

Research on the Impact of Heterogeneous Labor Inflows on the Economic Growth of Regions on Both Sides of the Hu Huanyong Line

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Abstract: *In order to explore the path to break through the pattern of China's economic development locked by the Hu Huanyong line and realize the goal of common prosperity, this study analyzes the relationship between heterogeneous labor inflow and China's regional economic growth with the help of a panel fixed-effects model based on the panel data of China's 30 provincial-level administrative regions from 2009 to 2019. It is found that the inflow of high-skilled labor force has a promoting effect on regional economic growth in the whole country, while the inflow of low-skilled labor force has a suppressing effect on economic growth in the whole country and the southeast side of the Hu Huanyong line, while it has a promoting effect on economic growth in the northwest side of the Hu Huanyong line. Therefore, it is necessary to strengthen the education and training of the labor force, accelerate the industrialization of the northwestern region, and guide the rational movement of labor factors.*

Keywords: *Heterogeneous labor force; Involution; Hu Huanyong line*

1. Introduction

Narrowing the regional economic gap is the key to promoting the stable and coordinated development of the national economy, and is an inevitable requirement for realizing the goal of common prosperity for the entire nation. With the development of economy and society, the migration of labor from underdeveloped areas to developed areas has become a common phenomenon and law. At the same time, along with the large-scale mobility of labor, the population focus and economic focus on both sides of the Hu Huanyong Line have deviated significantly. Therefore, breaking through the pattern of China's economic development locked by the Hu Huanyong Line has become an important issue in realizing the goal of common prosperity. In the post-population dividend period, China's labor force inter-provincial mobility presents the spatial distribution characteristics of aggregation and dispersion, and the population density on the southeast side of the Hu Huanyong Line has shifted from the overall relative uniformity to the uneven distribution of the economically developed areas, which is now becoming more and more concentrated. In the case that inter-provincial migration of labor has become excessive, further clarification is needed regarding the impact of the inflow of labor with different skill levels on regional economic growth. Therefore, this study will draw on the theory of new economic geography to explore the following aspects: first, to portray the mechanism of labor inflow affecting regional economic growth and put forward the corresponding theoretical assumptions; second, to study the relationship between heterogeneous labor inflow and regional economic growth on both sides of the Hu Huanyong line with the help of the panel fixed effects model. And accordingly, corresponding policy recommendations are put forward to promote China's labor force structural reform, eliminate economic disparities, and realize China's high-quality economic development and the goal of common prosperity.

2. Theoretical analysis and research hypothesis

Research results on the relationship between labor inflow and regional economic growth can be roughly divided into two categories. First, it emphasizes that labor inflow promotes economic growth. Since the reform and opening up, the labor force has been greatly transferred according to its own needs, and the migration of the labor force can promote the formation of human capital in the inflow area, promote its own productivity, and thus promote economic growth. Second, it emphasizes the heterogeneous impact of labor inflow on economic growth. On the one hand, the promotion effect of labor inflow on regional economic growth is affected by the degree of education of the labor force,

especially the knowledge and technology spillover effect formed by the inflow of skilled labor to promote the concentration of talent in the inflow area, which is conducive to the upgrading of the industrial structure of the region, thus promoting regional economic growth. On the other hand, there is regional heterogeneity in the role of labor inflow on economic growth. With the in-depth development of reform, inter-provincial migration of labor has been excessive. The flow of labor between regions can promote economic growth. However, for regions with different levels of economic development, there are significant differences in the role of labor inflow in promoting regional economic growth. This is due to the fact that economically developed regions will attract a large concentration of labor, while excessive population concentration will inhibit regional economic growth.

