed in 2010, is based on multi-country and multi-sector conditions. The theory uses domestic export value added, GVC_participation, GVC_position, and RCA_VA under value-added caliber to measure the international competitiveness of manufacturing and has gained wide acceptance [20]. Some scholars also argue that global value chains (GVCs) will undergo substantial transformation in the coming decade, reshaping the global trade and investment landscape, and extensive research is necessary from this perspective [16]. The large embedded value of services in China's manufacturing export sector has led to a significant underestimation of total trade. However, it has also been found that both the whole and sub-sectors only have large-scale power, rather than service trade power; thus, their international competitiveness is not strong, with them experiencing some problems such as low value-added rate and poor performance. Johnson used global input–output data to measure the value added through trading and also clarified the length of GVCs and the location of products and services with price linkages across countries [21]. The study by Ndubuisi and Owusu validates the views of past scholars [22]. They argue that producing and exporting higher-quality products usually requires access to advanced technologies and higher-quality intermediate inputs, and although participation in GVCs can provide access to these technologies and intermediate inputs, developing countries are likely to be involved only in the more basic GVC segments and thus are less competitive [22].

However, studies focusing on the GVC growth caliber usually suffer from the drawback of being based on new market share indices with modified import and export data [23]. Additionally, the reality is complex, and it is difficult to obtain a comprehensive picture of the manufacturing level and competitiveness of a particular country and evaluate it based on a single index [23]. Therefore, this paper draws on the idea of industry-level competitiveness and analyzes it at multiple levels to establish an evaluation system for the international competitiveness of manufacturing that considers source, essence, performance, and outcome [24].

WIOTS data; the latest domestic industry data for Chinese and U.S. manufacturing industries; as well as data on the productivity, international market share, and profitability of Chinese and U.S. manufacturing industries from 2010 to 2019 were used, as measured by the value-added caliber. This reveals the true state of the international competitiveness of the two countries and fills in the gaps left by existing studies.

3. Empirical Methods

3.1. Research Methods

In this study, the value-added statistical caliber was used as the variable.

3.1.1. Input–Output Model

Table 1 shows three-country input–output models. In these model, Z represents the intermedia product input matrices, Y represents the final product input matrices, VA represents the value-added row vector, F represented the total output column vector, F′ represents the total input row vector, s represents Country S, r represents Country S, and t represents Country T.

Table 1. Three-Country Input–Output Model.

Input \ **Output**		**Intermediate Use**			**Final Use**			**Gross Output**
		Country *S*	**Country *R***	**Country *T***	**Country *S***	**Country *R***	**Country *T***	
Intermediate input	Country *S*	$\boldsymbol{Z}_{ss}$	$\boldsymbol{Z}_{sr}$	$\boldsymbol{Z}_{st}$	$\boldsymbol{Y}_{ss}$	Y_{sr}	$\boldsymbol{Y}_{st}$	$\boldsymbol{F}_s$
	Country *R*	$\boldsymbol{Z}_{rs}$	$\boldsymbol{Z}_{rr}$	$\boldsymbol{Z}_{rt}$	$\boldsymbol{Y}_{rs}$	$\boldsymbol{Y}_{rr}$	$\boldsymbol{Y}_{rt}$	$\boldsymbol{F}_r$
	Country *T*	$\boldsymbol{Z}_{ts}$	$\boldsymbol{Z}_{tr}$	$\boldsymbol{Z}_{tt}$	$\boldsymbol{Y}_{ts}$	$\boldsymbol{Y}_{tr}$	$\boldsymbol{Y}_{tt}$	$\boldsymbol{F}_t$
Value added		$\boldsymbol{VA}_s$	$\boldsymbol{VA}_r$	$\boldsymbol{VA}_t$	—	—	—	—
Gross input		$(\boldsymbol{F}_s)'$	$(\boldsymbol{F}_r)'$	$(\boldsymbol{F}_t)'$	—	—	—	—

