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Industrial Basic Capacity Research: Theory and Measurement

Songling Wu * and Mengjiao Ren

Business College, Henan University of Science and Technology, Luoyang 471000, China; 220320130904@stu.haust.edu.cn
* Correspondence: 9901658@haust.edu.cn; Tel.: +86-18437919321

Abstract: This paper establishes a theoretical framework for understanding the connotations of industrial basic capacity. It employs models from economic growth theory to derive indices for assessing industrial basic capacity and exploring the economic correlations among its influencing factors. Additionally, it measures the industrial basic capacity indices of 17 subsectors across 9 major industrial countries from 2000 to 2020 using OECD data. The findings reveal that from 2000 to 2020, the Chinese manufacturing industry has surpassed the United States, becoming the global leader. Specifically, within the 17 subsectors, 9 are globally ranked first, with 7 nearing advanced levels, and only 1 facing relative backwardness. Chinese manufacturing industry's enhanced basic capacity is attributed to advantages in cost competitiveness and scale. However, significant disparities persist in technological input and industrial linkages with advanced nations. The decline in basic capacity among developed countries stems primarily from diminished value chain profitability due to inadequate investment. Sustainable improvement in industry basic capacity necessitates concurrent advancements in value chain profitability, fixed asset investment, technological levels, industrial linkages, and market scale. Overreliance on cost advantages or advanced technology poses substitution risks. Moreover, this paper underscores the limitations of exclusively relying on current data to assess global industrial basic capacity, advocating for a greater historical perspective. To strengthen the Chinese manufacturing industrial basic capacity within the global value chain, the Chinese manufacturing industry must enhance technological inputs, reduce the operational costs of enterprises, and elevate the degree of openness.

Keywords: manufacturing; industrial basic capacity; scale advantage

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1. Introduction

With the accelerated reconstruction of the global value chain [1], enhancing Chinese control over the global value chain and reversing the passive situation regarding key core technologies have emerged as focal points. The concept of industrial basic capacity was first introduced during the 2019 meeting of the Political Bureau of the Central Committee. It emphasized that "improving industrial basic capacity and industrial chain level is the sole path for China to transition from a manufacturing power to a manufacturing powerhouse and to reverse the passive situation regarding key core technologies". This notion was further underscored in the National 14th Five-Year Plan and 2035 Vision Outline, which stressed the importance of "accelerating the development of a modern industrial system, consolidating and strengthening the foundation of the real economy, and advancing the advanced industrial base and modernizing the industry chain". Therefore, enhancing Chinese control over the global value chain and upgrading the capacity of the manufacturing industry's industrial base have become crucial objectives.

With the objective of exploring the theme "Industrial Basic Capacity Research: Theory and Measurement", this paper addresses the following key questions: What is the connotation of industrial basic capacity within the context of global value chain reconstruction? What is the theoretical foundation and framework underpinning industrial basic capacity? How to effectively evaluate and measure a country's industrial basic capacity and that of different industries? To achieve this, we employ the theoretical model of market size and economic growth by Donaldson and Hornbeck to derive indices of industrial basic capacity and influencing factors, incorporating competitive advantage, import price indices, corporate behavior, and equilibrium analysis. The primary innovations and contributions of this paper are as follows: (1) Upon the foundation of prior academic research, this paper innovatively proposes the connotation of industrial basic capacity. Under the international division of labor, a country's control over key links in the global value chain and the strength of its industry's non-substitutability are central reflections of its industrial basic capacity. Therefore, the connotation of industrial basic capacity includes the comprehensive integration of national science, technology, craftsmanship, design, and other factors into industrial development; (2) This paper employs Donaldson and Hornbeck's methodology for comparative advantage trade modeling, which is based on a quantitative spatial structure model. Through the analysis of competitive advantage, import price indices, enterprise behavior, and equilibrium, this study derives the index of industrial basic capacity along with its influencing factors. The index of industrial basic capacity demonstrates that the profit rate obtained from the value chain, the scale of fixed investment in the industry, the input of industrial technological level, the degree of industrial linkage, and the size of the industry's consumer market are pivotal factors influencing the underlying strength of industrial capacity, providing a novel tool to assess and compare the industrial basic capacity [2]; (3) We empirically measure the comprehensive and subsector industrial basic capacity of nine countries, including China and the United States, using Organization for Economic Co-operation and Development (OECD) data from 2000 to 2020, and study the reasons for their changes, thereby offering insightful guidance to nations aiming to strengthen their industrial basic capacity.

The subsequent sections of this paper are organized as follows: Section 2 provides a literature review. Section 3 outlines the theoretical framework underlying the formation of industrial basic capacity, along with the data and relevant variables employed in our study. The measurement results and analysis of influencing factors are covered in Section 4. Section 5 presents the discussion. Lastly, Section 6 presents the conclusions and recommendations.

2. Literature Review

The introduction of the concept of industrial basic capacity stems from the adoption of reindustrialization strategies by developed nations, which hastened the restructuring of the global value chain and significantly affected Chinese industrial security. Consequently, studying this concept necessitates an examination within the framework of the international division of labor. The evolution of the international division of labor has traversed three stages: inter-industry division of labor, intra-industry division of labor, and intra-product division of labor. Correspondingly, the notion of industrial basic capacity has evolved through three stages: industrial security, industrial competitiveness, and industrial basic capacity. Within the context of each of these stages, we will conduct a literature review from three aspects: connotation, measurement, and influencing factors.

2.1. The Era of Inter-Industrial Division of Labor (From the 17th Century to the 1950s)—The Connotation and Criteria of Industrial Security

In the era of inter-industrial division of labor, scholars clearly put forward the concept of industrial security: over-reliance on a certain industry or a market may lead to economic and political negative impacts. Despite this conceptual advancement, a rigorous and definitive analytical approach for quantifying and evaluating industrial security indicators remained an unaddressed area of inquiry. In the examination of the factors that influence industrial security, the increase in labor productivity serves as a guarantee of industrial security. The criterion for determining which industry to protect involves ensuring that the cost of protection is lower than the discounted value of the expected profit that the industry can obtain in the future. Furthermore, the importance of using tariffs to protect domestic industries is emphasized [3,4].

2.2. The Period of Intra-Industrial Division of Labor (1960s to the Beginning of the 21st Century)—The Object of Industrial Security Protection and China's Industrial Security

In the 1960s, the international division of labor gradually transitioned into the period of intra-industrial division of labor. Developing countries, due to a lack of technology, capital, and other production factors, struggled to protect their industries. Their manufacturing capacity was often low, placing them at the lower end of the production spectrum, which challenged industrial security. Scholars have engaged in extensive discussions within the connotation of industrial security protection, exploring diverse concepts and theories. The theory of strategic trade policy emphasized the importance of government intervention in trade as a means of industrial protection, and it proposed the "income elasticity benchmark" and "productivity rise benchmark" as criteria for protection. As China integrated into the global value chain, industrial security became a significant concern for Chinese scholars. Chinese scholars, in their in-depth examination of the determinants influencing industrial security, have advanced the proposition that the possession of pertinent autonomy or control over its adjustment and development is beneficial to safeguarding industrial security. Conversely, foreign control of Chinese industries poses a threat to the national economy. Therefore, the essence of industrial security lies in industrial competitiveness. Whether in high-tech or autonomous industries, weak competitiveness poses a threat to national economic security [5–9].

2.3. The Period of Intra-Product Division of Labor (1990s to the Present)—The Concept of Industrial Competitiveness and the Path of Enhancement

As the international division of labor has progressed to the stage of intra-product division, industrial competitiveness has become crucial for national economic security. Industrial competitiveness measures a country's ability to control the global value chain. In this context, advancing manufacturing industries in developing countries from the low end to the high end of the value chain is vital for enhancing industrial competitiveness. In delving into the connotation of industrial competitiveness, scholars have advanced the idea that industrial competitiveness enables a country's industry to compete internationally and exhibit strong market expansion ability. In the examination of the factors that influence industrial competitiveness, a country's industrial competitiveness depends on several factors: the efficiency of industrial organization, the quantity and quality of input factors, the ability to learn and innovate, cooperation efficiency, cultural strength, and industrial policy. Improving industrial competitiveness must rely on innovation to create more added value. Embedding in global value chains (GVCs) allows developing countries to learn from the technology of developed nations, thereby promoting the competitiveness of their manufacturing industries [10–14].

2.4. Period of Accelerated Reconstruction of Global Value Chain (2008 Financial Crisis to Present)—Connotation and Path of Industrial Upgrading

Since the financial crisis, China's manufacturing industry has enhanced its position in the global value chain by increasing its participation. This increased participation has accelerated the reconstruction of the global value chain, making China the economy experiencing the most significant trade friction worldwide and risking gradual marginalization. To address this, China's manufacturing industry must achieve industrial upgrading to break through the international division of labor dominated by developed countries. This move aims to climb to the high end of the value chain, enhance the status of the division of labor, resolve the risk of marginalization, and realize high-quality economic development. The main strategies for this upgrade path include technological innovation, servitization of production, foreign investment spillover effects, and industrial policy drives [15,16].

