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# Employment Effect of Structural Change in Strategic Emerging Industries

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**Abstract:** Stable development of strategic emerging industries promotes its industrial transformation and upgrading, which has affected the development of not only the society and the economy but also other fields, thereby having a great impact on employment. To measure the impact of structural change of strategic emerging industries on employment in China, this paper constructs a regression equation, in which the employment of strategic emerging industries is the dependent variable, while the change direction of strategic emerging industry structure, the employment elasticity of strategic emerging industries and the change speed of industrial structure are the independent variables. The research results are as follows: (i) The change direction of strategic emerging industries is positively correlated with employment. (ii) The employment elasticity of strategic emerging industries is on the rise, and is positively correlated with employment. (iii) The speed of change of strategic emerging industries is unstable, and is negatively correlated with employment. As a result, the structural change in strategic emerging industries has played a role in promoting employment. The government should recognize the impact of structural changes in strategic emerging industries on China's employment. By implementing the existing strategic emerging industry policies and improving the external environment for the development of strategic emerging industries, the strategic emerging industries will play the role of "innovation, growth and leadership" in economic and social development.

**Keywords:** strategic emerging industries; industrial structure; employment effect



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## 1. Introduction

In recent years, emerging industries have gradually become the main driving force of global economic recovery and growth. Strategic emerging industries can promote the progress and development of science, technology and society [1,2]. With the rapid development of a new round of global scientific and technological revolution and industrial transformation, strategic emerging industries have been highly valued by countries all over the world. The United States and other countries have sought to accelerate the development of strategic emerging industries in order to maintain their position at the forefront of science and technology and maintain their advantages in global competition in the future. Strategic emerging industries are gradually becoming the main driving force promoting the development of the national economy [3]. Strategic emerging industries can drive social development, change the environment and space in which humans live, and create a considerable number of related industries and supporting facilities [4]. This strategy has become a global trend of industrial development and an inevitable requirement of optimal economic growth [5].

In October 2010, the State Council of China issued the Decision of the State Council on Accelerating the Cultivation and Development of Strategic Emerging Industries (http://www.gov.cn/zwgk/2010-10/18/content_1724848.htm (accessed on 18 October

2010)). The decision regards seven industries, namely energy conservation and environmental protection, new-generation information technology, biology, high-end equipment manufacturing, new energy, new materials and new-energy vehicles, as China's strategic emerging industries. In November 2018, the Chinese government had identified nine major industries as strategic emerging industries according to its national conditions and global development status, with the high-end equipment manufacturing industry as the core, the new generation of information technology industry as the support, and the energy conservation and environmental protection industry, new materials industry and new energy vehicle industry as the pilot (http://www.gov.cn/zhengce/zhengceku/2018-12/31/content_5433037.htm (accessed on 26 Novezmber 2018)). In November 2019, the guide catalogue for industrial restructuring was issued by the national development and reform commission of China, which clarified the goal and direction of the development of strategic emerging industries (https://www.ndrc.gov.cn/fgsj/tjsj/cyfz/zzyfz/201911/t20191107_1201849.html (accessed on 7 November 2019)). Therefore, it is necessary to actively cultivate and vigorously develop strategic emerging industries, and promote the transformation of industries for digitalization, networking and intelligence through the effective integration of traditional industries and strategic emerging industries [6]. Strategic emerging industries based on major technological breakthroughs and development needs have become China's new competitive advantage and the decisive force to achieve leapfrog development [7,8].

Industrial structural change is one of the most robust features of economic development [9]. The process of national or regional economic growth is the dynamic evolution process of industrial structure from uncoordinated to coordinated, from lower-level coordination to higher-level coordination, that is, the process of continuous optimization of industrial structures [10]. With industrial structure adjustment, the share of agriculture, manufacturing and service industries in employment has changed significantly. Employment has been a major concern in the growth and economic development of societies and countries [11]. As an important parameter determining employment scale, industry structure has the most significant influence on growing job employment. The strategic emerging industrial structure refers to the development level of each specific strategic emerging industry in a specific region and the proportional relationship among those specific industries. The development and expansion of strategic emerging industries can expand the scope of the economy, increase employment opportunities and create more jobs. Compared with the change of traditional industry structure, the change of strategic emerging industry structure has a greater impact on employment.

Strategic emerging industries paly a very import role in economic and social development and are the main direction in the future [12]. Strategic emerging industries can promote industrial transformation and upgrading as well as increase employment. In recent years, changes in the structure of strategic emerging industries have had an increasing impact on employment. However, most of the strategic emerging industries belong to the high-tech industry, and changes in the structure of strategic emerging industries will have uncertain effects on the growth of labor and employment. Some strategic emerging industries may have positive employment elasticity as a result of increased demand for their products and services, resulting in increased employment. However, due to technological advancements and automation, some strategic emerging industries may have negative employment elasticity, reducing the need for labor. Therefore, it is of great theoretical and practical significance to study the structural changes of strategic emerging industries and increase the number of labor employment. This is conducive for promoting industrial integration, development and optimizing the allocation of labor resources.

The main contributions of our research are as follows. Firstly, using real data, we calculate and analyze the direction of the structural change, the employment absorption capacity and the speed of change of the industrial structure in China's strategic emerging industries from 2009 to 2020. Secondly, we build a model to empirically analyze the employment effect of the structural changes in strategic emerging industries. Thirdly,

we empirically analyze the promoting effect of structural change of strategic emerging industries on employment.

The structural arrangement of this paper is as follows. In Section 2, we provide a literature review. In Section 3, we present research design that includes the mechanism of action, puts forward the hypotheses, and the regression equation. The variables and Data Sources are presented in Section 4. Section 5 gives the empirical results. Section 6 presents the important conclusions of this paper.

## 2. Literature Review

The relationship between changes in industrial structure and employment has attracted increasing attention. To explain why industry structural change impacts employment, many empirical research papers and models have been used to investigate this problem. This research examines the characteristics of industry structural change and the relationship between industrial structure upgrading and employment.