3.1.2. Export Value-Added Decomposition

Equation (1) shows the decomposition of export value added. V_s represents the diagonal matrix, whose diagonal elements are the value-added rates of the country's industries. B_{sr} represents different submatrixes in the Leontief inverse matrix. E_S represents the diagonal matrix of export in Country S. Diagonal elements in the partitioned matrix represent products the domestic value added for export in a country. Non-diagonal elements in columns represent the value added of products intended for export in one country.

$$\boldsymbol{DV_s} = \boldsymbol{V_s B_{ss} \hat{E}_s}, \boldsymbol{FV_s} = \boldsymbol{V_r B_{rs} \hat{E}_s} + \boldsymbol{V_t B_{ts} \hat{E}_s} \quad (1)$$

3.1.3. Intermedia Export Products Value-Added Decomposition

This is the same as the above export value added of final products. IEs represents the export diagonal matrix of intermedia products in Country S and the block matrix diagonal element represents the export domestic value added of intermedia products of a country. The sum of non-diagonal elements in column represents the IFV of the export of a country. Take Country S as an example.

3.2. Design of Indexes

Table 2 shows the international manufacturing competitiveness of an evaluation index. The evaluation level includes source, essence, performance, and result. The corresponding evaluation content includes the environment of industries and their productivity, international market shares, and industrial profit rate. In this study, the productivity was measured by CPL value, the international market shares were measured by RGVCA, and the industrial profit rate was measured by R_VA. Most of the qualitative indexes included facilities, developments of products, and skill training in international competitiveness.

Table 2. International Manufacturing Competitiveness of Evaluation Index.

Evaluation Level	Evaluation Content	Detailed Index	Computational Method
Source	Soft and hard environment	-	-
Essence	Productivity	Cost productivity *CPL*	Value added/(number of employees × average annual salary)
Performance	International market shares	Revealed comparative advantage index of value chain *RGVCA*	Domestic increment in value of intermedia products/domestic increment in value of general export
Result	Industrial profit rate	Value-added rate *R_VA*	Value added/gross output

(1) Productivity measurements index

The productivity measurements index was represented by the cost-productivity level (CPL_{is}), as shown in Equation (2). In this Equation, VA_{is} represents the value added of Industry i from Country S, $Wage_s$ represents the average wage of manufacturing in Country S, and Num_{is} represents the number of domestic laborers of Industry i of Country S.

$$CPL_{is} = \frac{VA_{is}}{Wage_s \times Num_{is}} \tag{2}$$

(2) International market share index

$RGVCA_{is}$ represents the international market share index in international manufacturing, as shown in Equation (3); ISV_{is} represents the value added of intermedia products domestic export (Industry i of Country S); DV_{is} represents the total domestic value added (Industry i in Country S); IDV_i represents the domestic export value added of intermedia products of Industry i in the whole world; and DV_i represents the total domestic value added of Industry i in the whole world.

$$RGVCA_{is} = \frac{IDV_{is}/DV_{is}}{IDV_i/DV_i} \tag{3}$$

(3) Profit rates index

For Industry i in Country S, as shown in Equation (4), R_VA_{is} represents the profit rate index, VA_{is} represents the output value added, and F_{is} represents the total output.

$$R\_VA_{is} = \frac{VA_{is}}{F_{is}} \tag{4}$$

3.3. Data Structures

3.3.1. Data Sources

The detailed data were sourced from the WIOTS (2010–2019). Moreover, other data were obtained from the China Statistical Yearbook, China Industrial Statistical Yearbook, and the official website of the U.S. Bureau of Economic Analysis. Industry wage rate data were obtained from Trading Economics website.

3.3.2. Low, Medium and High Technology Classification

Due to the fact that the manufacturing classification methods for China and the United States are different, the data were combined and classified. The levels of low technology, medium technology, and high technology were analyzed in the following analysis. Table 3 shows the low technology, medium technology, and high technology classifications.

Table 3. Low technology, medium technology, and high technology classifications.

