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Study on the Influence of Labor Flow on Industrial Structure Upgrading in Western China

Xin Ying Sun[1], and Xingqi Zhao[2*]

Research Center for Economy of Upper Reaches of the Yangtze River, Chongqing Technology and Business University, Chongqing 400067, China.

[*]*Corresponding Author.* E-mail: 2764417014@qq.com

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Abstract

Under the implementation of the regional coordinated development strategy, the western region, as an important key point, should grasp the development opportunity. We must transform and upgrade the industrial structure to achieve coordinated regional development and promote high-quality economic development. As the most basic factor of production, labor plays an important role in upgrading industrial structure. Based on the provincial panel data of the western region from 2006 to 2019, a fixed-effects regression was used to study the impact of labor flow on industrial structure upgrading in the western region. It is found that labor flow has a significant impact on industrial structure upgrading, which is characterized by industrial upgrading and industrial structure rationalization, and it has a promoting effect on industrial structure upgrading. Therefore, the western region should reasonably guide the return of labor force, pay attention to the construction and improvement of infrastructure, improve the effective use of labor resources in the western region, pay attention to the reasonable distribution of labor force among the three industries, and promote the rational industrial layout in the western region, to promote the upgrading of the industrial structure better.

Keywords: China; Labor Flow; Industrial Structure Upgrading; The Western Region

Introduction

The report to the 20th National Congress of the Communist Party of China put forward: "We will thoroughly implement the strategy of coordinated regional development, major regional strategies, functional zones, and new-type urbanization, optimize the distribution of major productive forces, and build a regional economic layout and territorial space system featuring complementary advantages and high-quality development." Regional coordinated development strategy is an important strategic measure to realize our country's overall economic and social development and an important part of building a modernized economic system. Since the reform and opening up, China's economic performance has been on the whole sound development, and the GDP has continued to grow, gradually increasing from 54 trillion yuan to 110 trillion yuan, ranking second place in the world and achieving a historic leap in China's economic strength. However, China has a vast territory and a large population, and the natural resources endowment of different regions is quite different, so the economic and social development still has obvious problems of imbalance and insufficiency. As an important factor of production, the labor force plays an important role in upgrading industrial structure. The labor force flow in urban and rural areas and at the provincial level is now common, and the labor force flow back to the West is also increasing. The labor force is the most basic factor of production in the process of flow; its degree of matching with industrial structure will have a key impact on the adjustment and upgrading of industrial structure in the Western region.

With the support of implementing the Western development strategy and national policies, people gradually realized the many opportunities for the development of the Western region, which resulted in the return of the labor force, and some young people flocked to the Western region for development. The resulting population flow can bring new labor resources to the western region and inject new vitality into the region's economic development. By affecting the environment and market conditions of industrial development, the upgrading of the industrial structure in the region is also affected. Despite extensive research on industrial upgrading, the specific role of labor flow in China's western region has been underexplored. So, this study contributes new insights into the relationship between labor mobility and industrial development in a key emerging region of labor flow in China's western region that has been underexplored.

Literature Review of Rural Industrial Integration

Study on the characteristics and measurement of labor mobility

As an important factor of production, the labor force has been studied by many domestic scholars in a wide range of fields and rich contents. This paper mainly discusses labor flow's characteristics, measurement, and influencing factors. As for the characteristics of labor flow, labor flow will also show an agglomeration phenomenon. The flow trend to regions with higher economic development levels is obvious, forming an agglomeration trend within the spatial scope. In terms of the quantity of flow, the outward flow of the rural labor force is increasing day by day. In terms of the flow area, the outflow of the rural labor force is relatively concentrated, mainly from the central and western regions to the more developed areas in the East. China's labor flow has obvious stage differences with time and economic and social changes. In recent years, migrant workers, the mobile labor force's main body, have become increasingly inclined to "return" to work near their hometowns in the central and western regions or start their businesses. With the development of the economy and the change in people's concepts, the labor force is no longer a single outward flow as before. There is no direct measurement index for the measurement of labor flow, so scholars use approximate indicators. The proportion of agricultural employees in national employment is an indicator to

measure the labor force (Khamis et al., 2021) and the situation of labor flow in terms of the proportion and scale of migrant labor (Dorn & Zweimüller, 2021). Someone took the permanent population as the substitute variable of the working-age permanent population and the registered population as the substitute variable of the permanent population and calculated the degree of labor mobility as the ratio of the permanent population to the registered population(Xu & Jin, 2024).