### *2.1. The Characteristics of Industrial Structure Change*

Industrial structure refers to the composition of various industries and their proportional relationship. The structural transformation of the process of workers transferring from agriculture to other sectors is a significant feature of development [13]. The change of industrial structure in a region is usually related to consumer demand, factor endowment and technological progress. The upgrading of industrial structure depends on the upgrading of factor endowment structure. The factor endowment structure mainly includes natural resources, material capital, labor force, technology, infrastructure and system. Kang and Lei [14] investigated the space-time evolution characteristics of industrial economy in Central Asia from the perspective of industrial scale, structural rationality, industrial competitiveness and industrial isomorphism, and pointed out that the industrial structure of Central Asian countries is becoming increasingly advanced, but there are certain differences in this evolution characteristics.

Most scholars study the change of traditional industrial structures. However, Gabardo et al. [15] underline that structural change cannot be restricted to the three broad sectors but instead it covers the change in the structure of production and employment between and within sectors as well. Lauri Hetemäki et al. [16] discussed structural changes of the forest sector and the realistic contribution of the forest-based sector to the global sustainability challenges. Duan [17] proposed a modeling method for evaluating the influence of industrial structure change on promoting coastal forestry economic growth based on big data and piecewise sample autoregression feature decomposition models and analyzed the influencing factors of industrial structure change and promoting the economic growth of coastal forestry. Xie et al. [18] studied the change of China's Marine industry structure through two indicators: industrial structure rationalization and industrial structure promotion. Jin et al. [19] employed the added values of three land-sea industries in the three marine economic circles of northern, eastern, and southern China to clarify the evolutionary behavior of the industrial structure of these three circles on the land and sea. Studying the characteristics of industry structural change can grasp the direction of structural changes in strategic emerging industries and provide a basis for the analysis of employment effects.

### *2.2. The Relationship between Industrial Structure Change and Employment*

Scholars have examined the interplay between industrial structural change and employment from various perspectives. Although scholars' views vary, they all agree that to some extent, changes in industrial structure affect employment. One view is that upgrading the industrial structure based on technological innovation can promote employment. The change of industrial structure can promote employment in two ways: first, industrial development needs to absorb labor force; second, the development of this industry can promote the development of other industries, and then promote employment. Basile

Rosanna et al. [20] used Italian labor data from 1981 to 2008 to study the impact of changes in industrial structure on employment growth and concluded that the relationship between industrial structure and employment structure is nonlinear. Chivu et al. [21] analyzed the number and scale of industrial structure adjustment, industrial output structural change, employment number and employee compensation in Romania. Zhang et al. [22] established a spreadsheet-based analytical model to estimate the employment effects of the solar PV industry among China's strategic emerging industries during the period 2009–2015. Monteforte [13] presented a dynamic dual economy model of structural transformation and found that labor market institutions influence structural transformation because they determine how quickly the urban sector can absorb labor from agriculture.

However, another view is that upgrading the industrial structure based on technological progress will harm employment. Hong et al. [23] taken the Korean ICT industry from 1995 to 2009 as the research object to analyze the relationship between structural changes and employment, and pointed out that unemployment growth occurred in the field of information and communication technology manufacturing. Although the output of the information and communication technology manufacturing industry increased significantly, the employment rate continued to decline. From the three dimensions of employment elasticity, structural deviation and labor productivity ratio, Ding et al. [24] investigated the degree of synergy between the three sectors, and found that the employment elasticity of the three sectors presents different characteristics, and the third sector has the most significant impact on employment.

Through a review of the literature on industrial structural change and employment, we found the following three research shortcomings. Firstly, most theories developed regarding the impact of industrial structural change on labor and employment are based on the early stage of industrial development or on mature industries. Although these research results have reference values and do provide some theoretical support for the research focus of this paper, they are not fully applicable to the situation in China. Secondly, although Chinese scholars have demonstrated the impact of industrial structural improvements on labor employment, mainly focusing on economic growth, the wide range of industrial structures, and the econometric calculations, their conclusions are disparate. Thirdly, the scope of the existing literature is limited to primary industry, secondary industry and tertiary industry, whereas scant attention is given to the effects of changes in strategic emerging industrial structure on employment and on its industrial employment flexibility.

Strategic emerging industries are new, rapidly growing industries that are deemed strategic for a country's economic development and future competitiveness. These industries typically involve cutting-edge technologies, goods, and services, and they have the potential to drive significant economic growth and job creation. According to our review of the literature, there are few researches on the employment effect of structural changes in strategic emerging industries. Strategic emerging industries are key areas to promote industrial restructuring in China [25]. Stable employment is the top priority for us. The research object of this paper is more targeted and time-sensitive, providing theoretical support for future research in related fields.

## 3. Research Design

### *3.1. Mechanism of Action*

The change of industrial structure is believed to be formed by the interaction of different technological developments on the supply side and factors on the demand side [26]. The two classic components of industrial structural change are industrial structural rationalization and upgrading [27,28]. This involves the reallocation of production factors (labor, capital and environment) among different sectors. Among those production factors, labor resource is the most dynamic [29,30]. The development of strategic emerging industries can help transform the economic development model and realize the optimization and upgrading of industrial organizations [31]. With the development of technology and economics, the structure of strategic emerging industries is adjusting through dynamic

development, and in the process, the forces of "creation and destruction" coexist, which produces the mechanism of destruction and compensation in labor employment.

The employment destruction mechanism of structural changes in strategic emerging industries involves the upgrading of the structure of emerging industries, in which labor-intensive industries are gradually replaced by technology- and capital-intensive industries, which reduces the demand for labor and causes structural unemployment. These changes will reduce the demand for labor, which in turn will have a crowding-out effect on employment, namely, a destructive effect. These changes are reflected in the following four aspects. First, in the process of changing the structure of strategic emerging industries, the technological level will be improved, machines will replace the labor force, and production will be increasingly automated and intelligently improved, which will reduce the demand for labor and the number of jobs [32]. Second, the change of strategic industrial structure changes the demand for labor force, which results in the lag effect and the decrease in employment. Third, the structural adjustment of strategic emerging industries will lead to the continuous optimization and upgrading of industries and the improvement of management levels, which will lead to a reduction of redundant personnel and a decline in employment. Fourth, in the process of restructuring strategic emerging industries, institutional and policy obstacles will appear, hindering the flow of labor between different industries, which will also lead to a decline in employment.

