

## Analysis of Supply and Demand of Manufacturing Labor Force in the Period of Transformation and Development

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### Abstract

Since 2013, the number of employed people in China's manufacturing industry has been declining year by year, and the manufacturing industry is also facing labor shortages and insufficient supply of high-quality labor. Especially in the period of transformation and development, the mode of economic development is shifting from scale-type and extensive growth to quality-efficiency-type intensive growth. The manufacturing industry faces the adjustment of industrial structure, and the impact of rising labor costs on the quantity and quality of labor supply. This paper uses quantitative methods to analyze the labor market of the manufacturing industry. On the one hand, it analyzes the labor supply from the age structure of the population, and on the other hand, it analyzes the change in the proportion of manufacturing employment in the total employment. In the end, the number of employed people in the manufacturing industry did not accelerate, but it began to show negative growth after reaching its peak in 2013. In order to ensure that there will be no serious structural imbalances in manufacturing employment, the government should guide the policy guidance of the manufacturing industry, make appropriate adjustments to the population birth policy, and strengthen human capital investment and management.

### Keywords

Manufacturing, Labor supply and demand, Transition period.

### 1. Introduction

Against the background of an aging population and the popularization of higher education, China's labor supply structure is undergoing profound changes, which will have a profound impact on the optimization of manufacturing structure. After the financial crisis in 2008, China's economy and society are in a new period of transformation and development, and personalized and diversified consumption has become the mainstream; The supply capacity of traditional industries has greatly exceeded the demand, and the industrial structure has been gradually optimized and upgraded; The comparative advantage of labor costs is fading away, and the aging population is developing day by day. Economic growth will rely more on the quality of human resources and technological progress, and innovation will become a new engine driving development.

As the foundation of China's economic and social development, manufacturing industry is developing towards a stage of higher form, more detailed division of labor and more reasonable structure. Manufacturing industry plays a leading role in China's national economy and is the main industry driving economic growth. According to the national economic industry classification revised by the national bureau of statistics, there are 31 categories in the manufacturing industry, including agricultural and sideline food, clothing processing, chemical processing and general equipment processing. In the 2010s, China's manufacturing labor

supply and demand began to show structural imbalance, so it is necessary to analyze the supply and demand of manufacturing labor in the new period of transformation and development.

## 2. Literature References

At present, the academic research on labor supply and demand in manufacturing industry mainly focuses on the increase of labor cost, population age structure, labor quality and the fluctuation of labor supply and demand. The center for international comparative education research of the Chinese academy of educational sciences (2013) believes that the development index of labor force can be constructed from the dimensions of the quantity, quality, structure and development environment of labor force, and points out that economic development and technological progress are more dependent on the quality level of labor force than the quantity of labor force [1]. For the manufacturing industry, through the calculation of the data of manufacturing enterprises above the scale in China from 2000 to 2007, the upgrading of industrial structure and the deepening of education can realize the continuation of labor cost advantage [2], trends in wages inevitably lead to higher labour costs [3].

L. G. Yang et al. (2014) carried out an empirical study on the effect of rising labor costs on the upgrading of manufacturing structure. The effects of rising labor costs on labor, capital and technology-intensive manufacturing industries were significantly negative, significantly positive and non-significant, respectively [4]; W. Ji (2018) used statistical analysis method to analyze whether the labor cost of China's manufacturing industry has advantages. The research conclusion is that the annual increase of labor cost of China's manufacturing industry is reasonable and continuous, and the labor cost advantage can still be maintained in the rising trend [5]. China's manufacturing employment does not show a parabolic growth pattern, but a fluctuating growth pattern. In the future, China's manufacturing industry will not be seriously affected in the increasingly aging population [6].

Through literature review, it is found that most of the studies on the supply and demand of labor force in the manufacturing industry are based on various influencing factors, but less on the balance of supply and demand of labor force in the manufacturing industry in the whole employment market at the macro level. Therefore, based on the existing research and the basic fact that the supply and demand structure of the labor market is unbalanced, this paper first analyzes the labor supply and demand situation from the age structure of the population, and then analyzes the employment situation of the labor market in the manufacturing industry from the whole macro employment market. Finally, put forward the corresponding policies and Suggestions from the government and enterprises.