Research on the motivation and measurement indicators of industrial structure upgrading.

The optimization and upgrading of industrial structure is a key measure to improve the comprehensive competitiveness of China's economy and an important support for sustainable and healthy economic development. Regarding the motivation for industrial structure upgrading, someone made a detailed analysis from five aspects: resource supply, consumer demand, technological innovation, opening to the outside world, and financial development (Allioui & Mourdi, 2023). Other people believe that industrial upgrading is mainly caused by the introduction of intellectual capital and human capital into the production process of goods and services due to the pursuit of the division of labor and transaction costs by economic entities (Zhou et al., 2022). In addition, one believes that the key to upgrading the industrial structure is to promote technological progress in heavy industry (You & Zhang, 2022). For the industrial structural upgrading of urban agglomerations in western China, the level of financial development is crucial to the upgrading of industrial structure (Wang & Wang, 2021). As for the measurement of industrial structure upgrading, domestic scholars do not have a unified measurement standard, and scholars adopt different measurement methods due to their research arrangements and research contents (Chen et al., 2021). Some scholars choose to use high-level representation, such as the ratio of the output value of the tertiary industry to that of the secondary industry. The first, second, and third industries should be empowered successively to build the industrial upgrading level coefficient (Gao et al., 2022). In addition, some scholars use the combination of industrial structure upgrading and industrial structure rationalization to measure (Wang et al., 2022). Most scholars use the deviation coefficient and Theil index to measure the rationalization of industrial structure.

Research on the impact of labor flow on industrial structure upgrading.

Domestic scholars' views on the impact of labor flow on the upgrading of industrial structure have not been unified, among which some scholars believe that labor flow plays a promoting role in upgrading industrial structure. Labor return not only increases labor supply but also provides a large number of laborers with labor skills, and its return provides necessary human resource support for accelerating the development of labor-intensive manufacturing industries in the central and western regions. Labor flow can promote the transformation and evolution of industrial structure from a lower form to a higher form. On the contrary, some scholars believe that labor flow hinders the upgrading of industrial structures. Some believe that cross-regional labor flow in China is one of the important reasons for the disparity in upgrading industrial structures in different regions (Mao et al., 2021). In particular, the excessive inflow of labor force in the eastern region and the great outflow of labor force in the central and western regions seriously restrict the upgrading of China's industrial structure. As for the tertiary industry, labor flow inhibits its internal upgrading.

The effect of labor flow on industrial structure upgrading

As a basic factor of production, the labor force is crucial to the production of enterprises and regions, and its flow will have an impact on the location choice of enterprises, thus reflecting the layout of industries (Kong et al., 2021). The external manifestation of labor mobility is the mass migration of the population. In terms of quantity, the number of the labor

force in the outflow area will decrease compared with that before the outflow area, which will further affect the number of enterprises recruiting workers in the outflow area, reduce the supply of labor force, and thus affect the development of the industry. On the contrary, due to the influx of labor force, the supply of labor force continues to increase, which promotes the development of enterprises and industries with sufficient labor security (Barinova et al., 2022). The rich labor resource area fully reflects its labor cost advantage, especially for labor-intensive industries; the richer the labor force in a region, the greater the labor supply, and the lower the labor cost than in other regions, which is conducive to the development of labor-intensive industries (Lopez-Acevedo et al., 2021).

