

The Impact of industrial upgrading on labor income: Evidence from China

Yuhao Zhang

Guangzhou Foreign Language School, Guangzhou, 511457, China

Abstract. This paper demonstrates a new way of industrial upgrading from the perspective of improving labor income. By constructing a new index to measure urban industrial upgrading, the influence of regional industrial upgrading on labor income is more accurately evaluated. The results show that industrial upgrading has significantly improved the labor income of employees. The effect of industrial upgrading is the result of the optimal redistribution of resources between industries and within industries. Industrial upgrading enhances the demand and dependence of enterprises on high-skilled labor, that is, human capital. This skill structure change of labor income increases the total labor remuneration by increasing the relative wages, the proportion of employees and labor income of high-skilled workers.

Keywords: industrial upgrading, labor income, industrial internal structure optimization, labor income skill structure.

1. Introduction

In fact, in different countries, many traditional industries have begun to seek their way out through industrial upgrading, such as using big data technology to simplify factory management procedures and optimize data statistics. The use of these new technologies and the upgrading of the industry will inevitably affect the wages of employees and the factory job demands make a difference.

How is the impact of industrial upgrading on employee's salary? On one hand, the impact of industrial upgrading for traditional industries is under hot discussion. It goes through these studies to find the balanced strategy between the company and its employees about the cost and profit. On the other hand, industrial upgrading often substitute some traditional jobs. At the same time, some new positions will also be created with more significant importance. The new relationship between industrial upgrading on employee's salary focuses on the manager and the employees. How to find a reasonable balance between industrial upgrading and employee's salary remains debatable.

The main topic of this paper is the impact of industrial upgrading on employee compensation. This article is mainly about the impact of industrial upgrading of traditional industries to make a discussion. Industrial upgrading is the improvement of production factors, structural changes, production efficiency and product quality improvement, and industrial chain upgrading that increase the added value of products. The essence of industrial upgrading is to open up the information asymmetry in product circulation through the outbreak of Internet, big data, artificial intelligence and other technologies and upgraded business concepts and methods, and accelerate the transmission of information from production to consumption, so as to achieve integration.

We also need to go through these studies to find a good one for the company and its employees a plan for salary changes. In fact, in China today, many traditional industries have begun to seek their way out through industrial upgrading, such as using big data technology to simplify factory management procedures and optimize data statistics. The use of these new technologies and the upgrading of the industry will inevitably affect the wages of employees and the factory job demands make a difference.

2. Hypothesis

First of all, industrial upgrading will have an impact on the employment structure. In the process of industrial upgrading, some traditional industries may face overcapacity and market contraction,

and the result of these problems is that enterprises face layoffs. However, due to the change in job demand caused by industrial upgrading, some previously important jobs will be replaced by big data, and the salary of some new occupations that were not important or did not appear before will increase.

With the development of science and technology and society, traditional industries continue to upgrade in the direction of intelligence and digitalization. These transformations not only have a profound impact on industrial development, but also put forward higher requirements for talent demand and cultivation. The impact of upgrading traditional industries on talent demand With the development of traditional industries towards digitalization and intelligence, the requirements for talent demand are also constantly increasing. We no longer need only skilled workers, but also people with high quality, global vision and innovative thinking.

The specific performance is in the following three aspects: (1) Skilled personnel: In the field of industrial manufacturing, the mechanical operation of traditional workers needs to be gradually converted to the control and maintenance of computers and robots. Therefore, there is a need for workers with relevant skills such as computer and robot programming, as well as software developers with strong machine learning and artificial intelligence skills. (2) Innovative talents: In the field of digitalization, talents with global vision and innovative thinking ability are needed, such as data engineers and data analysts. These careers require transforming massive amounts of data into useful insights and improving business processes through innovative approaches. (3) Managerial talents: In the field of digitalization and intelligence, managers need to have IT knowledge and management skills to further understand the integration and utilization of data and information. In addition, they need to have the knowledge and skills to work with different international and local business partners.

Industrial upgrading will have a differentiated impact on employee salaries. For example, some positions that were relatively important before are less important after industrial upgrading, but positions that were not so important before, or professional preferences that have never appeared, are better because of industrial upgrading, just like when your enterprise is digitally upgraded. There may not have been a position of data administrator before, but after the industrial upgrading, there will be a digital information administrator in your enterprise post, and there may have been a special statistician in the past, but after the industrial upgrading, the former data statistician may not be needed by the enterprise, so the industrial upgrading will have a differentiated impact on the salary of employees.