## 3. Analysis of Labor Supply and Demand in China's Manufacturing Industry

### 3.1. Analysis of Labor Market Supply in China's Manufacturing Industry

**Table 1.** Population age distribution and the proportion of working-age population (unit: ten thousand)

|          | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | 2013   | 2014   | 2015   | 2016   |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Total    | 132129 | 132802 | 133450 | 134091 | 134735 | 135404 | 136072 | 136782 | 137462 | 138271 |
| 0-14     | 25633  | 25232  | 24688  | 22259  | 22231  | 22342  | 22316  | 22569  | 22715  | 23091  |
| 15-64    | 95794  | 96547  | 97419  | 99898  | 100243 | 100334 | 100557 | 100398 | 100361 | 100246 |
| Above 65 | 10702  | 11023  | 11343  | 11934  | 12261  | 12728  | 13199  | 13815  | 14386  | 14933  |

Source: China national bureau of statistics

China's total population has little change in the trend, but the proportion of the total working-age population in the total population is on a declining trend, and the declining trend is quite obvious, while the decline of the natural growth rate of population makes the speed of population aging accelerate. Since 2013, China's labor supply has started to decrease in absolute terms, while the new demand for labor remains stable at around 8 million per year. China's future employment problem is not lack of demand, but lack of supply. A stimulus policy will only aggravate the problem of labor shortage in China.

In the short term, the changes in labor supply and demand brought by the aging population and the continuous rise of labor costs will not fundamentally change the low-cost advantage of China's manufacturing industry, and will not cause a fundamental impact on the export of China's manufacturing industry. On the contrary, the aging of the population may force the transformation and upgrading of China's manufacturing competitiveness into a mechanism, which, to some extent, promotes and strengthens the endogenous driving force of China's manufacturing sector structural adjustment and optimization. However, in the long run, the challenges brought by the aging population to the improvement of China's manufacturing competitiveness cannot be ignored, and the Chinese government must take active measures to deal with the possible negative effects [7].

In this paper, labor supply is defined = working-age population—students in school — prisoners in prison—net outflow of labor force— other population [8].

**Table 2.** Working-age population and effective supply (unit: ten thousand)

|              | 2007   | 2008   | 2009   | 2010   | 2011   | 2012   | 2013   | 2014   | 2015   | 2016   |
|--------------|--------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
| Total        | 132129 | 132802 | 133450 | 134091 | 134735 | 135404 | 136072 | 136782 | 137462 | 138271 |
| Labor supply | 90526  | 91261  | 91958  | 94386  | 94671  | 94739  | 94853  | 94649  | 94479  | 94288  |
| growth rate  | —      | 0.81%  | 0.76%  | 2.64%  | 0.30%  | 0.07%  | 0.12%  | -0.22% | -0.18% | -0.20% |

China's total population and working-age population have not changed significantly in the past few years, but the labor supply has fluctuated significantly. The total population rose from 1321.29 million in 2007 to 1382.71 million in 2016, with an average annual growth rate of 0.465% over the past decade. The labor supply population rose from 905.26 million to 942.88 million, with an average annual growth rate of 0.416% over the past decade. The labor supply trend is slightly lower than the upward trend of the total population

### 3.2. Demand Analysis of China's Manufacturing Labor Market

In this paper, in terms of labor demand calculation, main basis for the labor employed by employer, and labor employed and approximate number of practitioners in manufacturing enterprises, the differences between the two is not too big, so the staff number instead of labor demand, basically will not affect the results of calculation and analysis.

According to the yearbook data of China national bureau of statistics, the total number of employees in manufacturing industry = employees in urban units of manufacturing industry + employees in state-owned units of manufacturing industry + employees in urban collective units of manufacturing industry + employees in other units of manufacturing industry.