2.5. The Stage of Intensifying Trade Friction Between China and the United States (2018–Present)—Connotation and Evaluation of Industrial Basic Capacity

As the trade war between China and the U.S. continues to intensify and spread, it has become national consensus in China to improve control over its manufacturing industry within the global value chain. This response aims to counter the U.S. "choke point" strategy against China. The concept of manufacturing industrial basic capacity was first proposed at a Political Bureau of the Central Committee meeting in August 2019. Scholars have engaged in a thorough examination of the underlying connotation of industrial basic capacity. Industrial basic capacity refers to the ability of the upstream segments of the value chain to exert decisive influence and control over the development of industries within the international division of labor. Thus, industrial basic capacity refers to the comprehensive conditions and power that ensures the formation and development of industries. In rigorous academic investigations dedicated to the quantitative and qualitative assessment of industrial basic capacity, it is segmented into four dimensions: technical support capability, production organization capability, marketing capability, and industrial driving capability. In rigorous academic inquiries into the determinants of industrial basic capacity, technological innovation capacity and public service provision within the industry stand out as particularly pivotal factors [17,18].

Existing research on industrial basic capacity primarily focuses on demand-side factors such as value chain position and profitability, often starting with technological advancement. However, high-tech industries are particularly vulnerable and remain within the realm of industrial competitiveness. This paper endeavors to construct a theoretical framework for the underlying attributes of industrial basic capacity, analyzing it from the dual perspectives of the supply and demand sides.

3. Theoretical Framework of Industrial Basic Capacity

Drawing upon the preceding discourse, industrial basic capacity extends the concepts of industrial security and competitiveness. The essential attributes of industrial basic capacity encompass the independence, autonomy, integrality, and controllability of a country's industry and value chain, with irreplaceability highlighting its evolutionary trajectory. The theoretical mechanisms of industrial basic capacity are illustrated in Figure 1.

In the global value chain, the less easily an industry can be replaced by another country's industry, the stronger its industrial basic capacity. Thus, advanced technology alone does not signify strong industrial basic capacity if the industry remains easily replaceable. Industrial basic capacity manifests as a fresh embodiment of industrial security and competitiveness amidst the accelerated reconfiguration of the global value chain. Under the international division of labor, a country's control over key links in the global value chain and the strength of its industry's non-substitutability are central reflections of its industrial basic capacity. Therefore, the connotation of industrial basic capacity includes the comprehensive integration of national science, technology, craftsmanship, design, and other factors into industrial development. It encompasses a country's ability to control key links in the global value chain and reflects national economic security within the international division of labor. From the perspectives of supply, demand, and non-substitutability, the main influencing factors include the competitiveness of national industries in the global value chain, barriers for foreign manufacturers to enter the national industry, and the position and market concentration of domestic industries in global value chains. The size of the local market also plays a crucial role in determining industrial basic capacity.

Based on the above analysis of theoretical mechanisms, this paper employs Donaldson and Hornbeck's methodology for comparative advantage trade modeling, which is based on a quantitative spatial structure model. Through the analysis of competitive advantage, import price indices, enterprise behavior, and equilibrium, this study aims to derive the index of industrial basic capacity along with its influencing factors. To enhance the clarity of the article, a table of symbols is provided as shown in Appendix A.

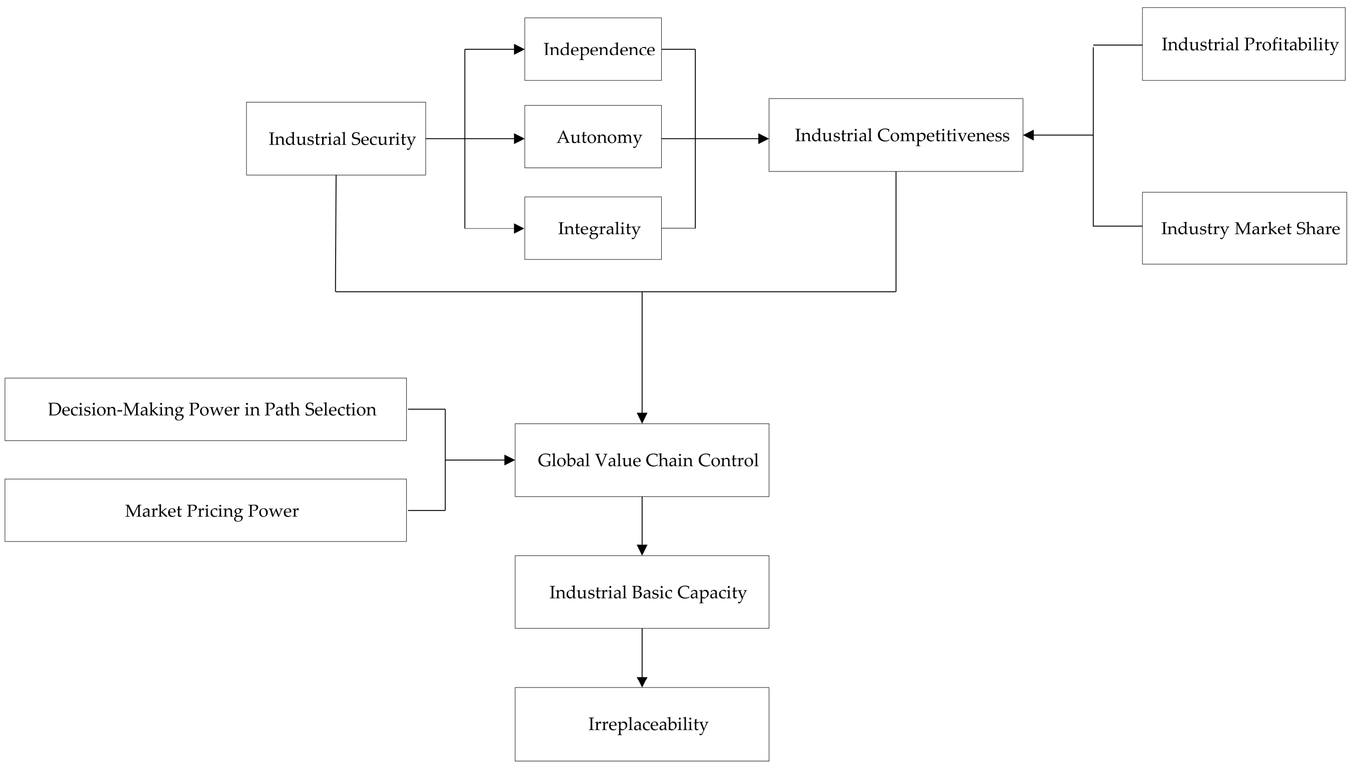


Figure 1. Theoretical mechanisms.

3.1. Competitive Advantage Analysis

Assume that a representative consumer in the country j supplies 1 unit of labor locally and inelastically and receives a wage (w_j) as payment for the labor. This consumer spends the entire wage on consumption, and consumption allows him or her to obtain utility. This paper utilizes a two-layer functional form to analyze the competitive advantage of each industry in the country. The first layer utilizes the Cobb–Douglas (C–D) functional form to sum up the competitive advantage of the country's different industries in the global value chain, and the second layer sums up the competitive advantage over other countries participating in the global value chain through the constant elasticity of substitution (CES) functional form. The functional expression is given below:

$$u_j = \prod_{s\epsilon S} {C_{j,s}}^{e_{j,s}} C_{j,s} = \left(\sum_{i\epsilon I} {c_{ij,s}}^{\frac{\sigma_s - 1}{\sigma_s}} \right)^{\frac{\sigma_s}{\sigma_s - 1}} \quad (1)$$

where S denotes the set of industries, I denotes the set of countries, σ_s denotes the elasticity of substitution of production industries in different countries, $C_{j,s}$ denotes the competitive advantage of country j's s-industry over the s-industries of the other countries in the GVC, u_j denotes the utility of the consumers in country j, and $c_{ij,s}$ denotes the competitive advantage of country j, over the s-industries of country i. If the product price index of the country j's s-industry is denoted by $\mathbb{P}_{j,s}$, the first level function refers to the Cobb–Douglas (C–D) utility function form, with the budget constraint: $\sum_{s\epsilon S} \mathbb{P}_{j,s} C_{j,s} = w_j$. If the product of industry s in country i is exported to country j at an export price denoted as $p_{ij,s}$ and the expenditure of wages on the purchase of the product of industry s is denoted by $w_{j,s}$, the budget constraint of the second level function is $\sum_{i\epsilon I} p_{ij,s} c_{ij,s} = w_{j,s}$.

Under the budget constraint, in the first step, the utility maximization problem is constructed from the first layer function and the corresponding budget constraint, and the Lagrange function is established and the utility maximization problem is solved, which can get $\mathbb{P}_{j,s} C_{j,s} = e_{j,s} w_j$; in the second step, the utility maximization problem is constructed from the second layer function and the corresponding budget constraint and the result of the first step is combined, it can be obtained that the ratio of the competitive advantage of the industry in country j over the industries in countries i and i' can be derived:

$$\frac{c_{ij,s}}{c_{i'j},s} = \frac{p_{ij,s}^{-\sigma}}{p_{i'j,s}^{-\sigma}} \Longleftrightarrow c_{ij,s} = c_{i'j,s} p_{i'j,s}^{\sigma} p_{ij,s}^{-\sigma} \tag{2}$$

The above equation shows that the competitive advantage of country j over country i can be expressed as a competitive advantage over another country i' in the global value chain. From Equation (2), the stronger the competitive advantage of the country j's industry s in the value chain, the lower the selling price of the products of industry s in this country, the larger the consumer surplus, and the higher the utility that consumers get from it.