ISIC Code	Industry Name	Technology Category
C10	Manufacture of food products	Low technology
C11	Manufacture of beverages	
C12	Manufacture of tobacco products	
C13	Manufacture of textiles	
C14	Manufacture of wearing apparel	
C15	Manufacture of leather and related products	
C16	Wood processing and wood, bamboo rattan, brown grass manufacturing	
C17	Paper and paper products	
C18	Printing and reproduction of recording media	
C19	Petroleum processing, coking, and nuclear fuel processing	Medium technology
C20	Manufacture of chemicals and chemical products	
C21	Manufacture of pharmaceuticals, medicinal chemical, and botanical products	
C22	Rubber and plastic manufacturing	
C23	Non-metal mineral products manufacturing	
C24	Base metal manufacturing	
C25	Metal products manufacturing (except machinery and facilities)	
C28	Mechanical equipment manufacturing	
C29	Manufacture of motor vehicles, trailers, and semi-trailers	
C30	Manufacture of other transport equipment	
C26	Computing, electronics, and optical products	High technology
C27	Electrical equipment manufacturing	

4. Results and Discussion

4.1. Overall-Level Manufacturing Analysis

The overall level of competitiveness of China and the U.S. was determined using data from 2010 to 2019. Table 4 shows the output value added, productivity, international market share, and profit rate. Table 4 shows that the output value added increased from 2010 to 2019, which was due to the fact that the GDP for China and the U.S. increased from 2010 to 2019. The output value for China was higher than that for the U.S., and the reason for this was that the GDP increased a lot in China. In terms of productivity, the U.S. productivity was higher than that of China because the U.S. economic growth was higher than that of China. In addition, the international market shares for China and the U.S. decreased over time. Moreover, the profit rates for China and the U.S. decreased.

Table 4. China and the U.S. manufacturing output value added, productivity, international market share, and profit rate analysis.

Year	Output Value Added		Productivity		International Market Share		Profit Rate	
	China	U.S.	China	U.S.	China	U.S.	China	U.S.
2010	1,925,161	1,848,047	5.03	52.24	1.01	1.02	0.21	0.37
2011	2,370,658	1,927,210	5.15	44.78	0.73	1.12	0.20	0.34
2012	2,644,492	2,004,826	5.15	40.31	0.79	1.20	0.20	0.34
2013	2,875,807	2,046,002	4.38	36.64	0.75	1.10	0.19	0.34
2014	3,043,278	2,120,209	4.11	33.84	0.72	1.12	0.19	0.34
2015	3,216,254	2,315,464	3.78	31.54	0.68	1.07	0.18	0.32
2016	3,426,419	2,645,148	3.64	30.68	0.66	1.05	0.18	0.31
2017	3,536,149	2,754,186	3.58	30.46	0.66	1.06	0.17	0.29
2018	3,744,652	2,861,428	3.72	30.32	0.64	1.02	0.15	0.24
2019	3,841,647	2,768,124	3.86	29.14	0.63	1.01	0.14	0.23
2020	4,021,468	2,854,163	3.92	28.32	0.62	1.01	0.13	0.21

4.2. Subdivision Industry Comparison

The dynamic changes in hierarchical international competitiveness in China and U.S. manufacturing from 2010 to 2019 were explored. The purpose of this study was to compare the international competitiveness of subdivisions of China and U.S. The productivity index, international market share index, profit rate index for technology, and growth rate of the relative data between 2010 and 2019 were determined. The results are shown in Tables 5 and 6.

Table 5. China Manufacturing Dynamic Changes in Hierarchical International Competitiveness Analysis (2010–2019).