**Table 3.** Manufacturing employment, GDP and its growth rate

ME: Manufacturing employment; EGR: Employment growth rate; GGR: The GDP growth rate; unit: ten thousand

|     | 2007 | 2008  | 2009  | 2010  | 2011  | 2012  | 2013  | 2014   | 2015   | 2016   |
|-----|------|-------|-------|-------|-------|-------|-------|--------|--------|--------|
| ME  | 6930 | 6968  | 6983  | 7274  | 8176  | 8524  | 10515 | 10486  | 10137  | 9787   |
| EGR | —    | 0.55% | 1.68% | 4.16% | 12.4% | 4.25% | 23.3% | -0.28% | -3.33% | -3.45% |
| GGR | —    | 18.2% | 9.25% | 18.3% | 18.4% | 10.4% | 10.1% | 8.19%  | 7.00%  | 7.91%  |

### 3.3. Analysis of Supply and Demand Matching in China's Manufacturing Labor Market

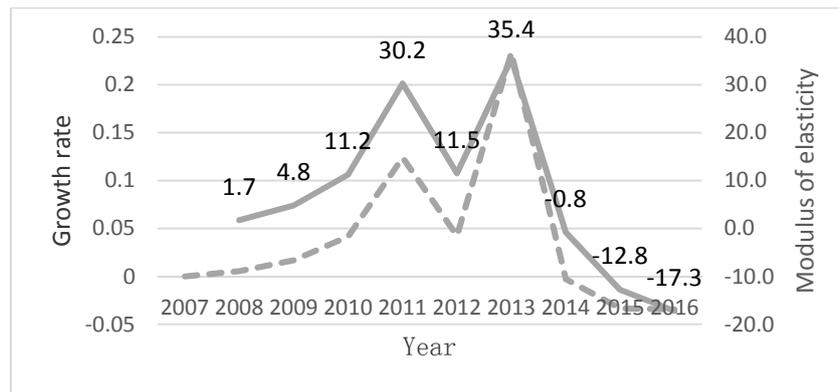
This article select effective matching rate of the index, the paper defines the meaning of effective matching rate for manufacturing employment and employment proportion in the whole market, then calculate the manufacturing employment relative to the elasticity of employment, suggests that every one percent increase in employment is able to drive the manufacturing employment increase how many percentage points, to two indicators to analyze the macro employment market in manufacturing employment of the labor market.

**Table 4.** Manufacturing employment growth rate, effective matching rate, elasticity coefficient

| Year | employment<br>(ten thousand) | Employment<br>growth rate | Manufacturing<br>employment | Growth rate of<br>manufacturing<br>employment | Effective<br>matching<br>rate | Modulus<br>of<br>elasticity |
|------|------------------------------|---------------------------|-----------------------------|---|-------------------------------|-----------------------------|
| 2007 | 75321.0                      | -                         | 6930.8                      | -   | 9.20%                         | -                           |
| 2008 | 75564.0                      | 0.32%                     | 6968.6                      | 0.55%   | 9.22%                         | 1.7                         |
| 2009 | 75828.0                      | 0.35%                     | 6983.8                      | 1.68%   | 9.21%                         | 4.8                         |
| 2010 | 76105.0                      | 0.37%                     | 7274.3                      | 4.16%   | 9.56%                         | 11.2                        |
| 2011 | 76420.0                      | 0.41%                     | 8176.6                      | 12.40%  | 10.70%                        | 30.2                        |
| 2012 | 76704.0                      | 0.37%                     | 8524.4                      | 4.25%   | 11.11%                        | 11.5                        |
| 2013 | 76977.0                      | 0.36%                     | 10515.8                     | 23.36%  | 13.66%                        | 35.4                        |
| 2014 | 77253.0                      | 0.36%                     | 10486.2                     | -0.28%  | 13.57%                        | -0.8                        |
| 2015 | 77451.0                      | 0.26%                     | 10137.5                     | -3.33%  | 13.09%                        | -12.8                       |
| 2016 | 77603.0                      | 0.20%                     | 9787.6                      | -3.45%  | 12.61%                        | -17.3                       |