To sum up, the process of the employment destruction mechanism involved in structural changes in strategic emerging industries is as follows (see Figure 1). The changes in strategic emerging industrial structure will improve production technology, change job demand, and improve the level of management so as to make production automatic and intelligent; machines will replace the labor force redundant personnel will be cut; and eventually, with the reduced demand and supply of labor, employment will decline.

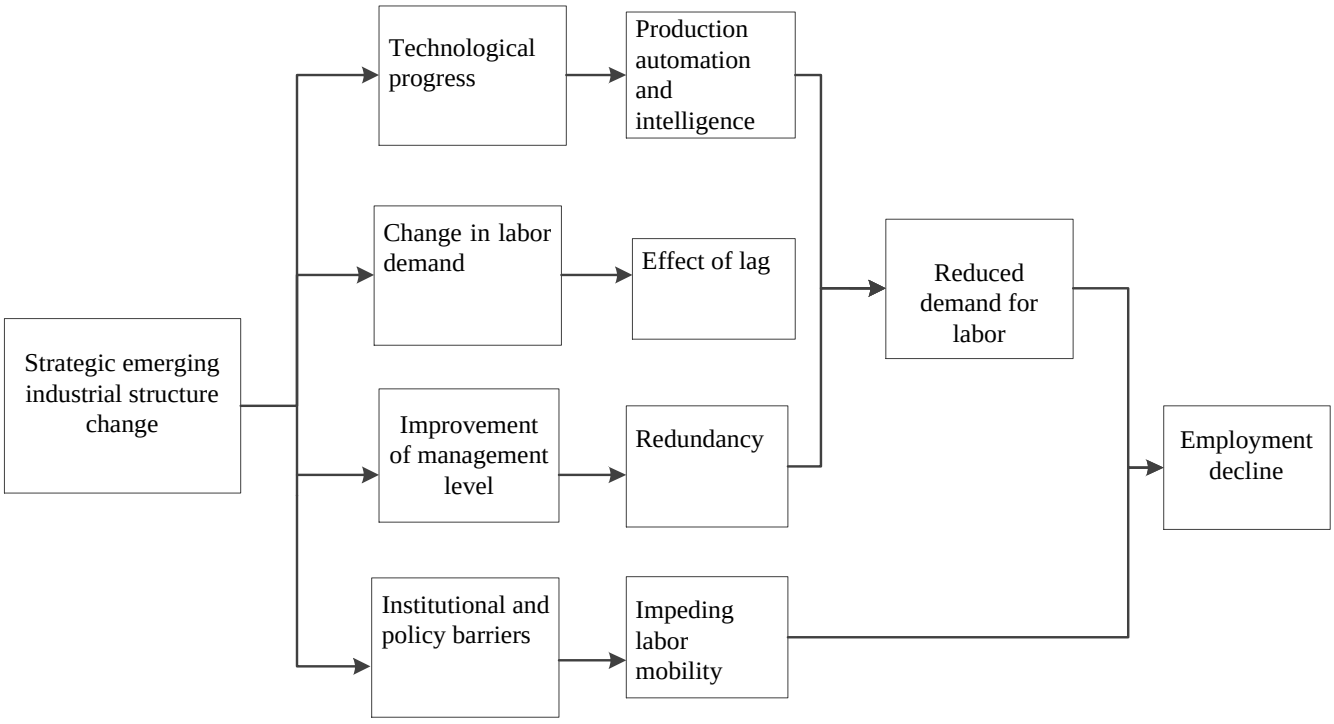


**Figure 1.** The formation process of the employment destruction mechanism of the changes in strategic emerging industrial structure.

The employment compensation mechanism [33] underlying the change in strategic emerging industries involves the creation of new products and emerging industries via technological innovation, leading to changes in the number of strategic emerging industries and the composition of the industrial structure. These changes, in turn, lead to the flow

of production factors between different industrial sectors and to the transfer of labor and drive the development of related industries. All these processes will increase the demand for labor force and have a promoting effect on employment, that is, a compensation effect. These changes are reflected in the following five aspects. We can summarize the formation process of the employment compensation mechanism caused by the structural changes in strategic emerging industries as follows (see Figure 2).