Category and Code	Feature	Productivity Index			International Market Shares Index			Profit Rate Index		
		2010	2019	Growth Rate (%)	2010	2019	Growth Rate (%)	2010	2019	Growth Rate (%)
Low technology	C10	107.32	145.46	3.44	0.42	0.73	6.33	0.18	0.26	4.17
	C11	87.28	186.24	8.79	0.21	0.36	6.17	0.22	0.34	4.96
	C12	76.76	121.58	5.242	0.28	0.41	4.33	0.21	0.35	5.84
	C13	35.24	101.27	12.44	0.31	0.46	4.48	0.24	0.47	7.75
	C14	24.31	38.54	5.25	0.23	0.38	5.74	0.31	0.52	5.92
	C15	22.54	87.62	16.28	0.27	0.42	5.03	0.15	0.29	7.60
	C16	284.16	718.64	10.86	0.87	1.64	7.30	0.46	0.68	4.44
	C17	184.52	428.64	9.82	1.08	1.63	4.68	0.38	0.87	9.64
	C18	224.65	411.25	6.95	1.58	1.69	0.75	0.27	0.52	7.55
Medium–low technology	C19	526.45	1364.59	11.16	1.35	1.64	2.19	0.29	0.29	0.00
	C22	132.58	356.46	11.62	0.96	1.68	6.42	0.32	0.32	0.00
	C23	156.64	412.68	11.36	0.89	1.68	7.31	0.43	0.43	0.00
	C24	308.64	528.34	6.15	1.04	1.38	3.19	0.28	0.19	−4.22
	C25	128.66	358.48	12.06	1.24	1.62	3.01	0.34	0.38	1.24
	C20	107.34	211.28	7.81	1.07	1.26	1.83	0.14	0.23	5.67
	C21	116.54	218.36	7.23	1.04	1.13	0.93	0.18	0.32	6.60
	C28	148.32	386.25	11.22	0.86	0.98	1.46	0.26	0.26	0.00
	C29	111.35	258.48	9.81	1.03	1.54	4.57	0.33	0.47	4.01
	C30	102.16	311.25	13.18	1.06	1.48	3.78	0.25	0.36	4.13
High technology	C26	265.38	318.64	2.05	0.74	0.86	1.68	0.17	0.31	6.903
	C27	154.62	318.46	8.36	0.78	0.89	1.48	0.37	0.24	−4.695

Table 6. The U.S. Manufacturing Dynamic Changes in Hierarchical International Competitiveness Analysis (2010–2019).

Category and Code	Feature	Productivity Index			International Market Shares Index			Profit Rate Index		
		2010	2019	Growth Rate (%)	2010	2019	Growth Rate (%)	2010	2019	Growth Rate (%)
Low technology	C10	348.54	468.45	3.34	1.02	1.34	3.08	0.21	0.34	5.5
	C11	412.36	507.28	2.33	1.08	1.27	1.82	0.18	0.23	2.76
	C12	446.57	508.36	1.45	1.11	1.36	2.28	0.17	0.26	4.83
	C13	231.25	311.14	3.35	1.07	1.62	4.72	0.21	0.35	5.84
	C14	176.52	233.27	3.15	1.42	1.25	−1.41	0.18	0.32	6.6
	C15	206.18	244.54	1.91	1.13	1.22	0.86	0.23	0.35	4.78
	C16	675.24	857.34	2.69	1.16	1.24	0.74	0.43	0.38	−1.36
	C17	1238.64	1624.25	3.06	1.18	1.32	1.25	0.43	0.36	−1.95
	C18	723.41	965.42	3.26	1.16	1.24	0.74	0.58	0.63	0.92
Medium–low technology	C19	14128.26	16842.68	1.97	1.08	0.92	−1.77	0.23	0.39	6.04
	C20	1724.35	3214.57	7.17	1.01	1.11	1.05	0.31	0.46	4.48
	C21	1438.24	1836.24	2.75	1.12	1.15	0.29	0.24	0.37	4.93
	C22	864.24	1342.54	5.02	1.13	0.92	−2.26	0.38	0.46	2.15
	C23	1084.26	1354.26	2.50	1.16	0.46	−9.77	0.48	0.52	0.89
	C24	1328.54	1638.16	2.36	1.21	1.04	−1.67	0.36	0.31	−1.65
	C25	857.36	1246.58	4.25	1.18	1.08	−0.98	0.53	0.42	−2.55
	C28	1125.64	1834.54	5.58	1.12	1.02	−1.03	0.54	0.62	1.55
	C29	658.27	835.14	2.68	1.04	1.28	2.33	0.38	0.46	2.15
	C30	846.38	1032.51	2.23	1.12	1.36	2.18	0.56	0.69	2.35
High technology	C26	1936.48	2954.16	4.80	1.34	1.03	−2.88	0.52	0.61	1.79
	C27	1124.37	1658.27	4.41	1.46	1.12	−2.90	0.43	0.52	2.13