Industrial upgrading will have a positive impact on the wages of skilled talents. For example, Technical talents can better help the factory to carry out some high-pass machine use, which can greatly improve the efficiency of the factory, reduce loss and reduce costs. Innovative talents can help the factory to design a good system or software with a variety of functions to help the factory more conveniently coordinate and manage the distribution of data.

Abouting the managment talents, when an enterprise carries out industrial upgrading, the process of the factory will be clearly divided into many parts, each of which has its own work and needs to perform its own duties. At this time, a good manager and a good managerial position will be particularly important. To play a role of connecting the preceding and the following to view the overall situation, compared with the importance of traditional factory management positions, the importance of management positions will be increased

However, industrial upgrading will have a negative impact on the salary of posts with statistical data. In traditional factories before industrial upgrading, manual workers are required to complete the statistical classification and summary of all data. At this time, their importance to the factory is obvious, but their workload is also very large and cumbersome, resulting in large errors in their work results, which cannot be completely accurate. Therefore, after industrial upgrading, enterprises will classify these information accurately through digital management, which greatly reduces the cost and improves the accuracy. Therefore, at this time, the factory is not so necessary for the posts of statistical information, so it has a negative impact on their wages

Industrial upgrading may lead to job substitution. Just like a traditional industry, there used to be a special staff to count the quantity and variety of products in the warehouse. This work was

particularly important before industrial upgrading. His work is replaced by the work of people sitting in front of computers in digital management and you can see that industrial upgrading will produce job substitution

In fact, industrial upgrading is the embodiment of scientific and technological innovation. For example, in traditional factories, all data statistics have to be completed manually, which is very time-consuming and laborious, and there are great errors. However, when an enterprise invents an application program that facilitates and centrally manages data analysis and classification through scientific and technological innovation, it can greatly save time. And improve data accuracy to reduce costs, which is also a symbol of technological innovation prompted by industrial upgrading.

3. Data, variables and methods

3.1 Data

First, the questions in this paper involve the two core variables of industrial upgrading and labor income share at the city level. Among them, urban industrial upgrading is measured by urban technical complexity, which in turn involves the technical complexity of each segment of the urban industrial sector and the city's industrial structure. The calculation of the former can be based on the HS six-digit product technology of the CEPII website Complexity data, the calculation of the latter can be based on the "China Industrial Enterprise Database".

To calculate the urban labor income share, you can first calculate the labor income share of each enterprise in the city, and then aggregate it to the city level. The calculation of enterprise labor income share can be based on the "China Industrial Enterprise Database". Secondly, some of the control variables at the city level come directly from the "China City Statistical Yearbook", and the other part is obtained through the aggregation of enterprise data. Finally, the mechanism analysis also involves related variables that represent the skill structure of urban labor income, which can be obtained from the "2004 National Industrial Census Data", "2000 National Population Census Data", "2005 Population Sample Survey Data" and so on. It should be noted that the industry and city code classification standards have been adjusted during the sample period. For the sake of accuracy, this paper unifies the industry codes and city codes as follows: First, the old industry classification standards before 2003 (GB/T 4754-1994) and the new standard (GB/T 4754-2002); the second is to unify the adjusted city code with the 1999 national classification standard (GB/T 2260-1999). In addition, the outliers in the data were eliminated according to the two core variables, which can effectively reduce the measurement error in the construction of synthetic instrumental variables in this paper (Enamorado et al., 2016).

Starting from the availability of data, the window period of this study is selected as 1998-2007, and with 2002 as the boundary, the sample is divided into two periods: 1998-2001 and 2002-2007. The main reasons for this division are as follows: First, China's accession to the WTO at the end of 2001 can be regarded as an important milestone for China's integration into the global economy, and trade liberalization has profoundly affected China's industrial upgrading and labor income distribution (Yu Miaojie and Liang Zhonghua, 2014; Zhou Mao et al., 2016); Second, 2002 is considered to be the first year of China's rapid economic development. From 1998 to 2001, China's economy was basically in the mid-high adjustment period. From 2002 to 2007, due to the joint promotion of domestic and foreign favorable factors, China's Continue to maintain an average annual high growth rate of about 12%. The economic environments of the two stages are quite different, which may lead to systematic differences in industrial upgrading and labor income share changes.