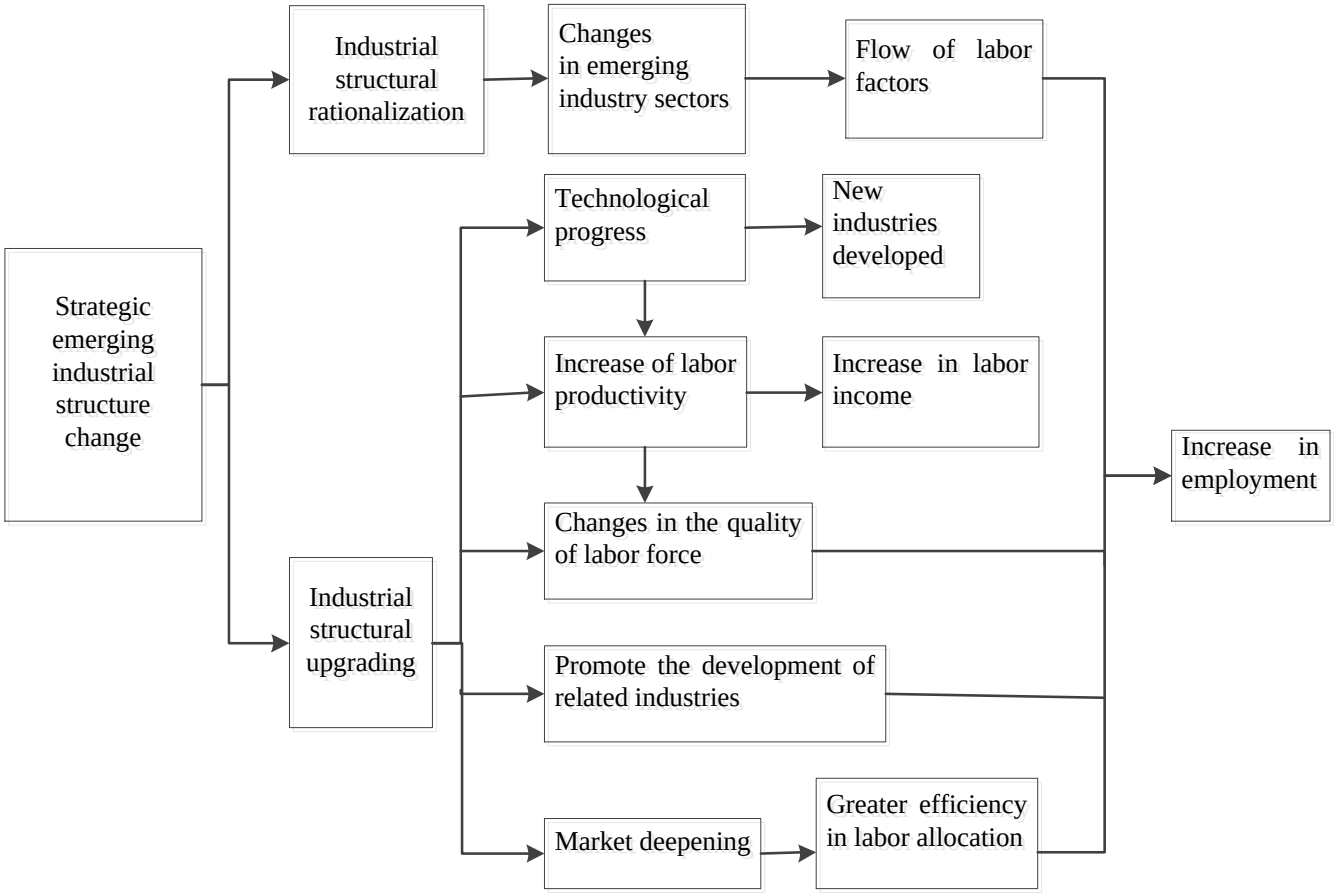


**Figure 2.** The formation process of the employment compensation mechanism of the change in strategic emerging industrial structure.

Firstly, the change in strategic emerging industries is accompanied by technological progress and increased labor productivity, which promotes the flow of labor factors within industries and among different industries. Thus, the reallocation of labor resources is realized, and the amount of employment is increased. Second, in the process of upgrading strategic emerging industrial structure, enterprises begin to develop new technologies in order to increase their market share and generate advantages in the market, resulting in the continuous improvement of the technological level of each industry [34]. This advancement will bring new products and new industries, create new jobs, and increase the number of people employed. Third, in the process of changing strategic emerging industries, the newly generated industries have good development prospects and relatively high labor productivity. Fourth, in the process of changing strategic emerging industries, the quality of the labor force will change and human capital investment will increase, easing the pressure of employment. This effect occurs because the rise of new industries results in higher requirements for the quality of the labor force, requiring more highly educated and skilled workers [35]. The demand for higher qualifications requires workers to extend their education time and improve their basic skills in order to adapt to the changes in strategic emerging industrial structure. This requirement for a more highly skilled labor force slows the entry of workers into the labor market, thus reducing the pressure on employment.

In addition, technological innovation brought about by the changes in the structure of strategic emerging industries leads to higher income levels, enabling people to continue to develop their education and increasing investment in human capital. Human capital investment also improves the quality and competitiveness of the labor force in emerging industries, which is conducive to labor mobility. Fifth, changes in the structure of strategic emerging industries directly or indirectly promote the expansion of relevant industries, deepen the market, transform the mode of economic growth [36] and improve the efficiency of labor resource allocation, thus increasing employment.

Changes in the structure of strategic emerging industries will promote the flow of factors of production among different departments and encourage the innovative allocation of labor resources. It will promote technological innovation, new products and new industries as well as create new jobs. The labor productivity of emerging industries increases, the enterprise income increases and the labor force income increases, which attracts more workers. This process will change the quality of the labor force, increase the investment in human capital and reduce the pressure of employment. It will promote the expansion of related industries, promote the deepening of the market and improve the efficiency of labor resource allocation. All of these factors will create jobs.

The effects of changes in strategic emerging industry on employment are complex and systematic, and the impact of industrial structural changes on employment depends on the combined effect of the employment compensation mechanism and the destructive mechanism. When the destructive mechanism of structural change in strategic emerging industry is greater than the compensation mechanism, total employment decreases, and when the compensation mechanism of the emerging industrial structure is greater than the destructive mechanism, total employment increases.

### *3.2. Hypotheses*

Based on the above theoretical analysis, we can find that the level of employment in strategic emerging industries is not only related to the expansion of the industrial scale but also to the adjustment of the industrial structure. There are many indicators to measure the change in industrial structure, but the main indicators are the direction and speed of the change. In addition, employment elasticity mainly emphasizes the absorptive capacity of labor resources for economic growth. Employment elasticity is an indicator to measure industrial employment absorptive capacity. Based on the above theoretical analysis, this paper examines the effect of the change in strategic emerging industrial structure on employment from the three perspectives of the direction of change in the industrial structure change, employment elasticity and change speed. It also puts forward the following three assumptions.

The scale of industrial structural change can be measured by the direction of this change. The value added of the industry is the value added by the production activities of enterprises in a certain period of time, which can accurately reflect the scale and speed of industrial production. Therefore, this paper uses the proportion of Gross Domestic Product contributed by the added value of strategic emerging industries to express the direction of industrial structural change and proposes the first hypothesis.