3.2. Import Price Index

The import price index is the sum of the prices of a basket of products (from different countries in the value chain) imported by countries participating in the global value chain, which is determined by the country's competitive advantage $C_{j,s}$. The price index is summed by the constant elasticity of substitution, so the import price index is obtained from the competitive advantage derivation by substituting the competitive advantage of the country j over the country i's industry s, $c_{ij,s} = c_{i'j} p_{i'j,s}^{\sigma_s} p_{ij,s}^{-\sigma_s}$, into the function of the country j's competitive advantage over all the countries participating in the GVC, and obtaining Equation (3).

$$c_{i'j,s} = \frac{p_{i'j,s}^{-\sigma_s}}{\left(\sum_{i\epsilon I} p_{ij,s}^{1-\sigma_s}\right)^{\frac{\sigma_s}{\sigma_s - 1}}} C_{j,s} \tag{3}$$

Equation (3) indicates that the competitive advantage of country j over s industry of country i' is determined by two factors: one factor is the competitive advantage of country j's industry over all the countries participating in the GVC, and the other factor is the ratio of the price of the products of country j's industry exported to country i' to the sum of the prices of the products of country j's industry exported to other countries. Both sides of the above equation are multiplied by $p_{i'j,s}$ and the summing operation for country i' is obtained:

$$\sum_{i'\in I} p_{i'j,s} c_{i'j,s} = \left(\sum_{i'\in I} p_{i'j,s}^{1-\sigma}\right)^{\frac{1}{1-\sigma}} C_{j,s} \equiv \mathbb{P}_{j,s} C_{j,s} \tag{4}$$

the left side of the first equal sign of the above equation is the profitability of the country j's industry s relative to all countries participating in the GVC, and the right side of the equation is the summed prices and the competitive advantage of the country j's industry s overall countries participating in the GVC. Thus, the import price index for the country j can be obtained:

$$\mathbb{P}_{j,s} = \left(\sum_{i\in I} p_{ij,s}^{1-\sigma_s}\right)^{\frac{1}{1-\sigma_s}} \tag{5}$$

Equation (5) shows that a country's import price index is expressed by summing the constant elasticity of substitution of the prices of exports of products from the country j's industry s to the rest of the global value chain. Since export prices are affected by the country's share of global trade, the price index $\mathbb{P}_{j,s}$ reflects the extent to which a country j's market size compares with that of other countries.

3.3. Corporate Behavior

3.3.1. Value Chain Control

The representative manufacturer of industry s in country i faces a perfectly competitive factor market, the investment scale is k, which is used to reflect the barriers to entry of an industry; the profit margin obtained in the global value chain is r, which is used to reflect the strength of competitiveness in the value chain; the wage rate of talent L is w, the technological level is A, the value-added is E, and σ_s is the elasticity of substitution of the production industries in different countries.

Let the technology level input $\varphi = \frac{\overline{A}}{A}$, where $\overline{A}$ is the global average technology level and A is the technology level of the country i's industry. Let industry relatedness $e = \frac{\overline{E}}{E}$, where $\overline{E}$ is the average value-added level of all countries in the global value chain and E is the value-added level of industry s in the country i. Using the Cobb–Douglas (C–D) production function form, the functional expression to measure the industrial basic capacity is: $Y = A^{\lambda} E^{\theta} L^{\alpha} K^{\beta}$. Here λ, θ, α, and β denote the proportion of technology level, value-added level, talent level, and investment scale level influencing the industrial basic capacity, respectively.

Participation in global value chain activities requires not only investment in talent and resources but also a certain level of technological input and industrial relevance to provide support. A higher level of technology input φ suggests a greater disparity between China and the world in terms of industrial technology levels. Similarly, greater industrial relevance indicates a larger difference between the level of value added in China's industry and that of the world. Therefore, the control power of a country's industry in the global value chain can be expressed as Equation (6), analogous to the benefit function.

$$R_{i,s} = p_{i,s} Y_{i,s} - \varphi_{i,s} e_{i,s} w_{i,s} L_{i,s} - \varphi_{i,s} e_{i,s} r_{i,s} k_{i,s} \tag{6}$$

where $p_{i,s}$ denotes the price of the product of industry s in country i and $p_{i,s} Y_{i,s}$ reflects the industrial profitability of industry s in country i in the global value chain [19,20]. Referring to the first-order condition of profit maximization, we make $\frac{\partial R_{i,s}}{\partial L_{i,s}} = 0$ and $\frac{\partial R_{i,s}}{\partial k_{i,s}} = 0$ to obtain the first-order condition of maximizing the control of the value chain, as in Equation (7) [21].

$$p_{i,s} = \varphi_{i,s} e_{i,s} w_{i,s} L_{i,s} \alpha^{-1} {Y_{i,s}}^{-1} \; p_{i,s} = \varphi_{i,s} e_{i,s} r_{i,s} k_{i,s} \beta^{-1} {Y_{i,s}}^{-1} \tag{7}$$

3.3.2. Intercity Trade Model

The higher the trade share of country i's industry in the global value chain, the higher the industry concentration of country i's industry, then the smaller the market size of country i's industry, if the price of country i's industry products is p_i, and then the price of exporting them to country j is p_{ij}, the industry concentration affects the relationship between the two prices. If you use the trade share of country i's industry in the global value chain to reflect the industry concentration, there is $p_{ij} = p_i M_{ij}$, where M_{ij} is country j's global trade share relative to country i. The higher M_{ij} is, the higher country j's global trade share is relative to country i, then the higher country j's industry concentration is relative to country i, and the smaller country j's industry market size is relative to country i. Multiply both sides of the competitive advantage Equation (2) by $p_{ij,s}$ and the sum of the pairs is $w_j = \sum_{i \in I} p_{ij,s} c_{ij,s} = c_{i'j,s} p^{\sigma}_{i'j,s} {\mathbb{P}_{j,s}}^{1-\sigma}$. The competitive advantage of country j over another country i in industry s is obtained as $c_{ij,s} = w_{j,s} {\mathbb{P}_{j,s}}^{\sigma-1} p^{-\sigma}_{ij,s}$. Multiplying the competitive advantage by the price $p_{ij,s}$, we can get the profitability of country j to country i's industry as $x_{ij,s} = p_{ij,s} c_{ij,s}$. If we use $\pi_{ij,s}$ to denote the profitability of country j to country i's industry s as a share of the profitability of country j to all countries in the global value chain, combined with the import ratio of the trade flow equation, it can be expressed as Equation (8).

$$\pi_{ij,s} = \frac{x_{ij,s}}{\sum_{i \in I} x_{ij,s}} = \frac{w_{j,s} {\mathbb{P}_{j,s}}^{\sigma_s - 1} p^{-\sigma_s}_{ij,s}}{w_{j,s} {\mathbb{P}_{j,s}}^{\sigma_s - 1} \sum_{i \epsilon I} p^{1-\sigma_s}_{ij,s}} = \frac{p^{-\sigma_s}_{ij,s}}{\sum_{i \epsilon I} p^{1-\sigma_s}_{ij,s}} \tag{8}$$

3.4. General Equilibrium

3.4.1. Market Size

Drawing on Donaldson and Hornbeck's methodology, market size is conceptualized as a factor cost weighted by the level of transportation development and augmented by the total number of trading partner cities. This formulation aims to capture the influence of transportation infrastructure on enterprise integration into the market, thereby linking market size to the degree of industrial concentration. Specifically, industrial concentration is gauged by the country's share of trade volume. Market size, in this context, is represented as a trade share weighted by the total number of trading partner countries.

In this paper, concerning the method of market size set by Donaldson and Hornbeck, by taking the index $1-\sigma$ for the import price index (Equation (5)) and substituting $p_{ij} = p_i M_{ij}$, the import market size can be obtained as Equation (9).

$$CMS_{j,s} \equiv \mathbb{P}_{j,s}{}^{1-\sigma} = \sum_{i\epsilon I} p_{ij,s}^{1-\sigma} = \sum_{i\in I} \left(p_{i,s}M_{ij}\right)^{1-\sigma} \quad (9)$$

Here, $CMS_{j,s}$ represents the import market size of the country j's industry. From Equation (9), the lower the trade share of country j relative to country i, the lower the industrial concentration of country j relative to country i, the lower the product price, and the higher the level of import market size of country j's industry s.

3.4.2. Constant Relationship of Industrial Basic Capacity

We propose the existence of a total value of global industrial basic capacity, where the strength of one country's industrial basic capacity inversely correlates with that of other countries. This suggests a scenario akin to trade income, where a constant relationship exists [22].

$$Y_{i,s} = \sum_j X_{ij,s} \; Y_{j,s} = \sum_i X_{ij,s} \quad (10)$$

Substituting the profitability Equation (8) into $Y_{i,s} = \sum_j X_{ij,s}$ and combining it with $Y_{j,s} = \sum_i X_{ij,s}$ yields Equation (11):

$$Y_{i,s} = \sum_j X_{ij,s} = \sum_j \pi_{ij,s} \sum_{i'\in I} X_{i'j} = \sum_j p_{ij,s}{}^{1-\sigma} \left(\sum_i p_{ij,s}{}^{1-\sigma}\right)^{-1} Y_{j,s} \quad (11)$$

Substituting the import market size Equation (9) into the above equation to eliminate $\sum_i p_{ij,s}{}^{1-\sigma}$ and defining the export market size, we can get Equation (12):

$$Y_{i,s} = \sum_j p_{ij,s}{}^{1-\sigma} \left(\sum_i p_{ij,s}{}^{1-\sigma}\right)^{-1} Y_{j,s} = p_{i,s}{}^{1-\sigma} \sum_j M_{ij,s}{}^{1-\sigma} CMS_{j,s}{}^{-1} Y_{j,s} = p_{i,s}{}^{1-\sigma} FMS_{i,s} \quad (12)$$

According to Donaldson and Hornbeck, it is further transformed into an export market size as $FMS_{i,s} \equiv \sum_j M_{ij}{}^{1-\sigma} CMS_{j,s}{}^{-1} Y_{j,s}$. It is easy to know that the size of the consumer market is proportional to the size of the manufacturer market [23]; similarly, the size of the import market is proportional to the size of the export market, i.e., $FMS_{i,s} = \varnothing CMS_{i,s}$. Substituting this condition into the export market size equation yields the expression obtained from Equation (13) (which has been slightly modified due to data availability):

$$MS_{i,s} = \sum_j M_{ij,s}{}^{1-\sigma} L_j MS_j{}^{\frac{\sigma}{1-\sigma}} \quad (13)$$

since the number of major trading countries of a single industry is always limited, for the convenience of calculation, Equation (13) is further deformed as $CMS_{i,s} = M_{i,s}{}^{1-\sigma} \sum_j L_j CMS_j{}^{\frac{\sigma}{1-\sigma}}$.