3.2 Variables

How to effectively measure industrial upgrading is a difficult point. The traditional industrial structure method mainly focuses on the proportion of industries in different development stages and regions, such as the proportion of three industries or the proportion of industries with different factor characteristics. The method is more suitable for characterizing changes in industrial structure rather

than industrial upgrading. Another commonly used measurement is to judge the development level of an industry based on its link or potential in the global value chain. This method is closer to the essence of industrial upgrading, but its measurement effect mainly depends on the various aspects of the product chain. The difficulty of segment segmentation and the accuracy of value-added calculation of products in each link, and the process of industrial transfer to higher value-added and higher productivity economic activities also emphasize the core role of technological progress as the basic driving force. Therefore, a large amount of literature in recent years is based on Hausmann et al.

The concept of technical complexity proposed by (2007) constructs the technical complexity of China's exports (Rodrik, 2006) and the spatial structure index of export products (Zhang Qizai, 2014; Deng Xiangrong and Cao Hong, 2016), which are used to represent the upgrading of China's exports, but the export industrial structure The meaning of upgrading is not the same as the upgrading of urban production structure that this paper focuses on. For this reason, on this basis, this paper further refers to the practice of Zhou Mao et al. (2016) to construct the urban technical complexity index $soph_{c,t}$. The change of this index in two periods can measure the upgrading of urban industries:

$$soph_{c,t} = \frac{\sum iOutput_{i,c,t} \times Prdy_{i,92}}{\sum iOutput_{i,c,t}} \quad (1)$$

In the above formula, $Prdy_{i,92}$ is the technical complexity of industry i in 1992, which can be obtained from the simple average of the six-digit product technical complexity of each HS in the industry, and the technical complexity of each product is actually determined by the global production structure of the product (Hausmann et al. , 2007). $Output_{i,c,t}$ Indicates the output of industry i in city c in year t , and indicates the internal industrial production structure of the city, which is obtained by summing up the output of enterprises in each industry.

Different from previous literatures that mostly use export technology complexity to discuss export structure, this paper first uses Hausmann et al. (2007) method to measure the technical complexity of different industries, and then use the production structure (i.e. weight) of each city in my country, ② instead of the export structure, to construct indicators that characterize urban industrial upgrading. Therefore, this paper focuses on the production structure of cities An escalation problem rather than an escalation problem of the export structure. The reason why the technical complexity value of each industry is fixed at 1992 is to exclude the natural change of the technical complexity of a certain city's industry at the global level, so as to identify the impact of industrial structure adjustment within the city. The window period of investigation is from 1998 to 2007. Fixing the technical complexity benchmark of each industry at 1992 (the earliest year available for the HS92 classification standard) as far as possible from the window period can increase the exogenous nature of this variable.

Another key variable in this paper is the labor income share (LSc,t) at the city level. Considering the availability of data, this paper first calculates the labor income share of each enterprise in the city, and then sums it up to the city level. The existing literature mainly uses the value-added method for calculation (Bai Chongen et al., 2008; Lu Bingyang and Guo Qingwang, 2012; Wei Xiahai et al., 2013; Jia Kun and Shen Guangjun, 2016). The labor income share of enterprises is represented by the proportion of employee remuneration (composed of wages and welfare fees) in value added. Among them, the added value is calculated based on the income method, which is obtained by summing up four parts: labor compensation, depreciation for the year, operating surplus and net production tax.

In the selection of control variables, this paper mainly controls the relevant characteristics at the city level. According to the literature of Bai Chongen et al. Industrial structure (represented by the proportion of the primary industry and the secondary industry in the added value), the proportion of state-owned economy (expressed by the output value of state-owned enterprises/total output value), the degree of market competition (expressed by the Herfindahl index), the degree of trade openness (Expressed by export/GDP), the proportion of foreign investment (expressed by FDI/GDP). Considering the construction process of instrumental variables for industrial upgrading, the predicted value of industrial output of each city is also controlled (expressed by the overall trend of national industrial output except the city). In addition, city and time fixed effects are controlled for. In the

mechanism analysis, related variables that represent the structure of urban labor skills are involved, mainly including the skill structure of labor income (expressed by the labor income of high-skilled workers/low-skilled workers), the skill structure of the number of laborers (expressed by the number of high-skilled workers /the number of low-skilled workers), and the skill premium of wages (expressed by the wage level of high-skilled workers/wage level of low-skilled workers). It should be noted that the calculation of the above variables requires more detailed individual labor data.