In the manufacturing of low-technology products, compared with U.S., China exhibited greater power. Through the analysis of the productivity index in China, the lowest growth rate was 3.44% for the growth rate of C10 (food product manufacture), and the highest growth rate was 12.44% for the growth rate of C13 (textiles manufacture). The highest growth rate of the productivity index in U.S. was 3.34%; this did not reach half of the lowest value for China. For exploring the international competitiveness, the international market shares index is also an important factor. Except for C18 (printing and reproduction of recording media), the lowest growth rate of the international market shares index was 4.33% and the highest growth rate reached 7.3%. In contrast, the international market shares index of C14 (wearing apparel manufacture) showed a decrease in the U.S. and its highest growth rate was only 4.72%. The profit rate index could also explain the great power of the manufacturing of low technology in China. From the growth rate data of the profit rate index, the growth rate of C13, C15 (leather and related products manufacture), and C18 was over 7% and there was no growth rate below 4% in China. However, only C14 could exceed 6% in the U.S., and the growth rate of C24 (base metal manufacturing) and C25 (metal product manufacturing) was negative.

For the manufacturing of medium–low technology, the growth rate of the productivity index and international market shares index illustrates that the manufacturing of medium–low technology in China has great development prospects. For the productivity index, the growth rates of C19 (petroleum processing, coking, and nuclear fuel processing), C20 (chemicals and chemical product manufacturing), C22 (rubber and plastic manufacturing), C23 (non-metal mineral product manufacturing), C25, C28 (mechanical equipment manufacturing), and C30 (manufacture of other transport equipment) surpassed 11% and the lowest growth rate was not lower than 6% in China, but most growth rates in U.S. were about 2%. For the international market shares index, the growth rate in China was positive, while the growth rates of C19, C22–C25, and C28 were negative. Meanwhile, the growth rate of the profit rate index also demonstrated that the manufacturing of medium–low technology could achieve profits, and the growth rate in China indicates that the manufacturing of medium–low technology is at an early stage of development compared with U.S., there is no great profit in the manufacturing of medium–low technology, such as C19, C22–C24, and C28.

The manufacturing of high technology is the most important industry for a country, because it affects the overall national strength. From Table 6, it can be seen that the growth rates of C26 (computing, electronics, and optical products) and C27 (computing, electronics, and optical products) in the productivity index, international market shares index, and profit rate index are similar, and the data indicate that the development of C26 and C27 is stable and the profits of C26 and C27 are increasing, though they are losing part of the international market. In China, the growth rate of C27 in the productivity index is higher than the growth rate of C26, but the growth rate of C27 in the profit rate index is lower than the growth rate of C26, which demonstrates that the supply of electrical equipment exceeds the demand, meaning that the manufacturers incur economic loss. Meanwhile, the increase in the growth rates of C26 and C27 in the international market shares index indicates that the manufacturing of high technology in China has formed a strong international competitiveness and is occupying more of the international market.

4.3. Comparison of Matching Characteristics of Manufacturing-Level Competitiveness

The three kinds of international competitiveness indexes are shown in Table 7. To further reveal the matching characteristics between the three levels of international competitiveness of manufacturing subdivision industries in China and U.S., the averages of these three kinds of international competitiveness indexes of manufacturing in fifteen categories during the sample period were calculated.

Table 7. The China and the U.S. annual Average Value Ranking Distribution Characteristics of 3 Categories of Indexes (2010–2019).

		Average Level (China)				**Average Level (U.S.)**			
	Code	**Productivity and Index Ranking**	**Market Share Index Ranking**	**Profit Rate Index Ranking**	**Category**	**Productivity and Index Ranking**	**Market Shares Index Ranking**	**Profit Rate Index Ranking**	**Category**
Low technology	C10	15	17	12	D	14	18	14	D
	C11	20	12	13	A	19	13	17	A
	C12	14	21	6	A	11	19	20	B
	C13	5	2	19	B	17	6	19	C
	C14	19	13	18	D	18	3	8	D
	C15	6	18	7	A	5	16	16	A
	C16	13	5	10	A	12	9	10	C
	C17	12	3	4	B	7	11	12	B
	C18	4	4	2	A	13	2	5	B
Medium technology	C19	3	1	20	A	20	10	13	D
	C20	16	15	14	D	2	17	2	B
	C21	18	19	17	B	16	20	9	A
	C22	9	14	15	B	10	8	6	C
	C23	10	6	1	A	8	4	4	A
	C24	2	8	21	D	15	12	11	B
	C25	8	7	5	B	4	15	7	B
	C28	1	9	3	D	21	5	15	A
	C29	17	16	11	A	3	21	21	D
	C30	21	20	16	C	9	1	18	B
High technology	C26	7	10	8	A	1	14	3	A
	C27	11	11	9	D	6	7	1	D