From Equation (12), it can be seen that the market size of industry s in a country i is embodied in the form of summing up the trading partner countries with the weight of trade share.

$$Y_{i,s} = \beta^{\frac{\sigma-1}{2-\sigma}} r_{i,s}{}^{\frac{1-\sigma}{2-\sigma}} k_{i,s}{}^{\frac{1-\sigma}{2-\sigma}} \varphi_{i,s}{}^{\frac{1-\sigma}{2-\sigma}} e_{i,s}{}^{\frac{1-\sigma}{2-\sigma}} CMS_{i,s}{}^{\frac{1}{2-\sigma}} \tag{14}$$

$$Y_{i,s} = \beta^{\frac{\sigma-1}{2-\sigma}} r_{i,s}{}^{\frac{1-\sigma}{2-\sigma}} k_{i,s}{}^{\frac{1-\sigma}{2-\sigma}} \varphi_{i,s}{}^{\frac{1-\sigma}{2-\sigma}} e_{i,s}{}^{\frac{1-\sigma}{2-\sigma}} M_{i,s}{}^{\frac{1-\sigma}{2-\sigma}} \left[\sum_j L_j CMS_j{}^{\frac{\sigma}{1-\sigma}} \right]^{\frac{1}{2-\sigma}} \tag{15}$$

Equation (15) shows that the industrial basic capacity of a country i's industry is influenced by the profit rate obtained from the value chain $r_{i,s}$, the scale of fixed investment in the industry $k_{i,s}$, the input of industrial-technological level $\varphi_{i,s}$, the degree of industrial linkage $e_{i,s}$, the share of industry's global trade volume $M_{i,s}$, the industry's consumer market size $CMS_{i,s}$, the human resources L_j, and so on. The profitability of the value chain serves as an indicator of industry competitiveness within the global value chain. Meanwhile, the scale of fixed investment in the industry acts as a measure of entry barriers. The degree of industry linkage is utilized to gauge the industry's position within the global value chain, encompassing both forward and backward linkages. Lastly, the ratio of global trade volume of the industry serves as a proxy for industry concentration.

3.5. Explanation of the Calculation of Each Indicator and Data Sources

3.5.1. Explanation of the Calculation of Each Indicator

First, we use the market deviation index of consumption and export to measure the size of the local market cms, and its equation is as follows [24]:

$$cms_s = \frac{Con_s / \sum Con_s}{Exp_s / \sum Exp_s} \tag{16}$$

Here, Con_s and $\sum Con_s$ denote the final domestic consumption of a country to industry s and the final global consumption of industry s; Exp_s and $\sum Exp_s$ denote the final export of a country to industry s and the final global export of industry s, respectively. Con_s indicates the deviation index between the consumption and export market structure of the country's s-industry: the larger the index, the higher the consumption proportion of the product and the larger the size of the local consumption market [25]. The data are calculated based on the ICIO input-output table in the OECD database.

Second, this paper uses Equation (17) to carry out the calculation of the value chain profitability of industry s in country i:

$$r_{i,s} = \frac{TV_{i,s}}{\sum_{i=1}^{n} TV_{i,s}} \tag{17}$$

here, $TV_{i,s}$ denotes the domestic value added of export of industry s in country i and $\sum_{i=1}^{n} TV_{i,s}$ denotes the sum of domestic value added of export of industry s in each country in the world. The data come from the OECD database [26].

Third, the scale of industrial fixed investment k in this paper is calculated by the author according to the GFCF items in the ICIO input-output table of the OECD database [27].

Fourth, we use Equation (18) to calculate the industrial technology level input of industry s in country i:

$$\varphi_{i,s} = \frac{BERD_{i,s}}{\overline{BERD_s}} = \frac{BERD_{i,s}}{\sum_{i=1}^{9} M_{i,s} BERD_{i,s}} \tag{18}$$

Here, $BERD_{i,s}$ denotes the enterprise R&D expenditure of industry s in country i, $M_{i,s}$ denotes the trade share of industry s in country i in the nine countries studied in this paper, and the trade share of industry s in country i is the weight to sum up the enterprise R&D

expenditures of industry s in each country and then to estimate the average enterprise R&D expenditures ($\overline{BERD}_s$) of the global industry s. The data are from the OECD database [28].

Fifth, we use Equation (19) to calculate the degree of industrial linkage of industry s in country i:

$$e_{i,s} = \frac{TV_{i,s}}{\overline{TV}_s} = \frac{TV_{i,s}}{\sum_{i=1}^{9} M_{i,s} TV_{i,s}} \tag{19}$$

here, $TV_{i,s}$ denotes the export value added of industry s in country i, $\overline{TV}_s$ denotes the average value added level of the global industry s, $M_{i,s}$ denotes the trade share of industry s in country i in the nine countries studied in this paper, and the trade share of industry s in country i is the weight to sum up the export value added of industry s in each country. The data come from the OECD database [29].

3.5.2. Data Sources

This paper utilizes the OECD database Input-Output (ICIO) table to gather data concerning the manufacturing industry and its subsectors across nine countries, including China, the United States, and Japan, spanning from 2000 to 2020. The industrial fixed investment scale, consumer market scale, industrial technology level inputs, and industrial relevance of manufacturing subsectors are derived from the ICIO input-output table of the OECD database. Profitability gained from the value chain and the share of the industry's global trade volume are sourced from the Organization for Economic Co-operation and Development (OECD-TIVA) database.

Industry technology level inputs are substituted with R&D input funding for each country and industry [30]. Industry-relatedness is determined by calculating the ratio of each industry's output value to the average output value. This paper adheres to the classification of manufacturing industries outlined in the ICIO input-output table of the OECD database, which divides the manufacturing industry into 17 subsectors. The time frame of manufacturing industries and their 17 subsectors in 9 industrial countries from 2000 to 2020 serves as the research sample.

4. Empirical Results and Analysis

4.1. Changes in the Index of the Industrial Basic Capacity of the Manufacturing Industry of Major Countries in the World

This paper computes the industrial basic capacity index using a combination of OECD-WTO TIVA statistics and ICIO input-output tables. Table 1 presents the industrial basic capacity index for nine major industrial countries worldwide from 2000 to 2020. It is important to note that this study only analyzes data for countries globally from 2000 to 2020. Historical data for each country, especially cumulative capital, are not calculated due to data availability constraints. Therefore, the industrial basic capacity index measured in this paper can only reflect a trend rather than proving definitive control over global value chains. The trend is illustrated in Figure 2.

In essence, the Chinese manufacturing industry has relied on the advantages of low prices and large-scale production to enhance its control within global value chains. However, it has not yet attained a leading position in terms of industrial technology level, industrial linkage, and market scale. Conversely, developed countries have experienced a decline in their control over the value chain due to diminishing profit margins, thereby constraining investment growth in fixed capital within their industries.

First, the industrial basic capacity of the Chinese manufacturing industry has increased from 11.40 in 2000 to 21.58 in 2020, indicating a gradual enhancement of its control within the global value chain. This growth primarily stems from continuous improvements in profitability within the value chain and increased investment in fixed assets. However, China still lags behind the United States in terms of industrial technology level, industrial linkage, and market size. In 2020, the Chinese industrial technology level, industrial linkage, and market scale were 65.20%, 34.77%, and 27.91% of the United States, respectively. This suggests that technological advancement alone is not a decisive factor, as China can still bolster its control over the global value chain through its low-cost and large-scale advantages.

Table 1. Index of manufacturing industrial basic capacity of major countries in the world.