During the window period, we based on the "2004 National Industrial Census Data", "2000 National Population Census Data" and "2005 Population Sample Survey Data" to obtain the education level of individual workers (as a proxy variable for skills) and wage information. However, since the first two types of data still lack individual wage information of workers, the skill premium of wages is estimated by the method of Chen Bo and He Chaoqun (2013).

3.3 Estimation method The benchmark regression model in this paper is set as follows

$$\Delta L S_{c,t,t+j} = \alpha + \beta \widehat{soph}_{c,t,t+j} + \lambda \Delta X_{c,t,t+j} + \sigma_c + \sigma_t + \varepsilon_{c,t} \quad (2)$$

In the above formula, $\widehat{soph}_{c,t,t+j}$ Indicates the change rate of the technical complexity of city c in period $t + j$ relative to period t , which is used to represent the city's industrial upgrading (or industrial technological regression); $\Delta L S_{c,t,t+j}$ Indicates the change in the urban labor income share between the two periods; $\Delta X_{c,t,t+j}$ is the change of the control variable in the two periods, and this paper refers to the change of relevant important characteristics at the city level; σ_c and σ_t It is city fixed effect and stage fixed effect, which is used to eliminate the impact of urban characteristics that do not change over time and the exogenous impact that affects all cities at the same time; $\varepsilon_{c,t}$ represents the random error term.

This paper focuses on the coefficient β , which reflects the impact of industrial upgrading on the labor income share. Combined with the above division of different stages of the sample period, in fact, the regression analysis will be carried out based on the panel data composed of two difference sections from 1998 to 2001 and from 2002 to 2007. It should be noted that if the OLS method is used directly to regress Equation (2), it may face potential endogeneity problems, which is also a difficult point in the quantitative evaluation of industrial upgrading effects.

Aiming at the shortcomings of using GMM to estimate the lagged term of endogenous variables as an instrumental variable in the past literature, this paper draws on the ideas of Chodorow-reich & Wieland (2016) to construct a more reasonable and optimized instrumental variable for industrial upgrading for the first time, so as to better Address endogeneity in evaluation. The specific idea is as follows: The change rate of technical complexity of a city in two periods is:

$$\widehat{soph}_{c,t,t+j} = \frac{soph_{c,t+j}}{soph_{c,t}} - 1 \quad (3)$$

We can reasonably assume that the city's technical complexity at the beginning of a period (such as period t) $soph_{c,t}$ It is given exogenously in the window period, so with the dynamic change of technical complexity, the potential endogenous problems in the process of industrial upgrading are mainly related to the urban technical complexity at the end of the period (such as period $t + j$). $soph_{c,t+j}$ related. According to formula (1), calculates $soph_{c,t+j}$ The industrial structure of the city at the end of the period used $Output_{c,i,t+j} / Output_{c,t+j}$ (Hereinafter abbreviated as $Sc_{i,t+j}$) Has a strong endogeneity. In this regard, try to use the given initial industrial structure $Sc_{i,t}$ and exogenous construction of the predictive value of the city's industrial growth $Sc_{i,t+j}$ The exogenous instrumental variable of $S_{c,i,t+j}^b$, details as follows:

The predicted value of the growth rate of the output value of each industry i in a single city c in the two periods ($g_{-c,i,t,t+j}$) for:

$$g_{-c,i,t,t+j} = \frac{Output_{-c,i,t,t+j}}{Output_{-c,i,t}} - 1 \quad (4)$$

In the above formula, $\frac{Output_{-c,i,t,t+j}}{Output_{-c,i,t}}$ Indicates the predicted value of the proportion of output value of industry i in city c during the two periods, $Output_{-c,i,t}$ It is obtained by summing up the output value of industry i in all cities except city c in period t . In other words, the general trend of national (excluding the city) growth of a certain industry is used here to predict the growth of the city in this industry. Its rationality lies in the fact that the general trend of the national growth of a specific industry must be closely related to the growth of the industry in that single city. At the same time, since the forecast value represents the general trend of the growth of the whole country (excluding the city), it will not directly affect the factor structure of the city's industry (such as labor income share). Therefore, logically speaking, using the predicted value as an instrumental variable for actual output changes in each city can better meet the two criteria for instrumental variable construction. On this basis, further calculate the predicted value of the growth rate of total output value of city c in the two periods:

$$g_{-c,i,t,t+j} = \sum_i S_{c,i,t} g_{-c,i,t,t+j} \quad (5)$$

Then, by calculation, we can get $S_{c,i,t+j}$ predicted value of $S_{c,i,t+j}^b$ for:

$$S_{c,i,t+j}^b = S_{c,i,t} \frac{1+g_{-c,i,t,t+j}}{1+g_{-c,t,t+j}} \quad (6)$$

Finally, the $S_{c,i,t+j}^b$ Substituting into formula (1), the exogenous predicted value of urban technical complexity at the end of the period is:

$$Soph_{c,t+j}^b = \sum_i Prdy_{i,92} \times S_{c,i,t+j}^b \quad (7)$$

Furthermore, according to formula (3), the predicted value of the change rate of technical complexity of a city in two periods is:

$$\widehat{Soph}_{c,t+j}^b = \frac{Soph_{c,t+j}^b}{Soph_{c,t}} - 1 \quad (8)$$

In the above formula, the final $\widehat{Soph}_{c,t+j}^b$ As an instrumental variable for changes in the city's actual technological complexity (actual industrial upgrading). The construction idea of this "Bartik instrument" synthetic instrument variable was first seen in McGuire & Bartik (1992), Blanchard & Katz (1992) and other documents. In view of its superiority, the relevant application of this method is also relatively extensive in recent years, such as Boustan et al. (2013) and Enamorado et al. (2016) used a similar method to examine the impact of income inequality on fiscal balances and crime rates based on the prediction of income inequality. Chodorow-Reich & Wieland (2016) examined the labor force based on the The impact of the reset on the business cycle. This paper applies this method to the prediction of regional industrial structure (or production resource reset).

4. Results

First, a simple OLS method is used to initially estimate the impact of urban industrial upgrading on labor income share. As shown in columns (1) and (2) of Table 1(B), regardless of whether control variables are introduced, the impact of urban industrial upgrading on the labor income share is positive but not significant. This result can preliminarily reflect the correlation between the two, but due to the potential endogeneity, it cannot explain the causality. In this regard, the instrumental variable method used in this paper can better control the endogenous nature of industrial upgrading, so as to more accurately evaluate the income distribution effect of industrial upgrading.

Table 1 Benchmark regression results

2SLS first stage regression results		
Explained variable: actual industrial upgrading	(1)	(2)
Forecast of industrial upgrading	0.7558*** (0.1642)	0.6736** (0.1999)
City-level control variables	N	Y
city fixed effect	Y	Y

stage fixed effects	Y	Y
R2	0.6053	0.6547
Observations	500	500

Table 2 The second stage of 2SLS: the impact of industrial upgrading on labor income share

Explained variable: Change in labor income share	OLS		IV	
	(1)	(2)	(3)	(4)
actual industrial upgrading	0.2625	0.2878	1.2525***	2.3829***
	(0.1663)	(0.2192)	(0.4463)	(0.7273)
City-level control variables	N	Y	N	Y
city fixed effect	Y	Y	Y	Y
stage fixed effects	Y	Y	Y	Y
F-statistic	21.173	14.970		
R2	0.4712	0.5676	0.3800	0.2295
Observations	500	500	500	500

Note: The robust standard errors are in brackets, ***, **, and * represent significant at the levels of 1%, 5%, and 10%, respectively; the control variables at the city level include the level of economic development, the proportion of the primary industry, and the proportion of the secondary industry Proportion, proportion of state-owned economy, degree of market competition, proportion of export, proportion of foreign investment, forecasted industrial output, etc., are not reported due to space limitations; the regression of this table is based on panel data composed of two differential cross-sections from 1998-2001 and 2002-2007 .

Specifically, this combines the initial industrial structure of each city in the sample period and the general industrial development trend of the whole country (excluding this city) to measure the predicted value of the city's industrial development, so as to construct a synthetic tool variable for endogenous urban industrial upgrading. Intuitively speaking, on the one hand, the industrial development of a specific city usually maintains a strong synchronization with the general trend of the country. On the other hand, considering that the initial industrial structure of other cities is given exogenously within the sample period, the industrial upgrading of this city based on the general trend of industrial development in the whole country (excluding this city) will not directly affect the labor income share of this city.