People are the main body of social economy and labor, and when they engage in relevant personal economic activities and make corresponding decisions, they will have an impact on the whole society (Antonacopoulou et al., 2021). With the flow of labor, the market size will change, and this size will often show a trend of expansion. Enterprises tend to choose regions with larger market sizes for production, which will lead to more investment, produce a circular cumulative effect, and promote the emergence of economies of scale, which will attract more investment. This circular cumulative effect will eventually lead to the gradual improvement of regional infrastructure and reduced production costs (Zou et al., 2022). More and more enterprises and industries will choose to transfer and form industrial clusters in the area through the extension and deep integration of the industrial chain, improve resource utilization efficiency and economic benefits, achieve industrial coordinated development, optimize industrial layout, and promote the optimization and upgrading of industrial structure.

The flow of labor force promotes the change of the flow quantity between regions, which not only affects production but also has a certain impact on the consumption capacity and structure between regions (Wang et al., 2021). For the inflow area, the increase in the labor population means that the demand for life in all aspects also increases with the increase of the population, stimulating the consumption demand in the inflow area, and because of the different needs of people, it will also affect the local consumption structure, and then cause the adjustment of industrial structure. (Su et al., 2021), a large number of people to the outflow, the local consumer demand will be reduced, the market vitality will be low, and it is not conducive to the production and development of enterprises and industries.

As the founder of human capital theory, Schulz pointed out that people are the most important factors affecting economic development, and economic development cannot be separated from the role of human capital (Schultz, 1972). Similarly, enterprises and industries tend to choose production factors with high marginal efficiency to maximize their benefits. Different from human resources, human capital is the knowledge, skills, and physical strength of economic value existing in the human body (Su et al., 2021). With the flow of the labor force, human capital is accompanied by inter-regional transfer. Labor flow will change the industrial structure of the destination and destination to some extent, and the outflow of high-quality talents is not conducive to the development of capital-intensive and technology-intensive industries (Su et al., 2021). The more developed a region is, the inflow of high-quality talent will attract more talents, which will greatly benefit the scientific research and innovation of the destination (Zhou et al., 2018). The richer the human capital stock of a region, the gradually accumulated production experience and related labor skills, the continuous improvement of production efficiency, the strengthening of the scientific and technological vitality and capacity of the inflow area, thus attracting investment from other regions, and ultimately with the industrial transfer and development, the local industrial structure will be affected.

Model setting, indicator description, and data source.

1. Empirical model setting

To analyze the impact of labor flow on the upgrading of industrial structure, this paper will use the data of 11 provinces in western China from 2006 to 2019 to characterize the upgrading of industrial structure from the two dimensions of industrial structure upgrading and industrial structure rationalization and build a benchmark model of the impact of labor flow on the upgrading and rationalization of industrial structure. The following regression equation is used to describe the relationship between the existing variables:

$$TS_{it} = \beta_0 + \beta_1 LB_{it} + \gamma X_{it} + \mu_i + \theta_t + \varepsilon_{it} \quad (1)$$

$$TC_{it} = \beta_0 + \beta_1 LB_{it} + \gamma X_{it} + \mu_i + \theta_t + \varepsilon_{it} \quad (2)$$

In the above equation, the TS _it、TC _it, and LB _it represent the upgrading and deviation coefficients of the industrial structure of region i in year t and the labor mobility of region i in year t, respectively, and X_it represents the control variables of region i in year t. β_0、β_1、and γ represent the regression coefficients of the intercept term, labor flow, and control variables, respectively, and represent the direction and effect of the corresponding variables on the industrial structure. In addition, μ_i represents individual fixed effects, i.e., individual characteristics that do not change over time; θ_t denotes a fixed effect in time; ε_it represents a random distractor.

2. Variable selection and description

This paper selects various provinces, autonomous regions, and municipalities in western China from 2006 to 2019 as samples. Given the availability and accuracy of data, relevant data in Tibet are excluded. Specific indicators are described as follows:

Explained variables: industrial structure upgrading and industrial structure deviation coefficient (TS_it, TC_it). Based on the method of Gan Chunhui et al. (2011) this paper uses the ratio of the added value of the tertiary industry to the added value of the secondary industry to measure the upgrading of the industrial structure and based on the method of Li Jianhua (2022), uses the industrial structure deviation coefficient to measure the rationalization of industrial structure in the western region. TS=Y3/Y2. Y3 and Y2 represent the added value of the tertiary and secondary industries, respectively, and the larger the TS, the higher the level of industrial structure, the development of the economy towards service, and the upgrading of the industrial structure.