Year	China	Italy	Germany	Korea	USA	Mexico	Japan	Spain	UK
2000	11.40	9.16	14.59	9.10	21.68	2.94	18.54	4.22	8.34
2001	12.52	9.67	15.06	8.83	21.76	3.46	17.86	4.74	8.57
2002	13.69	10.18	15.45	9.53	21.50	4.38	17.74	5.27	8.94
2003	15.03	10.61	15.98	9.69	21.09	3.51	17.84	6.00	9.00
2004	15.66	10.70	16.15	10.08	20.75	3.71	17.95	6.07	8.97
2005	16.27	10.31	15.89	10.30	20.77	3.97	17.65	5.88	8.56
2006	16.82	10.11	15.81	10.37	20.74	3.70	17.34	5.62	8.27
2007	17.38	10.30	16.06	10.26	20.46	3.30	17.00	5.93	8.18
2008	18.33	10.19	15.94	9.57	20.05	3.07	16.81	5.83	7.36
2009	19.35	9.72	15.31	9.82	19.88	2.51	16.34	5.37	6.93
2010	19.74	8.93	15.05	10.35	19.63	2.24	16.46	4.75	6.28
2011	20.13	8.71	15.11	10.39	19.32	2.32	15.97	4.53	6.09
2012	20.54	7.89	14.49	10.28	19.26	1.39	15.67	3.56	5.67
2013	20.70	7.73	14.43	10.47	19.15	1.82	14.80	3.53	5.67
2014	20.89	7.56	14.37	10.37	19.01	1.34	14.45	3.27	5.76
2015	21.02	7.11	13.89	10.18	19.05	1.57	14.12	2.84	5.63
2016	20.97	7.48	14.10	10.28	19.10	1.60	14.41	3.04	5.62
2017	21.13	7.43	14.11	10.59	18.77	1.32	14.24	3.11	5.33
2018	21.32	7.33	13.88	10.33	18.59	0.86	13.98	3.00	4.98
2019	21.38	7.13	13.71	9.74	18.50	0.82	13.80	2.73	4.60
2020	21.58	6.77	13.44	9.77	17.64	0.07	13.45	2.12	4.04

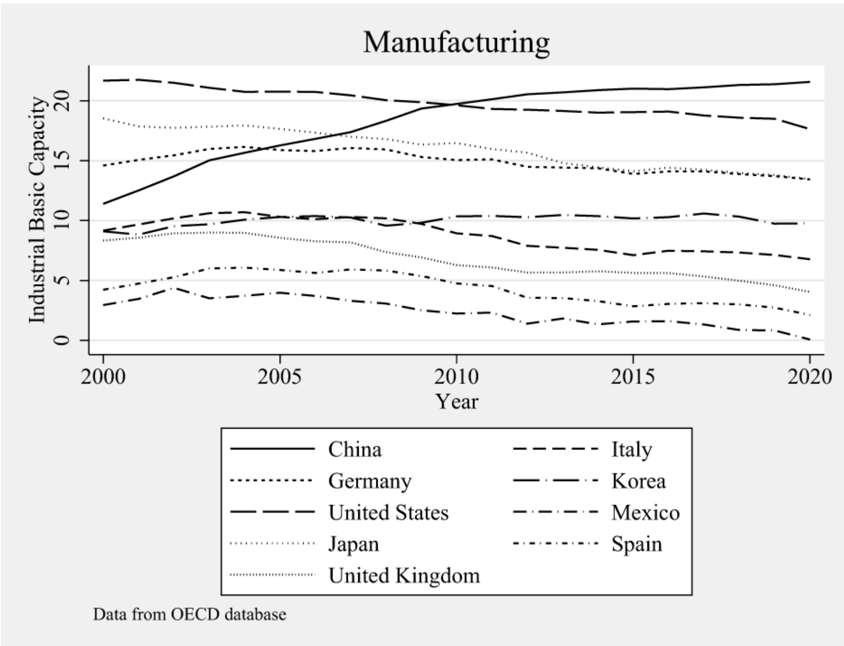


Figure 2. Manufacturing industrial basic capacity index for major countries in the world, 2000–2020.

Second, the U.S. manufacturing industry's industrial basic capacity has declined from 21.68 in 2000 to 17.64 in 2020, signaling a gradual weakening of its control over the global value chain. This decline can be attributed to a significant decrease in profitability within the global value chain and reduced investment in fixed assets. Specifically, the profitability and investment in fixed assets of the U.S. manufacturing industry were 51.70% and 61.10% in 2000, respectively, compared to 27.91% in 2020. Notably, there has been considerable improvement in the U.S.'s industrial technology level, industry relevance, and market size compared to 2000, particularly in high-tech fields.

Third, Germany and South Korea's manufacturing industrial basic capacity has remained relatively stable. Germany's industrial basic capacity index slightly declined from 14.59 in 2000 to 13.44 in 2020, while South Korea's index slightly increased from 9.10 to 9.77 during the same period. Lastly, Italy, Mexico, Japan, Spain, and the United Kingdom experienced significant declines in industrial basic capacity. Among these countries, Italy and Japan had relatively smaller decreases compared to Mexico, whose industrial basic capacity plummeted to only 2.38% of its 2000 level by 2020.

4.2. Changes in the Industrial Basic Capacity Index of Manufacturing Sectors in Major Countries in the World

According to the OECD database ICIO input-output table, the authors subdivided the manufacturing industry into 17 sectors. They then calculated the index of industrial basic capacity for these 17 sectors across 9 countries from 2000 to 2020. First, China has achieved leadership in several sectors, including textiles, clothing, and leather; paper products and printed matter; nonmetallic minerals; base metals; fabricated metal products; computers and electronics; electrical equipment; machinery and equipment; and machinery installation. These sectors are depicted in Figure 3.

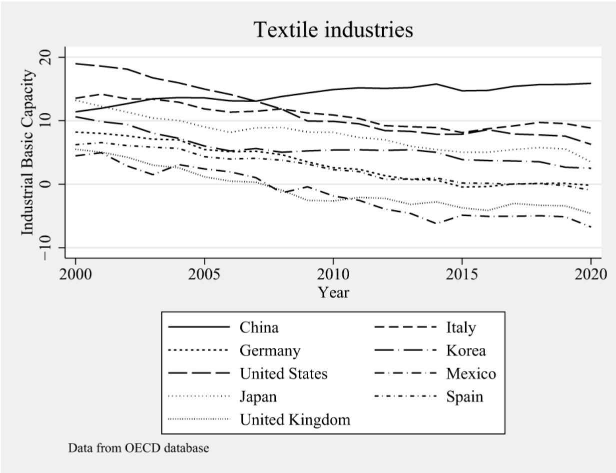
From Figure 3, it is evident that among the nine subsectors comprising the Chinese industrial basic capacity, electrical equipment manufacturing stands out as the foremost, as illustrated in Figure 3i. Its industrial basic capacity index surged from 15.53 in 2000 to 22.36 in 2020. Conversely, Germany, South Korea, the United States, and Japan experienced declines, with their industrial basic capacity indices decreasing from 15.31, 8.59, 18.59, and 21.47 in 2000 to 11.47, 7.05, 10.51, and 11.43, respectively, by 2020. Notably, Italy, Mexico, Spain, and the United Kingdom witnessed more pronounced declines, particularly in the United Kingdom, where industrial basic capacity plummeted from 7.40 in 2000 to 0.0125 in 2020.

The enhancement of the Chinese electrical equipment manufacturing industry significantly contributes to the value chain profitability and fixed asset factors. However, the overall improvement in the technical inputs, industrial linkage, and market size within the Chinese electrical equipment manufacturing industry is less evident. In contrast, developed countries' decline in industrial basic capacity primarily stems from decreased profitability and fixed asset investment. For instance, the U.S. electrical equipment manufacturing industry's index plummeted from 18.59 in 2000 to 11.91 in 2020 due to declining value chain profitability and fixed asset investment. While the level of technical inputs, industrial linkage, and market size have risen, they are outweighed by the decline in other factors. Mexico stands out with a significant decrease in the level of technical inputs leading to its decline.

Without considering historical accumulation factors, the Chinese electrical equipment manufacturing industry continues to improve its basic capacity, albeit with excessive reliance on low prices and scale advantages [31]. However, critical factors such as technology inputs, industrial linkage, and market size show a declining trend, suggesting a potential risk of substitution by low-cost countries [32]. Conversely, developed countries face a fundamental decline in industrial basic capacity due to decreased value chain profitability from underinvestment. Consequently, these countries might limit investments in higher technological segments of the electrical equipment manufacturing industry. Thus, while China currently holds a leading position in industrial basic capacity, the downward trend in crucial factors implies a risk of substitution when Western countries turn to lower-cost developing nations [33,34].

Second, China has approached the world's leading level in seven industries: food, beverages, and tobacco; coke and refined petroleum products; wood processing and wood products; rubber and plastic products; motor vehicles, trailers, and semi-trailers;

other transportation equipment manufacturing; and chemicals and chemical products, as depicted in Figure 4.



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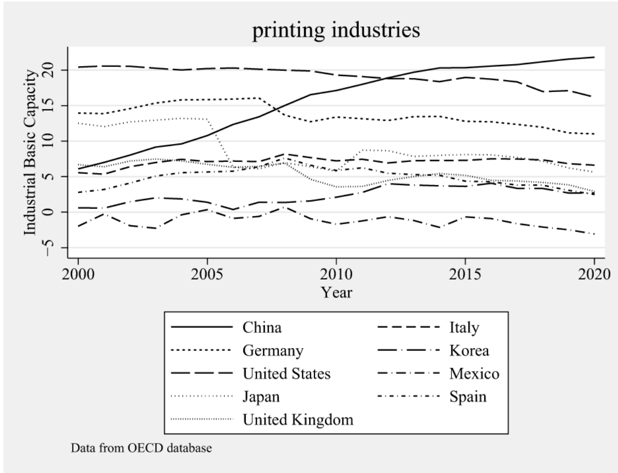

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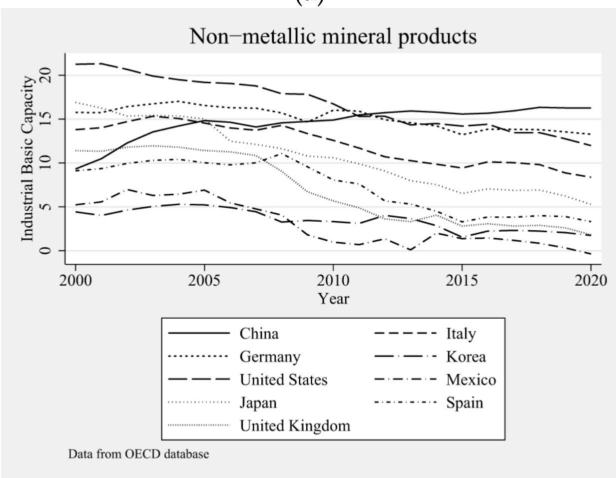