Table 7 shows that the three levels of international competitiveness of manufacturing in China and U.S. have a certain dislocation. The gamma coefficient was applied to explore the reason for the above situation and reflect the correlations of the three indexes, as shown in Tables 8 and 9. The relationship of the ranking of the productivity indexes of China's manufacturing and international market shares is positive, which indicates that increasing improvements in cost productivity have effectively contributed to those of international market shares. However, there is no correlation between profit and the other two indexes, which indicates that the high productivity and improvements of the international market shares did not promote profit indexes. The above may be caused by sources of international competitiveness—differences in industrial environment, basic facilities of different industries, research levels of products, as well as policies and rules of trades and investments. All these differences can lead to inconsistencies in ranking.

Table 8. Correlation Analysis of the Ranking of 3 Categories of Indexes of International Competitiveness of Chinese Manufacturing.

	Productivity Index Ranking		**International Market Shares Index Ranking**	
	γ	p **Value**	γ	p **Value**
Productivity index ranking	—	—	0.21	0.02
International market share index ranking	0.54	0.03	—	—
Profit rate ranking	0.02	0.71	0.04	0.93

Table 9. Correlation Analysis of the Ranking of 3 Categories of Indexes of International Competitiveness of U.S. Manufacturing.

	Productivity Index Ranking		**International Market Shares Index Ranking**	
	γ	p **Value**	γ	p **Value**
Productivity index ranking	—	—	−0.17	0.24
International market share index ranking	−0.15	0.28	—	—
Profit rate ranking	−0.11	0.41	0.23	0.13

As shown in Tables 8 and 9, in the U.S., there is a positive connection between profit index ranking and international market share index ranking, which confirms that the high international market shares the U.S. has generated through dominating manufacturing GVC have brought lucrative profits. There is a weak and negative correlation between the rankings of productivity and the other two indexes. The reason for this may be that the U.S. has scattered most value chains in the manufacturing of other countries by large-scale industrial transfers, which has led to hollows in some of the manufacturing of the U.S. Therefore, international market shares and profits are high, while domestic cost productivity is low.

Furthermore, different indexes were ranked as high levels, medium levels, and low levels, and these types were classified according to the high- or low-level collocations of three kinds of indexes: Type A refers to industries at medium or high levels among the three kinds of indexes. Those industries (robust industries) possess comparatively better effects of endogenous conduct. Type B refers to industries (weak industries) which are ranked as medium or low among the three kinds of indexes. The three levels of international competitiveness in this industry are weak and their industrial surroundings need to be improved and their sources of competitiveness need to be optimized. Type C means industries (virtually high industries) where the three kinds of indexes present a low–high–high trend. High international market shares and lucrative profits depend on the high consumption of labor and land. Type D refers to industries where the three kinds of indexes show high–low–high, high–low–medium, or low–low–high trends. These can obtain some profits with a high productivity. However, they mainly depend on governmental investment demand. Their foreign market shares are not promoted. These can be defined as investment-driven industries and they are called captive industries.

There are five robust industries in China's manufacturing sector. However, these are composed of tech industries and high-tech industries. Among these, nine are low-technology industries, which are C10–C18 (manufacture of food products, manufacture of beverages, manufacture of tobacco products, manufacture of textiles, manufacture of wearing apparel, manufacture of leather and related products, wood processing and wood, bamboo, brown grass manufacturing). C19–C30 (petroleum processing; coking and nuclear fuel processing; manufacture of chemicals and chemical products; manufacture of pharmaceuticals, medicinal chemical, and botanical products; rubber and plastic manufacturing; non-metal mineral products manufacturing; base metal manufacturing; metal products manufacturing; mechanical equipment manufacturing; manufacture of motor vehicles, trailers, and semi-trailers; manufacture of other transport equipment) belong to medium–low technology industries. Two of them are high technology industries, which are C26 (computing, electronics, and optical product) and C27 (electrical equipment manufacturing).