In order to further confirm the effectiveness of this instrumental variable, this paper conducts the following two tests: First, to test whether this exclusive instrumental variable is related to the regression variable (that is, the actual industrial upgrading of the city), and judge it through the first-stage regression results of 2SLS. As shown in columns (1) and (2) of Table 1(A), the correlation coefficient between the predicted value of urban industrial upgrading synthesized in this paper and the actual value reaches about 0.7 and is very significant. It can be considered that this instrumental variable satisfies the Correlation requirements; second, if there is a weak correlation between the instrumental variable and the regression variable, the estimation based on the instrumental variable will be invalid, which can be judged by the F statistic.

As shown in Table 1(B), the values of F statistics are all greater than 10. According to the standard of Staiger & Stock (1997), there is no weak correlation problem for this instrumental variable. Given the well-characterized instrumental variables described above, columns (3) and (4) of Table 1(B) report the results of the second phase of 2SLS. Column (3) does not include control variables when the city fixed effects and stage fixed effects are controlled. The results show that urban industrial upgrading can significantly improve the labor income share. After adding control variables in column (4), the effect is slightly has increased, but is still quite robust compared to column (3).

The results show that for every 1% increase in the intensity of industrial upgrading, the labor income share increases by about 2%. From 1998 to 2007, my country's actual industrial upgrading was about 3%. According to the estimation results of this paper, industrial upgrading will bring about a 6% increase in labor income share. In recent years, the problem of continuous decline of my country's labor income share (primary income distribution imbalance) has become prominent, and the existing studies are almost all carried out from the perspective of explaining the decline.

Relatively speaking, the findings of this paper that industrial upgrading is conducive to improving the labor income share are relatively new. The findings of this paper also have important implications for how to alleviate the decline in my country's labor income share and the formulation and implementation of related industrial policies in the future. In addition, comparing the estimation results of the instrumental variables with the simple OLS estimation results further confirms that there are serious endogeneity problems in the evaluation process of the industrial upgrading effect.

For robustness test, industrial structure is a key component of urban industrial upgrading indicators. Columns (1)-(2) in Table 2 use different methods to measure industrial structure, and then use new variables to estimate the benchmark model. On the one hand, it uses the number of employees in another commonly used index industry to measure the scale of the industry in addition to the total output value, and on the other hand, it sums up from different dimensions to the level of 2-digit industries (the benchmark model uses 4-digit industries).

The results show that the impact is still significantly positive. Second, columns (3)-(5) use a different approach to reflect the labor share of income. First, the labor income share is calculated using the factor approach. In theory, the net production tax is usually only the government's share of national income and does not involve the direct creation of added value. Therefore, the net production tax can be eliminated from the added value based on the income method. Chen Yufeng et al. (2013) called it element method. The results in column (3) show that the estimated results are robust. Then use the wage level (positively correlated with labor compensation) and per capita capital (positively correlated with capital compensation) to replace the labor income share to indirectly verify the stability of the baseline regression.

As shown in columns (4) and (5), the impact of industrial upgrading on wages The impact on capital per capita is significantly positive, and the impact on capital per capita is significantly negative, both of which are consistent with the benchmark results. Third, although urban characteristics and two-way fixed effects have been controlled in the baseline regression to alleviate the problem of omitted variables, there may still be some factors that change over time and place that are difficult to observe and control, such as the different speeds of social welfare growth in different regions May affect the labor share of income, leading to estimation bias.

Column (6) further controls the fixed effect of the province where the city is located (time, and the estimated result is still robust. Fourth, in order to better capture the long-term impact of industrial upgrading on changes in regional labor income shares, this paper refers to Enamorado et al. (2016) etc., use the first and last two years (1998 and 2007) of the full sample to construct a longer time difference in the sample period to test the robustness of the benchmark results. The long difference regression results in column (7) show that the industry The long-term impact of upgrading on changes in regional labor income shares is significantly positive, and the coefficient is slightly larger than the baseline regression results, and the estimated results are robust.