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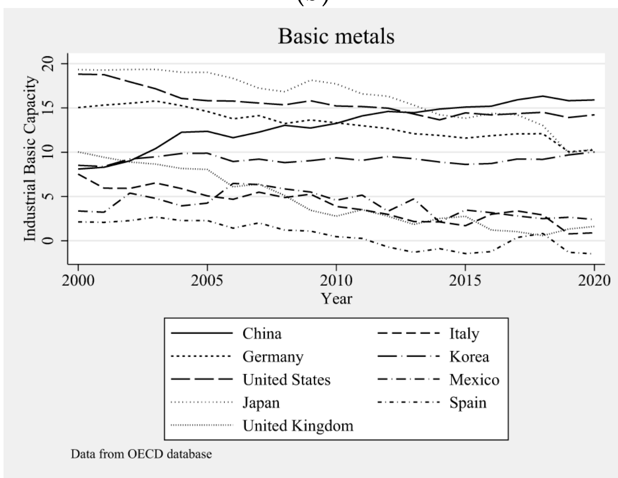

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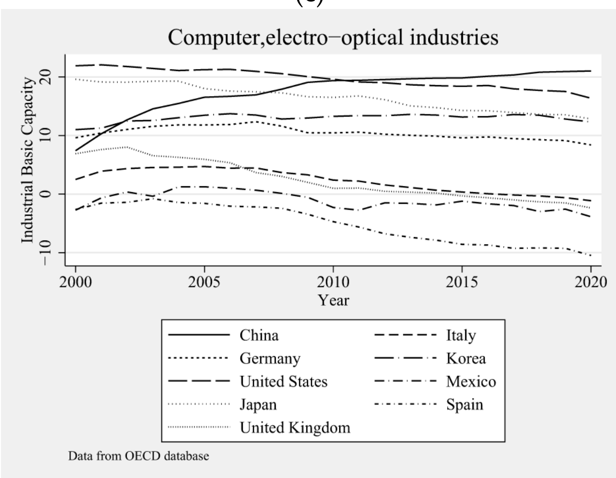

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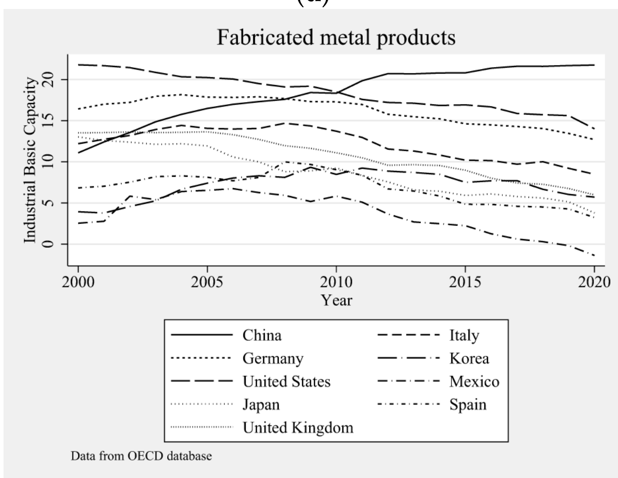

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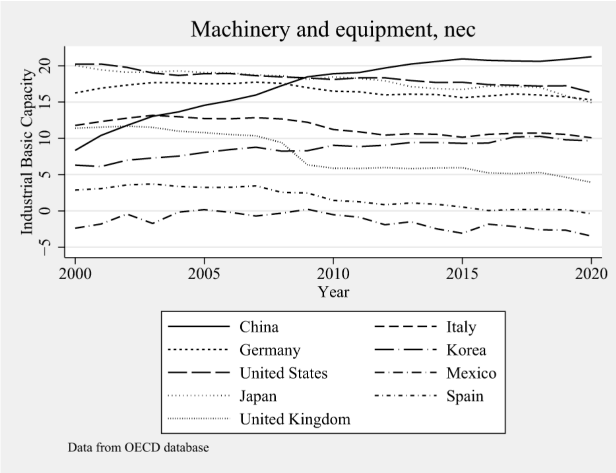

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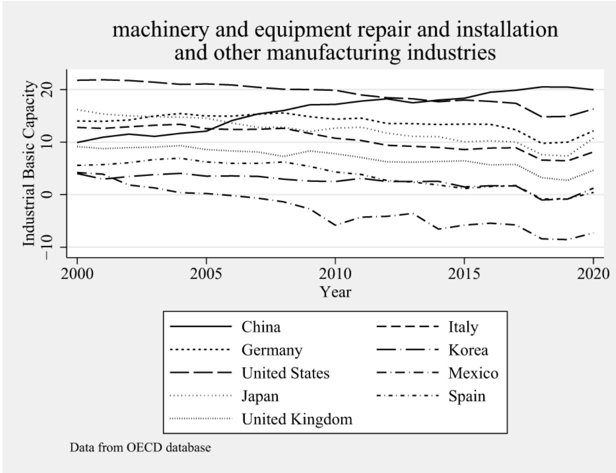

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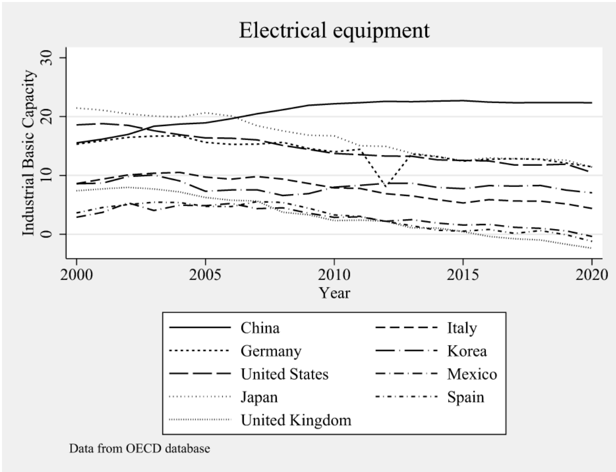
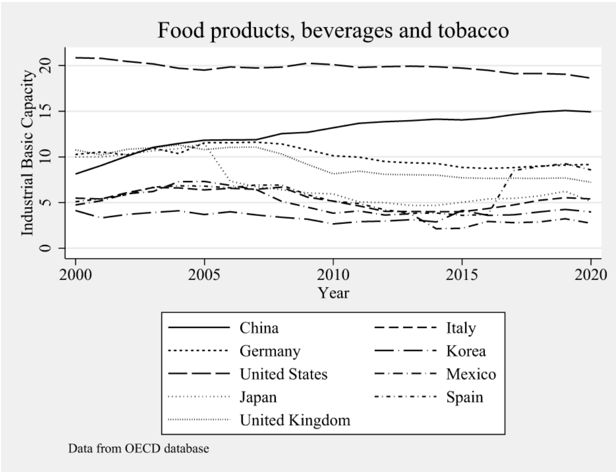


(**i**)

Figure 3. (**a**) Basic capacity index of textile industries in various countries of the world, (**b**) Basic capacity index of printing industries in various countries of the world, (**c**) Non-metallic Minerals Industrial Basic Capacity Index of the World Countries, (**d**) Basic Metals Industrial Basic Capacity Index of the World Countries, (**e**) computer, electro-optical industrial basic capacity index for all countries in the world, (**f**) fabricated metal products industrial basic capacity index for all countries in the world, (**g**) industrial basic capacity index for machinery and equipment, not elsewhere classified, for all countries in the world, (**h**) industrial basic capacity index for machinery and equipment repair and installation and other manufacturing industries for all countries in the world, (**i**) basic capacity index of electrical equipment industry of the world countries.

From Figure 4, it is evident that the Chinese industrial basic capacity in the seven aforementioned sub-industries lagged in 2000. However, by 2020, they are anticipated to reach near the world's leading level. Notably, the automobile manufacturing industry, inclusive of automobiles, trailers, and semi-trailers (hereinafter referred to as the automobile industry), is expected to demonstrate the most significant progress. Its industrial basic capacity index is projected to increase from 5.17 in 2000 to 18.37 in 2020. Comparatively, Germany's index was 17.83 in 2000 and is expected to reach 18.51 in 2020, ranking it first globally. In the same period, the United States and Japan are forecasted to experience slight declines, dropping from 20.12 and 18.84 in 2020 to 17.84 and 16.96, respectively. South Korea's automotive industry is expected to experience growth, with its basic capacity projected to rise from 8.47 in 2020 to 11.12 in 2020. Conversely, Italy, the United Kingdom, Spain, and Mexico's industrial basic capacities are expected to remain stable, albeit with slight declines.

The advancement in the Chinese automobile industry's basic capacity is attributed to significant progress across various metrics, including profit margin, fixed asset investment, technology level investment, industry affiliation, and market size. While China has not yet surpassed other nations in terms of technology investment and industry affiliation, it has been narrowing the gap, particularly in value chain profit margin, fixed asset investment, and market size, which have emerged as pivotal factors in bridging this divide. Comparatively, the primary reasons for the decline in industrial basic capacity in other countries, notably the United States and Japan, are the diminishing profit margins and fixed asset investments. In Germany, however, while profit margins, technological investment levels, industry affiliation, and market size remain relatively stable, fixed asset investment has notably increased from 2000 to 2020.