**Hypothesis 1.** *The change of direction in strategic emerging industrial structure is positively correlated with the level of employment.*

Employment elasticity refers to the percentage change of employment corresponding to the change of economic growth [37]. Analogously, industrial employment elasticity refers to the proportion of change caused by the change in employment quantity with a 1% growth in an industry's output. The industrial employment elasticity formula is as follows.

$$\varepsilon = \frac{\Delta L / L_i}{\Delta Y / Y_i} \tag{1}$$

In Formula (1), $\varepsilon$ represents employment elasticity, $\Delta L/L_i$ refers to the rate of employment growth in industry $i$, and $\Delta Y/Y_i$ is the output growth rate of industry $i$. When the elasticity coefficient $\varepsilon$ is positive, a higher value means that the pull effect of economic growth on employment is stronger; when the elasticity coefficient $\varepsilon$ is negative, it means that the higher its absolute value is, the greater the "crowding out" effect on employment. Generally, as the industry matures, its employment elasticity will gradually decrease. Therefore, this paper adopts industrial employment elasticity as an index to measure the employment absorption capacity of strategic emerging industries and proposes the second hypothesis.

**Hypothesis 2.** *The employment elasticity of strategic emerging industries is in the positive direction of the level of employment.*

The speed of change in industrial structure is an indicator of the degree of volatility (or change) in various industries. The change value of industrial structure is an index used to measure the change amplitude of industrial structure. The faster the change in industrial structure, the greater the adjustment of industrial dynamics and the more obvious the impact on employment. The value of industrial structural change was first proposed by the American economist Simon Kuznets and was improved by Gan Chunhui and others. The formula is as follows.

$$K = \frac{\sum|X_{it} - X_{io}|}{N} \tag{2}$$

In Formula (2), $K$ is the value of industrial structure change, which describes the speed of change of the structure of strategic emerging industries. $X_{io}$ is the proportion of the beginning industry; $X_{it}$ is the proportion of the end-of-term industry; $N$ is the number of industries. The greater the $K$ value, the greater the rate of change in the structure of strategic emerging industries. On the other hand, the smaller the $K$ value, the smaller the rate of change in the structure of strategic emerging industries. Generally, the faster the change in industrial structure, the more violent the fluctuations in various industries and the more serious the structural unemployment. Therefore, this paper uses the value of industrial structural change as an index to measure the speed of change of strategic emerging industrial structure and proposes the third hypothesis.

**Hypothesis 3.** *The speed of change of the structure of strategic emerging industries is oppositely correlated with the level of employment.*

In summary, assuming that other conditions such as technological progress remain unchanged, the employment effect of the change in strategic emerging industries is the result of the combined effect of the direction of industrial structural change, the elasticity of industrial employment and the speed of change of industrial structure.

### *3.3. The Regression Equation*

Based on the above theoretical analysis and assumptions, assuming that other conditions such as technological progress remain unchanged, this paper uses the three indicators of change direction, employment elasticity and speed of change in the strategic emerging industrial structure to construct a model and empirically study the employment effect of the change in China's strategic emerging industrial structure. This paper draws on the Cobb-Douglas production function to construct a nonlinear function relationship that includes the employment level of strategic emerging industries, the direction of industrial structure change, the elasticity of employment and the speed of change of industrial structure, that is,

$$L = f(ISCD, IEE, ISCS) = \eta(ISCD)^{\alpha}(IEE)^{\beta}(ISCS)^{\gamma} \tag{3}$$

In Formula (3), $L$ represents the number of people employed in strategic emerging industries; $ISCD$ represents the change direction of strategic emerging industries; $IEE$ represents the employment elasticity of strategic emerging industries; $ISCS$ represents the change speed in the structure of strategic emerging industries; $\alpha$, $\beta$ and $\gamma$ represent

the coefficients of the change direction, employment elasticity and change speed of the structure of strategic emerging industries, respectively, and $\eta$ represents a constant.

By taking logarithms from both sides of Formula (3) simultaneously, Formula (4) is obtained.

$$\ln L = \ln \eta + \alpha \ln(ISCD) + \beta \ln(IEE) + \gamma \ln(ISCS) \quad (4)$$

The regression Formula (5) is established on the basis of Formula (4).

$$\ln L = \rho + a \ln(ISCD) + b \ln(IEE) + c \ln(ISCS) + \mu \quad (5)$$

In Formula (5), $\rho$ is the constant item; $a$, $b$, and $c$ represent the respective coefficients; and $\mu$ represents the random error.

## 4. Variables and Data Sources

### *4.1. Explained Variables: The Level of Employment in Strategic Emerging Industries*

Table 1 shows that the number of people employed in China's strategic emerging industries increased from 2009 to 2020, from 47.97 million in 2009 to 97.72 million in 2020, showing different degrees of this upward trend year by year, indicating that China's strategic emerging industries are developing well.

**Table 1.** Employment in strategic emerging industries from 2009 to 2020 (Unit: 10,000 people).

| Year | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Number of people in business at the end of the year | 4797 | 5174 | 5398 | 5767 | 6052 | 6452 | 6803 | 7172 | 7595 | 8251 | 8877 | 9772 |

### *4.2. Explaining Variables*

#### 4.2.1. The Changing Direction of Strategic Emerging Industrial Structure

In Table 2, we can see that from 2009 to 2020, the proportion of GDP contributed by China's strategic emerging industries increased, from 3.7% in 2009 to 11.7% in 2020, showing a steady upward trend year by year.

**Table 2.** The proportion of added value of China's strategic emerging industries in GDP in 2009–2020.

| Year | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 | 2016 | 2017 | 2018 | 2019 | 2020 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Proportion of industry added value in GDP | 3.7% | 4.0% | 4.8% | 5.9% | 7.3% | 7.6% | 8.0% | 8.4% | 10% | 11% | 11.5% | 11.7% |

#### 4.2.2. The Employment Elasticity of Strategic Emerging Industries

Using Formula (1), this paper measures the employment elasticity of China's strategic emerging industries from 2009 to 2020, as shown in Table 3. Table 3 reflects the employment elasticity and total employment elasticity of the seven subsectors of China's strategic emerging industries in 2009–2020.