In the neoclassical model, when the labor force flows from region A to region B, it will lead to the reduction of labor supply in region A, thus contributing to the rise of the wage level of the labor force in the region; due to the large inflow of labor factors into region B, it will lead to the increase of labor supply in the region, and the decline of the wage level. Regional economic growth is directly dependent on the flow of production factors, on the one hand, the inter-regional flow of labor can promote the optimal allocation of labor factors in each region, increase the labor force and the market and the suitability of the regional enterprises, which is conducive to the optimal production efficiency of regional labor factors. On the other hand, the inflow of labor to promote the formation of regional talent concentration, talent is the main carrier of technological innovation, labor inflow of knowledge, technology spillover effect can enhance the productivity of the economy, thereby promoting further growth of the regional economy^[1]. However, the study does not distinguish the flow of different skilled labor, in fact, the population density and economic disparity between the two sides of the Hu Huanyong line is obvious, and there are differences in the mobility thresholds of laborers with different skill level^[2], so what effect does the heterogeneous labor inflow have on the regional economic development needs to be further analyzed.

The siphon effect of economically developed regions is obvious, out of the need for their own development and the temptation of relative wage levels, labor tends to choose to flow from underdeveloped regions to economically developed regions^[3], and the level of population agglomeration in the inflow area increases. However, the flow of high-skilled labor tends to be more influenced by regional infrastructure, administration and other factors^[4], while the flow of low-skilled labor is generally influenced by the labor market. Therefore, high-skilled laborers generally move to economically developed regions with well-developed infrastructures, while when low-skilled laborers move to regions with higher wages, the high population density of the region causes the emergence of crowding effects, so laborers with lower skills are forced to move to sub-developed regions. The high population density of the region on the southeast side of the Hu Huanyong line may cause a crowding effect on the flow of labor^[5], thus weakening the mechanism of labor inflow on regional economic growth, while the population density of the region on the northwest side of the line is small, and thus the crowding effect on labor inflow may not be obvious.

That is to say, when the population density exceeds the critical point, the crowding effect brought about by over-concentration of population begins to appear, labor productivity decreases, and the tendency of involution appears, which will certainly be detrimental to the further development of the economy. The weak concentration of labor force in the western part of the Hu Huanyong Line continues, and the rich agricultural and animal husbandry resources are transformed into low efficiency and income, and there is a dilemma of having resources but no assets, which is not conducive to the coordinated development of the economy of the regions on both sides of the Hu Huanyong Line. In this situation, in order to eliminate regional economic disparities, realize high-quality economic development, and then realize the goal of common prosperity of the whole country, it is necessary to realize the reform of the allocation of labor factors. At the same time, the flow and distribution of labor force with different education level is an important reason for the imbalance of regional economic development, and the matching of labor force with the skills of jobs in different regions is the key to the disparity of economic level between regions. It can be seen that different types of labor mobility has a certain heterogeneous impact on economic development. Accordingly, the following hypotheses are proposed:

H1: Heterogeneous labor inflows contribute significantly to regional economic growth.

H2: There is regional heterogeneity in the impact of labor inflows on regional economic growth.

3. Model construction and data source

The characteristic implication of Jia Zhangke's film aesthetics is mainly discussed from two aspects

of regional culture and bottom culture.

3.1. Fixed effect model

Based on the above analysis, a panel fixed effects model is constructed in order to analyze the relationship between heterogeneous labor inflow and regional economic growth:

$$gdp_{it} = \alpha_0 + \alpha_1 gdp_{i(t-1)} + \alpha_2 lab1_{it} + \alpha_3 lab2_{it} + \alpha_4 X_{it} + \mu_i + v_t + \varepsilon_{it} \quad (1)$$

Among them, i stands for province, t represents year; gdp_{it} represents the level of regional economic growth; $gdp_{i(t-1)}$ represents a lag in the level of regional economic growth; $lab1_{it}$ represents the inflow rate of high-skilled labor; $lab2_{it}$ represents the inflow rate of low-skilled labor, X_{it} indicates a series of control variables, μ_i indicates regional fixed effect, v_t indicates time fixed effect, and indicates random error items.