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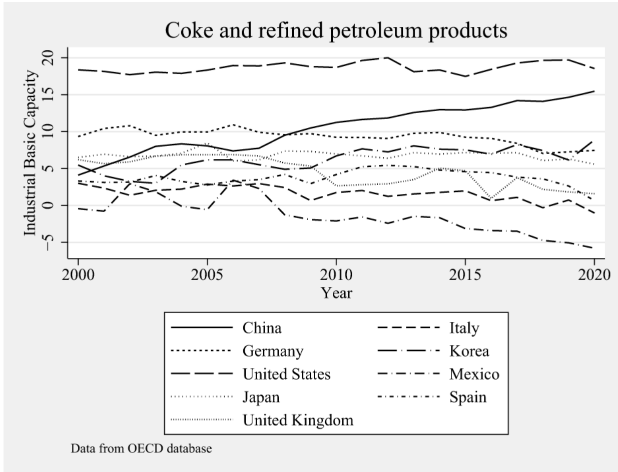

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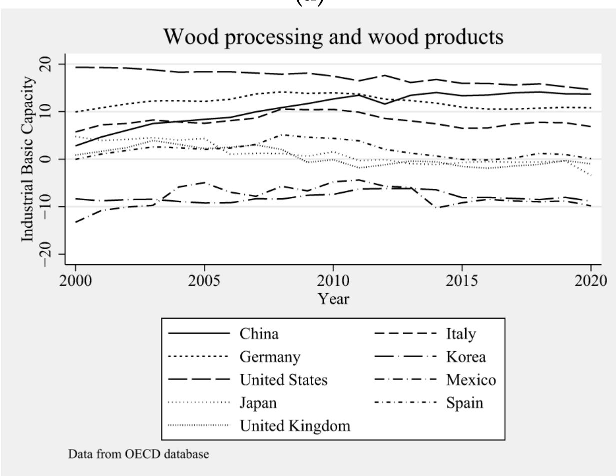

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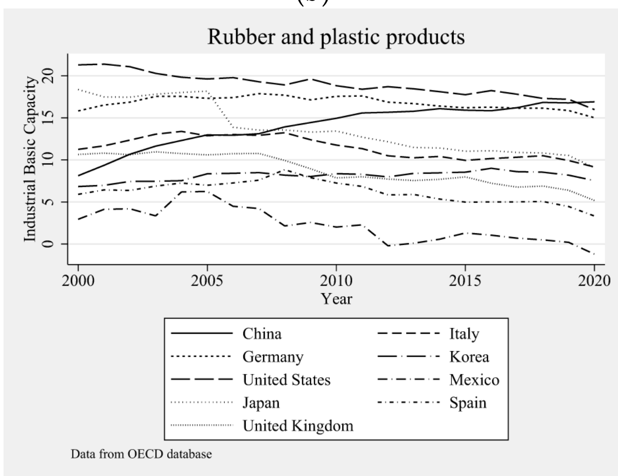

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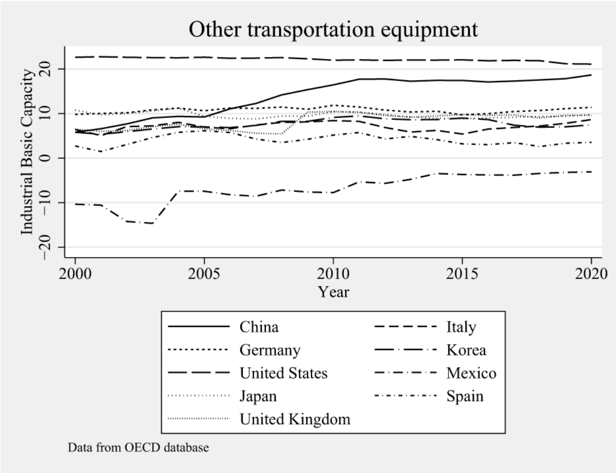

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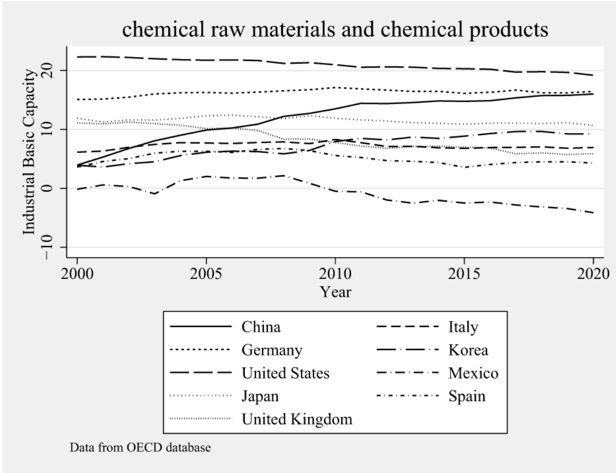

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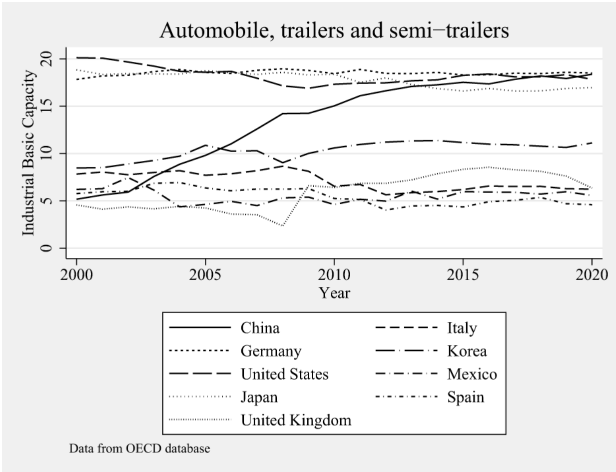

(**g**)

Figure 4. (**a**) Food, Beverage, and Tobacco Basic Capacity Index for All Countries in the World, (**b**) Coke and Refined Petroleum Industrial Basic Capacity Index for All Countries in the World, (**c**) Wood processing and wood products industrial basic capacity index for all countries in the world, (**d**) Rubber and plastic products industrial basic capacity index for all countries in the world, (**e**) Basic capacity index of other transportation equipment for all countries in the world, (**f**) Basic capacity index of chemical raw materials and chemical products industry for all countries in the world, (**g**) Basic capacity index of automobile, trailer, and semi-trailer industry in the world countries.

Similar patterns are observed in other industries such as wood processing, wood products, rubber, plastic products, and transportation equipment manufacturing, where China is narrowing the gap with other countries through analogous mechanisms as seen in the automobile industry. In 2020, the Chinese automobile industry's basic capacity is projected to rank second globally, primarily attributed to its competitive pricing and scale advantages, while also edging closer to developed nations in terms of technological inputs and industrial linkage [35]. Conversely, the decline in industrial basic capacity in other countries, especially developed ones like Japan, is largely due to diminishing profitability along the value chain, resulting in underinvestment. Germany stands out with stable profit margins and sustained investments, positioning it as a leader in industrial basic capacity. South Korea's improvement, on the other hand, is driven by increased profit margins and investment, although it also relies on competitive pricing. This analysis underscores the comprehensive nature of Chinese improvements in the automobile industry's basic capacity. If such advancements, driven by progress in profit margins, fixed asset investment, technology level investment, industry correlation, and market size [36], continue in unison, Chinese control over the value chain will be further solidified. Notably, by 2023, China has emerged as the world's largest automobile manufacturing and sales market, with the automobile industry proving to be one of the most resilient sectors.

Third, the more backward industries in China encompass pharmaceuticals, medicinal chemicals, and plant products manufacturing, as depicted in Figure 5.

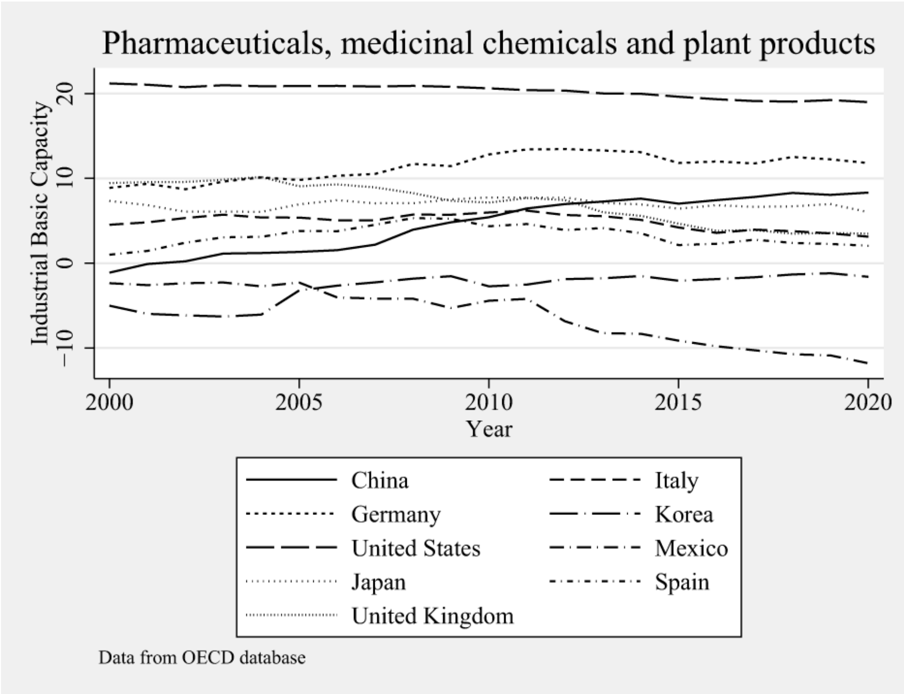

Figure 5. Index of the basic capacity of pharmaceuticals, medicinal chemicals, and plant products industries in the world.