**Table 3.** Total employment elasticity and employment elasticity of China's seven subsectors of strategic emerging industries in 2009–2020.

| Industry / Year | Energy-Saving and Environmental Protection Industry | A New Generation of the Information Technology Industry | Bio-industry | High-End Equipment Manufacturing | New Energy Industry | New Materials Industry | New Energy Vehicle Industry | Total Employment Elasticity |
|---|---|---|---|---|---|---|---|---|
| 2009 | 0.332 | 1.236 | 0.589 | 0.732 | 0.023 | 0.544 | 0.407 | 0.500 |
| 2010 | 0.357 | 0.567 | 0.740 | 0.711 | 0.040 | 0.532 | 0.759 | 0.529 |
| 2011 | 0.135 | 0.411 | 0.460 | 0.942 | 0.340 | 0.458 | 0.367 | 0.445 |
| 2012 | 0.119 | 0.919 | 0.722 | 0.405 | 0.199 | 0.455 | 0.978 | 0.542 |
| 2013 | 0.200 | 0.459 | 0.553 | 0.273 | 0.139 | 0.459 | 0.521 | 0.372 |
| 2014 | 0.236 | 0.668 | 0.939 | 0.393 | 0.179 | 0.661 | 1.222 | 0.614 |
| 2015 | 0.134 | 0.924 | 1.164 | 0.324 | 0.435 | 0.255 | 1.252 | 0.641 |
| 2016 | 0.131 | 0.746 | 1.109 | 0.226 | 0.338 | 0.283 | 1.087 | 0.560 |
| 2017 | 0.184 | 0.749 | 0.849 | 1.251 | 0.486 | 0.635 | 0.485 | 0.663 |
| 2018 | 0.330 | 1.011 | 0.801 | 1.301 | 0.876 | 0.669 | 0.517 | 0.786 |
| 2019 | 0.303 | 1.033 | 1.375 | 1.425 | 1.285 | 0.454 | 0.114 | 0.855 |
| 2020 | 0.660 | 1.078 | 0.995 | 1.877 | 0.541 | 0.256 | 0.523 | 0.847 |
| Mean value | 0.260 | 0.817 | 0.858 | 0.792 | 0.407 | 0.472 | 0.686 | 0.613 |

In terms of subindustries, the employment elasticity of each subsector industry is greater than 0, which indicates that China's seven strategic emerging industries have a pull effect on employment. However, the employment elasticity of each subsector of strategic emerging industries shows an unstable trend. Regarding the average employment elasticity of each subsector, the bioindustry had the greatest pull effect on employment between 2009 and 2020, with an average employment elasticity value of 0.858. Second, the new generation of the information technology industry and high-end equipment manufacturing industry have average employment elasticities of 0.817 and 0.792, respectively. In addition, the average employment elasticities of the new materials industry and new energy industry are also relatively close, with values of 0.472 and 0.407, respectively, hovering at approximately 0.5, indicating that the pull effect on employment is not obvious. The energy-saving and environmental protection industry has the lowest average employment elasticity value, at only 0.260, indicating that the employment absorption capacity of energy-saving and environmental protection is weak. On the whole, the employment elasticity of China's strategic emerging industries fluctuates between 0.855 and 0.372 from 2009 to 2020, with an average of 0.613, and all of the values are positive, which indicates that strategic emerging industries have a pull effect on employment. The ability of strategic emerging industries to absorb employment is strong, and the role of strategic emerging industries in absorbing employment is enhancing.

#### 4.2.3. The Change Speed in the Structure of Strategic Emerging Industries

Using Formula (2), this paper measures the change value K of the structure of strategic emerging industries for 2009 to 2020, as shown in Tables 4 and 5. In order to make the data easier to understand, we added the percentage after the data.

**Table 4.** The speed of change in the structure of China's seven subsectors strategic emerging industries in 2009–2020.

| Year | Energy-Saving and Environmental Protection Industry | A New Generation of the Information Technology Industry | Bioindustry | High-End Equipment Manufacturing | New Energy Industry | New Materials Industry | New Energy Vehicle Industry |
|---|---|---|---|---|---|---|---|
| 2009–2010 | 0.923% | 3.046% | 1.334% | 0.675% | 0.126% | 0.276% | 0.077% |
| 2010–2011 | 0.325% | 1.432% | 0.593% | 0.038% | 0.093% | 0.016% | 0.271% |
| 2011–2012 | 0.267% | 0.709% | 0.730% | 1.202% | 0.112% | 0.299% | 0.177% |
| 2012–2013 | 0.218% | 2.213% | 0.467% | 2.836% | 0.013% | 0.209% | 0.367% |
| 2013–2014 | 0.566% | 2.472% | 0.007% | 3.186% | 0.057% | 0.213% | 0.261% |
| 2014–2015 | 0.573% | 2.288% | 0.184% | 1.221% | 0.743% | 0.163% | 0.113% |
| 2015–2016 | 0.133% | 2.697% | 0.435% | 1.560% | 0.285% | 1.254% | 0.005% |
| 2016–2017 | 0.185% | 2.742% | 0.029% | 1.327% | 0.661% | 0.239% | 0.445% |
| 2017–2018 | 0.477% | 0.450% | 0.020% | 0.722% | 0.110% | 0.470% | 0.206% |
| 2018–2019 | 0.967% | 1.162% | 0.274% | 0.084% | 0.084% | 0.753% | 0.358% |
| 2019–2020 | 0.711% | 1.226% | 0.833% | 0.654% | 0.255% | 0.313% | 0.435% |

**Table 5.** China's strategic emerging industry structure: changes in R value in 2009–2020.

| Year | $\sum \lvert X_{it} - X_{i0} \rvert$ | K |
|---|---|---|
| 2009 | 6.457% | 0.922% |
| 2010 | 2.737% | 0.391% |
| 2011 | 3.496% | 0.499% |
| 2012 | 6.296% | 0.899% |
| 2013 | 6.763% | 0.966% |
| 2014 | 5.285% | 0.755% |
| 2015 | 6.359% | 0.908% |
| 2016 | 5.571% | 0.796% |
| 2017 | 2.455% | 0.351% |
| 2018 | 3.682% | 0.526% |
| 2019 | 4.427% | 0.632% |
| 2020 | 7.110% | 1.016% |