Core explanatory variable: labor flow (LB_it). Based on the practice of Xu Qingqing (2019). At the same time, the practice of Ye and others (2018) will also be used for reference, and the explanatory variable will be replaced when the proportion of floating population =1-the number of urban household registration population/the total population of the city at the end of the year is used for robustness test.

Control variables: Consumption Level (Conit), The level of consumption in a region by referring to the total retail sales of consumer goods/gross regional product; Technology level (lntvit), The number of local patent grants is analyzed using logarithm; Level of Openness (openit), Foreign direct investment/gross regional product is measured; Tax level (taxit), This paper uses government tax revenue/gross regional product to measure; Government Support (govit), This paper measures the local government's development support in terms of the general budget expenditure/gross regional product of local government finance; Educational attainment level (eduit),the number of students enrolled in regular higher education/resident population.

Empirical results and analysis

1. Descriptive analysis

Table 1 shows the descriptive statistics of this paper. According to the general analysis, a descriptive statistical analysis of variables is carried out based on the four aspects of the average value, standard deviation, minimum value, and maximum value of the sample. The relevant information is shown in the following table:

Table 1 Descriptive statistics

Var	N	Mean	St	Min	Max
TS	136	1.086	0.216	0.685	1.599
TC	136	2.361	0.701	1.092	6.035
LB	136	-0.055	0.022	-0.101	-0.007
edu	136	0.015	0.006	0.006	0.029
open	136	0.188	0.096	0.055	0.642
gov	136	0.320	0.128	0.152	0.758
tax	136	0.076	0.015	0.049	0.112
con	136	0.363	0.062	0.245	0.496
lntv	136	8.556	1.450	4.575	11.377
infra	136	0.366	0.255	0.080	1.300

The variables in the above table: TS="the advanced industrial structure", TC= "Rationalization of industrial structure", LB = "Labor flow", edu="educational level" , open="opening level", gov=" government support", ="tax burden level", and the variable con="consumption level", lntv="innovation level" infra="infrastructure level".

2. Regression results and analysis

According to the Hausmann test results, the fixed-effect model should be selected to influence labor flow in upgrading industrial structures. The following table shows the regression results of fixed and random effects of labor flow on industrial structure upgrading and industrial structure deviation coefficient, respectively.

Table 2 Results of baseline regression

	(1) TS	(2) TS	(3) TC	(4) TC
LB	2.693***	1.372	-8.803**	-6.173*
	(2.683)	(1.352)	(-2.181)	(-1.865)
Edu	4.413	0.693	-49.626	-36.170**
	(0.525)	(0.098)	(-1.468)	(-2.288)
Open	0.303**	0.332**	-1.012*	-1.905***
	(2.063)	(2.175)	(-1.710)	(-3.539)
Infra	0.916***	0.662***	-0.996*	0.163
	(6.452)	(5.542)	(-1.745)	(0.614)
Gov	0.477*	0.888***	-2.060**	-1.176**
	(1.893)	(4.045)	(-2.033)	(-2.035)
Tax	-4.208***	-4.964***	6.162	3.386
	(-3.563)	(-4.096)	(1.297)	(0.826)
Con	1.220***	1.014***	-2.019*	-0.123
	(4.355)	(3.600)	(-1.792)	(-0.125)
Lntv	0.001	0.026	0.101	-0.116*
	(0.032)	(0.978)	(0.805)	(-1.817)
_cons	0.492***	0.365**	3.242***	4.023***
	(3.048)	(2.222)	(4.998)	(7.385)
Model	FE	RE	FE	RE
F	35.644		21.643	

Note: (*** p<1%, **p<5%, *p<10%)