Figure 5 reveals the significant progress in the basic capacity of Chinese pharmaceuticals, medicinal chemicals, and plant products from 2000 to 2020. However, it still lags behind the United States and Germany, with their industrial basic capacities reaching 18.99 and 11.81 in 2020, respectively. Notably, China has surpassed countries like Japan and the United Kingdom, whose industrial basic capacities in 2020 were 6.02 and 3.49, respectively. The improvement in Chinese pharmaceutical and chemical industries' basic capacity can be primarily attributed to significant advancements in value chain profitability, fixed investment, and market size. In 2020, the value chain profitability, fixed investment, and market size saw remarkable growth compared to 2000, reaching 304.95%, 801.02%, and 134.34%, respectively. However, there still exists a considerable gap in technological advancement and industrial relevance when compared to developed nations [37].

The United States maintains its industrial basic capacity leadership due to its advantages in fixed asset investment, technology level investment, industry relevance, and market scale. While the Chinese pharmaceutical and chemical industries' profitability along the value chain is comparable to that of the U.S., it lags in other aspects, placing it in a less favorable position compared to the top contenders. Germany, on the other hand, has seen significant improvement, ranking first globally with its industrial basic capacity increasing from 8.86 in 2000 to 11.81 in 2020. This improvement is mainly attributed to enhancements in profit margin, fixed asset investment, technology level investment, and industrial linkage, albeit with a slight decline in market size in 2020 compared to 2000.

Other countries have experienced declines in their industrial basic capacities, primarily due to deteriorating profitability, fixed asset investment, and market size. For instance, Japan's pharmaceutical and chemical products industry witnessed a decline in market size, leading to a decrease in its industrial basic capacity index from 7.34 in 2000 to 6.02 in 2020, despite maintaining certain advantages in other areas. It is evident that Chinese pharmaceutical and chemical industries still rely heavily on low prices and scale advantages, indicating a gap in technological inputs and industrial relevance compared to developed nation [38]. The United States maintains its advantageous position across various parameters, including profitability, fixed asset investment, technological inputs, industrial relevance, and market size. The decline observed in other countries' industrial basic capacities can be attributed to a continuous decrease in profitability and market size, resulting in reduced inputs.

5. Discussion

The research results obtained in this study exhibit a degree of divergence from the perspectives espoused by scholars in the preceding literature review. Previous scholars emphasize that industrial basic capacity encompasses a country's ability to control key links in the global value chain and highlight the pivotal role of the transition from a traditional to a modern economic system in bolstering these competencies, with technological advancements emerging as the foremost determinant. In contrast, this paper contends that the connotation of industrial basic capacity includes the comprehensive integration of national science, technology, craftsmanship, design, and other factors into industrial development, reflecting national economic security within the international division of labor. From the vantage point of establishing the industrial basic capacity index, the industrial basic capacity of a nation is collectively shaped by a multifaceted array of factors, encompassing cost, scale, technology, industrial interconnectedness, and market magnitude. A reliance on just one, two, or even three of these factors yields an insecure mastery over the global value chain. Alternatively, a mastery of the value chain that is excessively dependent on technological advancements, while disregarding other pivotal factors, is susceptible to being readily superseded.

The core thesis of this study posits that: (1) The current development of China's manufacturing industry has placed undue emphasis on technological advancement, neglecting factors such as cost, scale, industrial interconnectedness, and market size. To facilitate the robust enhancement of industrial basic capacity, it is imperative to discontinue the single-minded pursuit of technological advancement and instead strive for a holistic development of the manufacturing sector; (2) Over the past two decades, the industrial basic capacity of China's manufacturing sector has achieved substantial advancements, primarily driven by its reliance on cost competitiveness and economies of scale. However, in recent years, with the erosion of China's advantages in terms of cost and fixed asset investment, the strengths of its manufacturing industrial basic capacity have been weakened, posing a risk of being supplanted; (3) The evolutionary pathway of industrial basic capacity is oriented towards the establishment of an irreplaceable status.

Despite the introduction of innovative concepts pertaining to industrial basic capacity and irreplaceability in this paper, there are still several pressing issues that necessitate resolution: (1) Within the backdrop of escalating trade frictions and intensifying great power competition in the contemporary era, what strategies can be employed to ensure the holistic advancement of industrial basic capacity? (2) A country's manufacturing sector is segmented into various industry sectors, each of which is situated at distinct developmental stages. Do these varying stages of development uniformly lend themselves to the comprehensive advancement of all manufacturing sub-sectors? (3) In contrast to the concept of industrial basic capacity delineated in this study, does a more scientifically rigorous and logically coherent concept exist that can integrate the notion of industrial basic capacity with irreplaceability into a cohesive conceptual framework?

6. Conclusions and Recommendation

6.1. Conclusions

This paper presents a theoretical framework for industrial basic capacity, elucidating its new connotations, and employs a theoretical model linking market size and economic growth to derive the index of industrial basic capacity and the economic relationships among influencing factors. Utilizing data from the OECD database, the study measures the index of industrial basic capacity across 17 subsectors in 9 major industrial countries from 2000 to 2020, yielding the following conclusions and policy insights.

First, Chinese manufacturing industrial basic capacity has exhibited substantial progress from 2000 to 2020, surpassing that of the United States to become the world's foremost, with 9 out of 17 subsectors, including electrical manufacturing, ranking first globally, and 7 subsectors, such as the automobile industry, approaching advanced levels. However, the pharmaceuticals, medicinal chemicals, and plant products industry lags.

Second, the Chinese manufacturing industrial basic capacity relies on low prices and scale advantages, yet there persists a significant gap in technological input and industrial connectivity with advanced nations. In contrast, the United States holds advantages in industrial technological input, industrial connectivity, and market scale. The decline in the industrial basic capacity of other countries stems from diminishing profits in the value chain leading to underinvestment. Developed nations concentrate on investing in sectors with higher profit margins and greater technological prowess in high-end technology.

Third, if the enhancement of industrial basic capacity results from joint progress in value chain profitability, fixed asset investment, technological input, industrial affiliation, and market scale, the industry's control over the value chain will be more robust, reducing the risk of displacement. However, reliance solely on low-cost advantages, scale, or advanced technology poses the risk of industry displacement.

6.2. Recommendation

This section outlines the following policy recommendations, based on the aforementioned conclusions, with the aim of strengthening the Chinese manufacturing industrial basic capacity within the global value chain.

First, we should emphasize the utilization of the regulatory capacities inherent in the market economy to achieve optimal allocation of production factors. In the context of capital allocation, it is imperative to refine the development of capital markets, thereby fostering their growth and facilitating the seamless flow of capital. Additionally, there is a need to establish and enhance a comprehensive system that efficiently channels capital to serve industrial development, ultimately cultivating a standardized yet agile capital market mechanism. In the context of technological advancements, it is imperative to bolster support for corporate research and development (R&D). Enterprises, as the cells of the market economy that directly interact with the market, necessitate the establishment of a research system that incentivizes their R&D activities. This necessitates providing preferential allocations in terms of research funding and incentives. In the context of human resources, it is imperative not only to cultivate scientific research talent but also to make concerted efforts in nurturing advanced skilled personnel. Continuous advancement of the educational system reform is essential, alongside robust support for the cultivation of internationally-oriented talents. These endeavors collectively aim to establish a talent pool that facilitates the enhancement of the basic capacity within the manufacturing industry.

Second, reducing the operational costs of enterprises is crucial. Based on the latest statistical figures, during the first three quarters of 2024, there was a year-on-year decline of 3.5% in the profits of industrial enterprises in China, which was accompanied by a notable phenomenon of manufacturing relocation. This trend was primarily attributable to the increasing costs associated with environmental protection and financing. This paper contends that policies ought to be implemented with flexibility, tailored to the distinct phases of manufacturing development, to ensure the augmentation of industrial basic capacity across various manufacturing sectors. A uniform, "one-size-fits-all" strategy should be avoided. In the realm of financing, equitable treatment among all industries is imperative. An undue preference for high-tech industries may undermine the competitive edges of traditional industries, and consequently diminish the industrial basic capacity of traditional manufacturing.

Third, elevating the degree of openness to facilitate collaborative success and mutual benefit outcomes in the context of globalization holds significant value. The enhancement of openness will inevitably facilitate China's further comprehensive integration into the global economic system. The implementation of high-standard policies aimed at facilitating trade and investment liberalization will incentivize Chinese enterprises to "go global" through direct investment overseas. This will elevate their position within the global value chain, broaden their presence in international markets, and foster mutually beneficial cooperation and win-win outcomes.

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Conflicts of Interest: The authors declare no conflicts of interest.

Appendix A

Table A1. Table of Symbols.

Main Symbol Description	
S	The set of industries
I	The set of countries
σ	The elasticity of substitution of production industries
C	Competitive advantage
u	Utility of the consumers
$\mathbb{P}$	Product price index
p	Export price
k	Investment scale
r	The profit margin obtained in the global value chain
L	Talent
w	Wage rate
A	Technological level
E	Value-added
φ	Technology level input
e	Industry relatedness
CMS	Market size
FMS	Export market size

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