Limited to data feasibility, the window periods of the baseline regressions in this paper are 1998-2001 and 2002-2007 In order to investigate whether the "new normal" stage will affect the estimated results, this paper estimates the capital depreciation of all enterprises in 2008, and then calculates the added value of enterprises according to the income method, and then obtains the labor income share of enterprises in 2008 and The share of urban labor income required in this paper. Without considering the change of statistical standards for enterprises above designated size in 2013, the 2008-2013 stage can be added on the basis of the two stages. As shown in column (8) of Table 2 , using the newly constructed three-stage panel data for instrumental variable regression, the estimated coefficients are

very close to the two-stage estimation results, and they are all very significant, indicating that the core estimation results will not be substantially affected by the new stage.

Table 3 Robustness check

Explained variable: change in labor income share	Calculating Industrial Structure Using Number of Employed Persons	Based on 2-digit industry calculation on industry structure	Calculation of labor income share using the factor approach	Wages	capital per capita	Control province $\times$ time fixed effect	1998-2007 Long Difference Regression	Added 2008-2013 estimates for new phase
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
actual industrial upgrading	2.4890*** (0.8408)	0.8413** (0.3893)	2.2974*** (0.6794)	31.2753*** (10.1119)	-18.0705* ** (5.0000)	2.7719* ** (0.9269)	3.2711*** (0.6023)	2.3649** * (0.8628)
City-level control variables	Y	Y	Y	Y	Y	Y	Y	Y
city fixed effect	Y	Y	Y	Y	Y	Y	N	Y
stage fixed effects	Y	Y	Y	Y	Y	Y	N	Y
F-statistic	13.989	42.583	14.970	14.970	14.970	9.055	21.637	37.313
R2	0.3131	0.4214	0.5988	0.5757	0.2791	0.5628	0.3456	0.5096
Observations	500	500	500	500	500	500	500	500

5. Conclusion

This paper demonstrates a new way to improve welfare through industrial upgrading from the perspective of alleviating the imbalance of income distribution, that is, improving the labor income share. In view of the insufficiency of the existing research on the quantitative evaluation of China's industrial upgrading effect, this paper first constructs a new index to measure industrial upgrading from the perspective of technological progress around the industrial sector. This index can better represent the true connotation of contemporary industrial upgrading. Secondly, for the first time, combined with the initial industrial structure of each city in the sample period and the predicted value of the city's industrial development measured by the general trend of national industrial development, a synthetic tool variable for endogenous industrial upgrading was constructed, which enhanced the accuracy of the assessment.

On the basis of the above, this paper empirically evaluates the impact and mechanism of industrial upgrading in China on the labor income share during 1998-2007. The research results show that industrial upgrading has significantly increased the labor income share. From the perspective of the impact mechanism, the effect of industrial upgrading is the result of the combined effect of resource optimization and redistribution between industries and within industries. Further analysis at the factor

level shows that industrial upgrading has increased the demand and dependence on high-skilled labor, that is, human capital.

This change in the skill structure of labor income increases the relative wages of high-skilled labor, the proportion of employees, and labor income, thereby The proportion of total labor remuneration in value added has been increased. The policy inspiration of this paper is that in accelerating the process of industrial upgrading, we must correctly handle the relationship between industrial upgrading, capital-biased technological progress, and income distribution.

In order to avoid the "crowding out" of labor by technological progress, it is necessary to gradually abandon the original method of blindly adopting simple capital deepening to promote industrial upgrading, pay attention to the combination of capital and labor factors, and seek new kinetic energy for industrial upgrading with the help of capital advantages. On the other hand, it is necessary to vigorously improve the skills and quality of workers and accelerate the transformation of the labor force structure to meet the needs and matching of workers for high-level industrial upgrading. This can become a long-term driving force for industrial upgrading without reducing labor costs income share.