As shown in the above table, the regression results of model (1) show that the influence coefficient of industrial structure upgrading is 2.693, and is significantly positive at the significance level of 0.01. In other words, when the labor flow in the western region changes by one unit, the level of industrial structure upgrading will change by 2.693 units, indicating that labor flow does significantly affect the upgrading of industrial structure and labor inflow in the western region has a positive role in promoting the upgrading of industrial structure. Due to the strong support of the Western development strategy and relevant policies in recent years, some industries and enterprises in the eastern or central regions have accelerated their transfer to the Western region, resulting in a gradual and slow rise in the number of employees in the secondary and tertiary industries in the western region. The increase in the number of employees in the tertiary industry is better than that in the secondary industry, which is developing rapidly. Accelerated the upgrading of industrial structure. In model (3), the deviation coefficient of industrial structure will change by 8.803 units for each change of net labor mobility and pass the significant level of 0.05, which means that labor flow significantly impacts the deviation coefficient of industrial structure. The net labor migration rate increase will help reduce the deviation coefficient, which means the improvement of industrial rationalization. The reason is that although the flow of labor in the western region has been dominated by outflow in recent years, the scale and speed of outflow have eased.

Moreover, the country has accelerated the encouragement and implementation of the talent introduction strategy so that the labor resources in the western region can be reconfigured to a certain extent. Originally, a large number of labor forces were engaged in the primary industry, and the distribution of labor forces was unbalanced among industries. According to the reasonable division of labor, the distribution of labor forces among the three industries was gradually balanced, and the existing industrial structure layout was improved to make the

overall industrial structure reasonable. Therefore, from the perspective of the two dimensions, labor flow plays a significant role in promoting industrial upgrading.

According to the regression results of control variables, except education level and tax level, the other control variables significantly positively impact the upgrading of industrial structure in western China. The influence of consumption level on the upgrading of industrial structure is positive at the significant level of 0.01, and the influence coefficient is 1.220, indicating that the higher the consumption level of people in the western region, the more consumer demand and market potential, which has a positive effect on the upgrading of industrial structure. The influence coefficient of education level on upgrading industrial structure is positive, but not significant. Generally speaking, improving the education level can provide talent for the local area and better talent support. However, because the economic development level of the southwest region is far from that of the eastern region to a certain extent, under the open labor market, the developed eastern region is more attractive to high-quality talent, which leads to the outflow of talent, so it cannot have a significant impact on the industrial upgrading. Government expenditure has a significant positive impact on the upgrading of industrial structure, indicating that the increase of government expenditure and the gradual increase of support for the social and economic market will effectively improve the construction of infrastructure and improve the production environment, and play an important role in promoting the upgrading and development of the industrial structure.

Meanwhile, the influence coefficient of government expenditure on the degree of industrial deviation is -2.060. This indicates that an increase in government expenditure will reduce the deviation of industrial structure and promote the rationalization of industrial structure. The level of infrastructure and openness has a significant positive impact on the upgrading and rationalization of industrial structures, indicating that improving public services and infrastructure construction will be conducive to upgrading industrial structures. At the significant level of 0.01, the influence coefficient on the upgrading of industrial structure in the western region is negative, which indicates that the increase of tax revenue will hinder the upgrading of industrial structure. The reason is that increasing tax intensity will reduce enterprise assets and provide insufficient support for innovation and technological upgrading, which is not conducive to improving enterprises' production efficiency and, thus, to industrial upgrading.

3 Robustness test

To ensure the steady influence of labor flow on the upgrading of industrial structure, this paper replaces the indicators of labor flow under the condition that other conditions remain unchanged. The robustness test is carried out based on the practice of Ye and others (2018). After replacing indicators, the robustness test regression results are shown in the following table:

Table 3 Alternate explanatory variables regression results

Variable	(1) TS	(2) TS	(1) TC	(2) TC
LB	2.693***		-8.803**	
	(2.683)		(-2.181)	
Labor		0.710*		-4.295***
		(1.785)		(-2.762)
edu	4.413	5.827	-49.626	-57.376*
	(0.525)	(0.684)	(-1.468)	(-1.722)
open	0.303**	0.230	-1.012*	-1.542**
	(2.063)	(1.469)	(-1.710)	(-2.520)
infra	0.916***	0.877***	-0.996*	-1.299**
	(6.452)	(5.989)	(-1.745)	(-2.268)
gov	0.477*	0.543**	-2.060**	-1.709*
	(1.893)	(2.103)	(-2.033)	(-1.692)
Tax	-4.208***	-3.827***	6.162	4.391
	(-3.563)	(-3.218)	(1.297)	(0.944)
con	1.220***	1.054***	-2.019*	-1.848*
	(4.355)	(3.744)	(-1.792)	(-1.678)
lntv	0.001	0.015	0.101	0.140
	(0.032)	(0.461)	(0.805)	(1.113)
_cons	0.492***	0.274*	3.242***	3.881***
	(3.048)	(1.910)	(4.998)	(6.915)

As can be seen from the above table, after the substitution of explanatory variables, the influence of labor flow on the upgrading of industrial structure and the deviation degree of industrial structure is the same, and the significance level remains unchanged. It shows that the inflow of the labor force has a positive impact on the upgrading of industrial structure, and increasing the introduction of talents and rationally guiding the return of the labor force are expected to promote the upgrading of industrial structure in western China. In the robustness test, the influence of other control variables on the industrial structure upgrading index and industrial structure deviation coefficient is not significantly different from that of the benchmark model.

Conclusion

Based on the panel data of 11 provinces in western China from 2006 to 2019, this paper selected corresponding measurement methods for measurement and calculation, described the current situation of labor flow in western China, and built a fixed effect model to analyze the relationship between labor flow and the upgrading of industrial structure in western China. The results are as follows:

First of all, in terms of labor flow as a whole, in the early period, the flow of labor in Western China was mainly from the West to the developed areas in the East on a large scale, mainly because the country implemented the strategy of priority development. With the rapid economic development in the eastern region, the demand for labor force is large, and the salary of the labor force is good, which attracts a large number of labor force to go there. However, after 2012, the quantity and scale of labor outflow in the western region gradually slowed down, the outflow of labor gradually decreased, and some labor returned. In recent years, the state has paid more and more attention to the development of the western region. With the continuous

implementation and improvement of the Western development strategy and the construction of the Chengdu-Chongqing twin City economic circle, policy support has been provided for the development of the Western region, which has made the outflow of labor in the Western region fluctuate down, and the net migration rate and the number of returnees fluctuate up.

Secondly, in terms of industrial structure and upgrading in the western region, as time goes by, it is found that with the expansion of the contribution of the western region to the total economic volume of China, the industrial structure has also changed into type 3, 2 and 1, which shows that a series of policies implemented by the state in the western region have achieved certain results. Through the analysis of the structure of employment in the three industries in the western region, it can be seen that the proportion of employment in the primary and tertiary industries shows the opposite change, and the increase in the proportion of employment in the tertiary industry is unstoppable. There is a close relationship between the employment and industrial structures in western China. Regarding industrial structure upgrading in the western region, the coefficient of industrial structure upgrading in various provinces is constantly improving, and the gap is gradually narrowing. Although the coefficient of industrial structure deviation in some provinces in the western region is still different, the rationalization of industrial structure in the whole western region has shown a good trend in recent years.

Finally, based on the relevant theoretical basis of labor flow and industrial structure, this paper constructs a panel fixed effect model, collects, and uses relevant data, and conducts an empirical study on the relationship between labor flow and industrial structure upgrading. The empirical research results show that labor flow significantly impacts the upgrading of industrial structures. The net migration of the labor force will promote the upgrading of industrial structure and, at the same time, help to reduce the deviation coefficient of industrial structure, that is, promote the rationalization of industrial structure in the western region, so it is necessary to reasonably guide the return of labor resources to promote the upgrading of industrial structure. In addition to the influence of labor flow on the upgrading of industrial structure, market potential, consumption level, education level, infrastructure, and government support level also influence the upgrading of industrial structure in western China.

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