Table 4 reflects the speed of change in the structure of the seven subsectors of strategic emerging industries from 2009 to 2020. As shown in Table 4, the industrial structure of each subsector of emerging industry changed to varying degrees between 2009 and 2020. Taking the energy-saving and environmental protection industry as an example, the speed of industrial structure change in 2009–2010 was 0.923%, the change in industrial structure decreased to 0.218% in 2012–2013, and then in 2014–2015, there was an upward trend reaching 0.573%. Between 2015–2016, it fell to 0.133%, but then increased to 0.711% in 2019–2020. It can be seen that the change in the energy-saving and environmental protection industrial structure shows an unstable fluctuation trend. The structures of other subsectors of strategic emerging industry also show different degrees of change, which shows that there are obvious differences in the strategic emerging industrial structures of each subdivision.

Table 5 reflects the speed of change in the structure of strategic emerging industries from 2009 to 2020. From 2009 to 2020, the change in $K$ value of the industrial structure of strategic emerging industries increased in volatility from 0.922% in 2009 to 0.351% in 2017 and to 1.016% in 2020, showing a declining trend and then an upward trend.

### 4.3. Data Sources

In 2012, China's Ministry of Industry and Information Technology announced the Strategic Emerging Industry Classification (2012). In 2018, China's National Bureau of Statistics published the Strategic Emerging Industries Classification (2018). In view of

the availability and reliability of the data, this paper takes the 2012 edition of China's strategic emerging industry classification, defines seven industries, and selects 2009–2020 as the research interval. The raw data are taken from the China Statistical Yearbook, China High-tech Industry Statistical Yearbook, China Science and Technology Statistical Yearbook, China Torch Statistical Yearbook, and China Strategic Emerging Industry Development Report (2022). Some of the data come from China's National Bureau of Statistics, strategic emerging industries database and so on. Data that are difficult to obtain directly, such as the number of people employed in the new energy vehicle industry, are calculated using the statistics and data of the relevant industries.

## 5. Results

This paper takes strategic emerging employment as the dependent variable and the direction of industrial structure change, the elasticity of industrial employment and the speed of industrial structure change as the independent variables. Based on regression Equation (5), by using Eviews 9.0 analysis software, this study further analyzes the employment effect of changes in the strategic emerging industrial structure.

The presence of non-smooth time series in regression modeling analysis will lead to pseudo-regression analysis. To avoid this phenomenon, it is generally necessary to perform a unit root test of individual variables before the econometric modeling analysis.

According to the results of unit root test in Table 6, it can be found that the $\boldsymbol{p}$ value of the $ADF$ of the original series of the four variables is greater than 0.05. The hypothesis of no unit root is rejected. Therefore, the four variables are not stable sequences. However, the $ADF$ values of the difference series of the four variables are all less than the critical value of 5% and the probability $p$ is all less than 0.05. It is considered that there is no unit root in all difference sequences. Therefore, the four variables meet the conditions for further regression analysis. Using Eviews 9.0 to test the regression estimate and test Equation (5), the following regression results are obtained:

**Table 6.** Test of all enterprises.

| Variable | Original Sequence | | | First-Order Difference | | | Second-Order Difference | | |
|---|---|---|---|---|---|---|---|---|---|
| | ***ADF*** | ***p* Value** | **Conclusion** | ***ADF*** | ***p* Value** | **Conclusion** | ***ADF*** | ***p* Value** | **Conclusion** |
| $\ln(L)$ | −0.3796 | 0.5183 | Not smooth | −3.6825 | 0.0761 | Not Smooth | −7.4192 | 0.0000 | Smooth |
| $\ln(ISCD)$ | −1.7733 | 0.6486 | Not smooth | −2.3360 | 0.3822 | Not smooth | −3.0793 | 0.0065 | Smooth |
| $\ln(IEE)$ | −3.3602 | 0.1089 | Not smooth | −2.3873 | 0.3598 | Not Smooth | −3.2505 | 0.0060 | Smooth |
| $\ln(ISCS)$ | −2.3238 | 0.3912 | Not smooth | −3.2885 | 0.1255 | Not Smooth | −4.1978 | 0.0009 | Smooth |

According to the regression results, we can see that $R^2 = 0.9839$, the $F$ value = 163.6847, and the $p$ value = 0.000, indicating that regression Equation (5) is well fitted. There is a stable relationship between the number of employments in strategic emerging industries and the direction of industrial structure change, the elasticity of employment and the speed of industrial structure change.

From the regression coefficient of Table 7, the following regression model is obtained,

$$\ln L = 9.9491 + 0.4264 \ln(ISCD) + 0.1917 \ln(IEE) - 0.0133 \ln(ISCS) \quad (6)$$

**Table 7.** Regression coefficient table.

| | Coefficient | Standard Error | Trial | Prob |
|---|---|---|---|---|
| C | 9.9491 | 0.1434 | 69.3411 | 0.0000 |
| $\ln(ISCD)$ | 0.4264 | 0.0357 | 11.9205 | 0.0000 |
| $\ln(IEE)$ | 0.1917 | 0.0600 | 3.1909 | 0.6499 |
| $\ln(ISCS)$ | −0.0133 | 0.0282 | −0.4715 | 0.0128 |

From regression Equation (6) and Table 7, we can see the following:

(1) The relationship among the three explanatory variables is different: the strategic emerging industrial structure change direction ($ISCD$), industrial employment elasticity ($IEE$) and the speed of change ($ISCS$), and the number of people employed ($L$) of the interpreted variables. The directions of change of the strategic emerging industrial structure ($ISCD$) and the number of people employed ($L$) are positively correlated, and the correlation is significant. The industrial employment elasticity ($IEE$) and the number of people employed ($L$) are positively correlated, but the correlation is not significant. The speed of change ($ISCS$) and the number of people employed ($L$) show an inverse relationship, and they are significantly correlated.