References

- [1] Akerberg,D.A.,K.Caves,and G.Frazer,2015, "Identification Properties of Recent Production Function Estimators", *Econometrica*,83(6),2411-2451.
- [2] Acemoglu,D.,S.Johnson,and J.Robinson,2002,"Reversal of Fortune: Geography and Institutions in the Making of the Modern World Income Distribution",*Quarterly Journal of Economics*,117(4),1231-1294.
- [3] Angrist,J.,and A.Krueger,1991,"Does Compulsory School Attendance Affect Schooling and Earnings?",*Quarterly Journal of Economics*,106(4),979-1014.
- [4] Angrist,J.D.,and J.S.Pischke,2008,*Mostly Harmless Econometrics: An Empiricist's Companion*,Princeton University Press.
- [5] Baily,M.N.,C.Hulten,and D.Campbell,1992,"Productivity Dynamics in Manufacturing Establishments",*Brookings Papers on Economic Activity*,1,187-249.
- [6] Blanchard,O.J.,L.F.Katz,R.E.Hall, and B. Eichengreen,1992,"Regional Evolutions", *Brookings Papers on Economic Activity*,(1),1-75.
- [7] Boustan,L.,F.Ferreira,H.Winkler,and E.M.Zolt,2013,"The Effect of Rising Income Inequality on Taxation and Public Expenditures: Evidence from US Municipalities and School Districts,1970-2000 ",*Review of Economics and Statistics*,95 (4),1291-1302.
- [8] Brandt,L.,J.Van Biesebroeck,and Y.Zhang,2012,"Creative Accounting or Creative Destruction? Firm-level Productivity Growth in Chinese Manufacturing",*Journal of Development Economics*,97(2),339-351.
- [9] Chodorow-Reich,G.,and J.Wieland,2016,"Secular Labor Reallocation and Business Cycles",*Working Paper*(No.w21864),NBER.
- [10] Cragg,J.G.,and S.G.Donald,1993,"Testing Identifiability and Specification in Instrumental Variable Models",*Econometric Theory*, 9(2),222-240.
- [11] Enamorado,T.,L.F.López-Calva,C.Rodríguez-Castelán,and H.Winkler,2016,"Income Inequality and Violent Crime:Evidence from Mexico's Drug War",*Journal of Development Economics*,120,128-143.
- [12] Hausmann,R.,J.Hwang,and D.Rodrik,2007,"What You Export Matters",*Journal of Economic Growth*,12(1),1-25.
- [13] McGuire,T.J.,and T.J.Bartik,1992,"Who Benefits from State and Local Economic Development Policies?",*National TaxJournal*,45(4),457-459.
- [14] Melitz,M.J.,and S.Polanec,2015,"Dynamic Olley-Pakes Productivity Decomposition with Entry and Exit",*RAND Journal of Economics*,46(2),362-375.
- [15] Rodrik,D.,2006,"What's so Special about China's Exports",*China & World Economy*, 14(5),1-19.
- [16] Roodman,D.,2009,"A Note on the Theme of Too Many Instruments",*Oxford Bulletin of Economics and Statistics*,71(1),135-158.

- [17] Staiger,D.,and J.H.Stock,1997,“Instrumental Variables Regression with Weak Instruments”,*Econometrica*,65 (3), 557-586.
- [18] Andreu.Mas-Colell, *Microeconomic theory*, Oxford University Press, 1995.
- [19] Alchian, A.A. (1950) ‘Uncertainty, evolution, and economic theory’, *Journal of Political Economy* 58:211-21.
- [20] Alchian, A.A. And Demsetz, H. (1972) ‘Production, information costs, and economic organization’, *American Economic Review* 62:777-95.
- [21] Becker,G.S. (1962) ‘Irrational behavior and economic theory’, *Journal of Political Economy* 70:1-13.
- [22] Brian Snowdon & Howard R. Vane, eds., *A Macroeconomics Reader*, New York: Routledge, 1997. p. 367.
- [23] Barro,R.,and Sala-i-Martin,X.,1995,*Economic Growth*, McGraw-Hill.
- [24] Banassy-Quere A, Coupet M and Mayer T. Institutional Determinants of Foreign Direct Investment, CEPII Working Document 2005-05.
- [25] Blaug, Mark, *Economic Theory in Retrospect*, 4thed., London: Cambridge University Press, 1985.
- [26] Cyert, R.M. and March, J.G. (1963) *A Behavioral Theory of the Firm*, Englewood Cliffs, New Jersey: Prentice Hall.
- [27] Dawson John W. Institutions, Investment and Growth: New Cross-Country and Panel Data Evidence. *Economic Inquiry*, 1998:603-619.
- [28] Dani Rodrik. Institutions for High Quality Growth: What They Are and How They Affect Growth. Paper prepared for the International Monetary Fund Conference on Second-Generation Reforms, Washington D.C., 8-9 November 1999.