3.2. Variable definition and measurement

3.2.1. The explained variable

Level of regional economic growth(gdp): It is difficult to reflect the real population of a region directly by the registered population, so this study uses the ratio of regional GDP to the number of permanent residents at the end of the year to measure the regional economic growth level. At the same time, we take industrial added value(y) as the substitute variable of gdp. In this paper, we use the logarithm of the industrial added value of each province to measure.

3.2.2. Interpretive variables

In this study, the labor force is divided into high-skilled labor force and low-skilled labor force, and their mobility degree is measured respectively^[6]. At the same time, the inflow rate of skilled labor(lab1) and the inflow rate of unskilled labor(lab2) are selected as the substitute variables of the inflow rate of heterogeneous labor in this study^[7].

High-skilled labor inflow rate(lab1): The inflow rate of highly skilled labor is mainly measured by the total number of employees with college degrees or above. An inflow of high-skilled labor enhances the region's technological innovation capacity, which may boost the region's economic growth.

Low-skilled labor inflow rate(lab2): The inflow rate of low-skilled labor is mainly measured by subtracting the total number of employees with college degrees or above from the total number of workers engaged in the three industries in each province. An influx of low-skilled labor reduces the region's capacity for technological innovation, which may inhibit the region's economic growth^[8].

3.2.3. Control variables

Considering the availability of data, this study mainly selects the level of technology introduction, the degree of economic openness, the level of foreign direct investment and the level of government direct investment as control variables. At the same time, in order to ensure the stability of data, logarithms of control variables are taken. Specific instructions are as follows:

The level of technology introduction(tf): The introduction of technology is conducive to the improvement of innovation level and has a significant impact on the expansion of regional economic gap. This paper uses the amount of technology introduction contract to measure the level of technology introduction.

The degree of economic openness(op): The degree of economic openness will affect the level of foreign trade import and export in a region and improve the level of economic development in the region. In this paper, the ratio of import and export to GDP after the annual average exchange rate is adopted to measure the degree of economic openness.

The level of foreign direct investment(fdi): The higher level of foreign direct investment is conducive to technological progress and economic growth. This paper uses the ratio of foreign direct investment to gross regional product to measure the level of foreign direct investment.

The level of direct government input(gov): Government investment is often used to support the industrial development of economically backward areas, and has a certain impact on the regional wealth gap. This paper adopts the regional general government budget expenditure to measure the level of

government direct investment.

3.3. Data description

The sample data for the empirical process of this study come from China Statistical Yearbook, China Science and Technology Statistical Yearbook, China Yearbook of Labor Statistics, provincial statistical yearbooks and provincial statistical bulletins, etc. At the same time, considering the completeness of the data, the sample data of the Tibetan region is excluded, and a small amount of missing data is supplemented with the statistical yearbooks of each province and city and the method of linear interpolation, and the sample interval is from 2009 to 2019. Table 1 demonstrates the descriptive statistics of the above variables.

Table 1: Data description.

Code	N	Mean	Sd	Min	Max	Data sources
gdp	330	10.7026	9.3113	12.0061	0.4928	China Statistical Yearbook
lab1	330	0.1232	-0.2494	8.6259	0.5398	China Yearbook of Labor Statistics
lab2	330	-0.0174	-0.3690	8.9431	0.5360	China Yearbook of Labor Statistics
tf	330	8.6325	-2.7155	15.6246	4.8272	China Science and Technology Statistical Yearbook
op	330	0.2758	0.0127	1.5482	0.3172	China Statistical Yearbook
fdi	330	0.3728	0.0482	3.7304	0.3987	China Statistical Yearbook
gov	330	8.1992	6.0693	9.7583	0.6462	China Statistical Yearbook

Note: In the description of data on labor inflow rates, a positive sign indicates an inflow and a negative sign indicates an outflow.