Effective matching rate = (total number of manufacturing employees/total number of employees) \*100%

Elasticity coefficient = (growth rate of manufacturing employment/growth rate of employment) \*100%



**Fig 1.** Analysis of manufacturing employment

Dotted line: Growth rate of manufacturing employment

Solid line: Modulus of elasticity

In the 21st century, China's manufacturing industry has experienced a period of rapid development, but the employment number absorbed by it did not accelerate. Instead, it began to show negative growth after reaching the peak in 2013, for the following reasons: 1.2. Due to the adjustment of industrial structure, the demand for low-quality labor is reduced, while the demand for high-quality labor is increased, but the total demand for labor is reduced;3. As labor costs rise, enterprises turn to production automation.

The number of population of labor supply is the trend of the net since the early 2013 s, but has negative growth since 2013, it have inseparable relations with the China's population aging problem, reduce the number of very little even though the percentage of the total, is around 0.2%, but the employment net did not decrease, but the growth rate has slowed. The number of people employed in the manufacturing industry had been increasing before 2013, but it began to decrease slowly after 2013, which is closely related to China's strategic policies of transformation and development. In general, the supply and demand of labor in China's manufacturing industry have not changed much in recent years.

#### 4. Conclusions and Policy Recommendations

Before 2013, the number of manufacturing employees had been increasing, and the elasticity coefficient gradually increased to the peak, and the number of manufacturing employees accounted for the largest number of total employees in 2013, indicating the trend of more people flooding into the manufacturing industry. But starting in 2014, the elastic coefficient of began to present a negative trend, each rose one percent, and total number of employees in manufacturing employment will accelerate to reduce the number of the more shows that China is currently in transition in the new period of development, both capital and human or public attention, started from the traditional manufacturing industry to new economy industry. Manufacturing employment is expected to remain at about 100 million over the next decade or so. While there won't be a significant increase in employment, there will be a greater demand for technology workers. The manufacturing industry has been facing great pressure of employment inflow, but this pressure has not caused serious structural imbalance in the manufacturing industry, indicating that in the future, there will not be great fluctuations in the employment of the manufacturing industry.

##### 4.1. Promote Manufacturing Upgrades Based on Double Improvement in Technical Skills

We will vigorously develop vocational and technical education and accelerate the training of highly skilled personnel. Financial support for the construction of public training bases to

improve the technical skills of workers; Guide the new generation of labor force to form a correct concept of employment and employment behavior.

#### **4.2. Promote Manufacturing Upgrades Based on Human Capital Enhancement and Technological Innovation**

Based on the market demand, we should innovate the system and mechanism of higher education. First, we should promote the conformity of educational structure and industrial structure. Second, we should innovate the system of higher education enrollment. Deep cooperation between universities and enterprises to cultivate high-level innovative talents; we will implement an innovation-driven strategy to upgrade manufacturing based on human capital.

#### **4.3. Policies to Promote the Manufacturing Industry to the Dynamic Changes in Coordination with the High-End Upgrading of Labor Supply**

In line with the trend of high-end labor force, the policy promoted the upgrading of manufacturing industry. In line with the changes of regional labor supply, the policy promoted the gradient transfer and layout optimization of manufacturing industry. Under the strategy of "One Belt And One Road", the comparative advantage of foreign labor force is brought into play to promote the "going global" and transformation and upgrading of manufacturing industry.

#### **4.4. Strengthen Human Capital Investment and Management**

Talents with highly innovative knowledge and technical ability are the key to the development and innovation of manufacturing industry. Therefore, manufacturing enterprises should constantly strengthen the investment in talent training, and continuously enhance the loyalty of employees to enterprises through the construction of enterprise cultural atmosphere. In manufacturing enterprises, with the continuous increase of labor cost, enterprises should pay more attention to the management of labor force. By improving the work efficiency and production capacity of labor force, enterprises can finally improve their competitiveness and service level.

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