(2) The hypothesis proposed in this paper is verified: Firstly, it can be seen that hypothesis 1 is verified. The direction of structural change in strategic emerging industries ($ISCD$) and the change in employment ($L$) are changing in the same direction, indicating that the greater the proportion of the value added of strategic emerging industries in GDP, the greater the number of people employed. This finding shows that the development direction of strategic emerging industries determines the level of employment as well as the growth of employment in these industries. Therefore, expanding the scale of the development of strategic emerging industries and giving full play to their leading and expanding roles in economic and social development is an important measure to promote the high-quality development of China's economy and expand employment. Secondly, it can be seen that hypothesis 2 is verified. The employment elasticity of strategic emerging industries and the number of people employed ($L$) are changing in positive directions, indicating that with the development of strategic emerging industries, the employment elasticity of each industry is gradually creasing and the level of employment absorption is gradually creasing. Thirdly, it can be seen that hypothesis 3 is verified. The speed of change in the structure of strategic emerging industries ($ISCS$) and the number of people employed ($L$) are changing in oppositive directions, indicating that the faster the structural change in strategic emerging industries, the fewer people will be employed. Thus, we can see that the three hypotheses in this paper are supported.

(3) Three indicators, that is, the direction of change in the structure of strategic emerging industries, the elasticity of industrial employment, and the speed of change, have different effects on labor employment. First, the change in the structure of strategic emerging industry has the greatest impact on employment, and its coefficient is 0.4246, $p < 0.001$. Second, the employment elasticity of strategic emerging industries has a lesser impact on employment, and its coefficient is 0.1917, $p > 0.05$. Third, the rate of change of the structure of strategic emerging industries has the least impact on employment, and its coefficient is $-0.0133$, $p < 0.05$. It can be seen that the direction of structural change of strategic emerging industries and their employment elasticity has a greater positive effect on employment than the negative effect of the speed of structural change of strategic emerging industries on employment.

In total, the effect of changes in strategic emerging industrial structure on employment is positive. This indicates that the structural adjustment of strategic emerging industries has a positive effect on employment growth. That is to say, the structural change in strategic emerging industries have played a role in promoting employment. The change in China's strategic emerging industrial structure provides strong support for the expansion of China's employment. The results show that in the development of strategic emerging industries, the change in industrial structure has played a role in promoting employment. Therefore,

we should rationally adjust the structure of strategic emerging industries, accelerate the development of strategic emerging industries and enhance the proportion of their industrial added value to the GDP by expanding the boundaries of these industries, accelerating the transformation and application of high-tech research results and cultivating new industries and new employment growth points, so as to improve the employment absorption capacity of strategic emerging industries.

## 6. Conclusions and Implications

This paper constructs a regression equation, in which the employment of strategic emerging industries is the dependent variable, while the change direction of strategic emerging industry structure, the employment elasticity of strategic emerging industries and the change speed of industrial structure are the independent variables. Using the relevant data of China's strategic emerging industries from 2009 to 2020, this paper uses the regression equation to analyze to the employment effect of structural change in strategic emerging industries. The main research conclusions are as follows:

(1) The direction of the change in the structure of China's strategic emerging industries is basically the same as its GDP and moves in a positive direction with the employment of strategic emerging industries. This shows that in the process of the development and growth of strategic emerging industries, the direction of the change in the structure of strategic emerging plays a role in promoting its employment. (2) The employment elasticity of China's strategic emerging industries shows a creasing trend year by year in its fluctuation, and changes positively with the number of its employees. This means that with the development of strategic emerging industries, its industrial employment absorption capacity is enhancing year by year and its employment is increasing. (3) The speed of change of the structure of China's strategic emerging industries is not stable at present, and this change is negatively correlated with the number of employments in strategic emerging industries. This trend shows that China's strategic emerging industrial structure is still in a state of dynamic adjustment, and further clarification of industrial boundaries is required.

The research results of this paper have certain theoretical significance and practical value. From the perspective of theoretical significance, the extension of industrial structure change to strategic emerging industry structure change has enriched the theoretical research on the employment effect of industrial structure change. From the perspective of practical value, based on the main research conclusions, this paper proposes the following countermeasures and suggestions for the formulation of strategic emerging industrial policies: (1) It is clear that changes in the structure of strategic emerging industries have a positive impact on employment. They have the potential not only to drive significant economic growth, but also increase the number of employments. The government should frequently provide assistance and incentives to these industries in order to promote their development and global competitiveness. (2) It is necessary to recognize that employment elasticity of strategic emerging industries is fluctuating. More research and analysis are required to determine the employment elasticity of strategic emerging industries. The government has further explored new channels for improve employment flexibility of strategic emerging industries to promote employment promoting by building effective links between emerging industries and traditional industries. (3) Although the structural change in strategic emerging industries has a positive effect on employment, the destructive effect of the speed of change of strategic emerging industries on employment cannot be ignored. The government should establish a sound labor market mobility mechanism, enhance the education and training of strategic emerging industries professionals, and as much as possible curb the destruction of employment caused by the rapid change of strategic emerging industry.

Although this paper has some contributions in theory and practice, it still has some shortcomings. On the one hand, this paper only constructs a regression model to analyze the employment effect of structural change in strategic emerging industries and does not aim at the specific employment effect of strategic emerging industries such as high-end

equipment manufacturing and the new-generation information technology industry for further analysis. On the other hand, this paper does not consider the influence of those factors such as economic growth, technological advancements, and government policies preference on employment levels of strategic emerging industries.

Stepping into the stage of high-quality and innovation-driven development, the 14th Five-Year Plan for China places a high priority on advancing the strategic emerging industry (SEI) [38]. These problems need to be further discussed in the follow-up research. In the future, with the improvement of statistical data, more theoretical methods [39] and empirical studies are needed to enrich our understanding of the direction of change, the employment absorption capacity and the speed of change of the industrial structure in strategic emerging industries. We also can continue to study and understand the employment effect of structural changes in strategic emerging industries among different regions and provinces in China.

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