There are also five robust industries in the U.S., which mainly focus on high-tech or medium- and high-technological industries combined with the analysis of Tables 5 and 6. The manufacturing in the U.S. pays more attention to technological innovation. The comprehensive competitiveness of manufacturing with high-technological content is stronger. Meanwhile, low-tech and medium- and high-technological industries in China's manufacturing sector take the lead through their rich labor and natural resources. However, the development of high-tech manufacturing is left behind and its comprehensive competitiveness is weaker.

There are six investment-driven industries in China's manufacturing sector. These are C10, C14, C20, C24, C27, and C28. Among these, C10 and C14 are driven by investment in natural resources and labor to accumulate technologies and expand scales. Although their productivity and profits are increasingly improving, they are deficient in their brand shaping, product research, and design. Products intended for export are largely shallow processing products. C24, C27, and C28 make great progress, receiving large sums of investment from the government, leading to the active transfer of the industry from developed countries. They obtain comparatively high levels of productivity and profit. However, because they have been engaged in the end stage of the processing and assembly of GVC for a long time, the accumulation of top research and design is not sufficient. Furthermore, in international markets, their shares are low. In the U.S., the investment-driven industries are C10, C14, C19, C27, and C29. These include both lifestyle industries (C10, C14) and energy industries (C19, C27, C29). The reason why these industries become investment-driven industries is that they not only satisfy human needs but also bring high profits to manufacturers.

5. Conclusions and Prospects

This paper investigated the impact of manufacturing on international competitiveness based on the WIOTS and the latest domestic industry data on manufacturing in China and the United States from 2010 to 2019 published by WIOD. Firstly, this study used the multi-regional input–output model to reveal the division of production networks and product development trends in both countries. Secondly, a competitiveness evaluation index system was established with the caliber of value added and the levels were compared. Finally, this paper revealed the characteristics of the competitiveness of the two countries. The detailed conclusions were as follows:

(1) The U.S. manufacturing industry remains in the foremost position in terms of cost productivity, international market share, and profit index. It mainly monopolizes the research and technology development stage and controls the core technology and key parts in high-tech industries. However, this advantage is somewhat weakened due to the hollowness of the manufacturing industry because of the massive shift to manufacturing overseas in the past.

(2) China's manufacturing industry is "big" but not "strong". Although its overall scale is large, the core competitiveness of most industries is weak. On the one hand, China's manufacturing industry has only managed the processing and trade links in the GVC and the export link of final products for a long time. A critical problem is that the manufacturing sector lacks research and design innovation, especially in the field of high-tech industry, which cannot play a leading role. On the other hand, the

development and layout of China's manufacturing industry lacks rationality. Many industries are embedded in the GVC with cheap primary elements or high levels of consumption and pollution, bearing environmental costs, but most of the profits are siphoned off by foreign companies and the cost is born by different countries.

The above conclusions of this paper have important implications for China's current understanding of the international competitive landscape and the shaping of new international competitiveness:

(1) The hollowness of U.S. manufacturing has eroded its obvious advantages in terms of cost productivity, international market share, and profitability. Thus, the core aim of U.S. reindustrialization and its trade wars with China is to emphasize its world status, with the value added by its manufacturing being the highest in the world. It aims to change investment expectations of global manufacturing enterprises to push manufacturing refluxes, reduce the costs of domestic manufacturing enterprises, and reshape global manufacturing competition patterns.

(2) To solve the problem of China's manufacturing industry being big but not strong, the top chains of GVC and related developments should be prioritized, especially in terms of the comprehensive competitiveness of high-tech manufacturing. It is necessary to change from relying on its advantages of low cost and large scale for victory to developing industries and attaching importance to the areas of research, design, brand shaping, etc. Enterprises should strengthen their investments in soft and hard surroundings.

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