4. An empirical test of the relationship between heterogeneous labor inflows and regional economic growth

4.1. Fixed effects panel model regression analysis

Equation (1) takes into account the three core explanatory variables of the inflow rate of high-skilled labor, the inflow rate of low-skilled labor, and the level of regional economic growth in the lagged period. The results of the empirical tests are shown in Table 2. model (1) shows that the impact coefficient of high-skilled labor inflow on regional economic growth is 0.0573 and is significant at the 5% level. The impact coefficient of low-skilled labor inflow on regional economic growth is -0.0544 and is significant at the 5% level. This indicates that there is a significant positive effect of high skilled labor inflow on regional economic growth while there is a significant negative effect of low skilled labor inflow on regional economic growth, H1 is proved. Among them, the inflow of high-skilled labor significantly promotes regional economic growth, while the inflow of low-skilled labor has a significant inhibitory effect on regional economic growth. It can be seen that regional economic growth is affected by the inflow of labor at different skill levels, and the inflow of high-skilled labor is conducive to knowledge spillovers, increasing the productivity of the economy and promoting economic growth, while the inflow of low-skilled labor will cause a mismatch between skills and jobs, lowering the overall productivity, which is not conducive to the further development of the economy. In other words, increasing labor force skill training, improving labor force skill level, and effectively completing the rational allocation of labor force are the keys to promote regional economic upgrading.

Table 2: Fixed effects panel model regression results.

	Regression1	Regression2	Regression3	Regression4	Regression5
gdp(t-1)	0.9020*** (0.0153)	0.8990*** (0.0101)	0.8980*** (0.0101)	0.8910*** (0.0116)	0.7180*** (0.0421)
lab1	0.0573** (0.0175)	0.0572** (0.0174)	0.0573** (0.0179)	0.0575** (0.0177)	0.0519** (0.0158)
lab2	-0.0544** (0.0170)	-0.0544** (0.0169)	-0.0536** (0.0174)	-0.0538** (0.0172)	-0.0449** (0.0160)
Control variables	NO	YES	YES	YES	YES
_cons	1.1250*** (0.1639)	1.1540*** (0.1072)	1.1990*** (0.1095)	1.3070*** (0.1305)	1.8110*** (0.1917)
R ²	0.9653	0.9652	0.9660	0.9668	0.9656
N	330	330	330	330	330

Note: Standard errors are shown in brackets in the table, where ***, **, and * are significant at 1%,

5%, and 10% confidence levels respectively.

4.2. Robustness test

In the process of testing inter-regional economic growth using the 2009-2019 samples, this study finds that, regardless of whether the fixed-effects model is adopted or the control variables are gradually increased, the core explanatory variables show only slight changes in the coefficient sizes, while the significance does not undergo any significant variations, which indicates that the regression results of this study are robust.

In order to further test the robustness of the role of labor inflow on regional economic growth, this study selects the value added of industry as a replacement variable for the level of the regional economy, and selects the rate of inflow of skilled labor and the rate of inflow of unskilled labor in the region as a proxy for the inflow of high-skilled and low-skilled labor to conduct the robustness test. The corresponding estimation results are shown in Table 3. By comparing the results with those in Table 2, the significance and direction of the main explanatory variables do not change when changing the explanatory variables, indicating that the result coefficients are robust and credible. When changing the core explanatory variables, the inflow rate of skilled labor promotes regional economic growth, and the inflow rate of unskilled labor hinders regional economic growth and is not significant, due to the fact that unskilled labor is less skilled than low-skilled labor, and the crowding effect of economically developed regions on this type of labor is greater. The estimates in Table 2 are therefore robust and plausible.

Table 3: Robustness test.

	Change the explained variable		Change the core explanatory variable	
	y		gdp	y
One-phase lag	0.6850***(0.0453)			
lab1	0.1090***(0.0306)		0.1390***(0.0411)	0.1950**(0.0739)
lab2	-0.1060***(0.0309)		-0.0003(0.0002)	-0.0004(0.0004)
Control variables	YES		YES	YES
cons	1.3610***(0.2258)		4.4160***(0.1508)	2.6400***(0.2714)
R ²	0.8322		0.9335	0.7097
N	330		330	330

Note: Standard errors are shown in brackets in the table, where ***, **, and * are significant at 1%, 5%, and 10% confidence levels respectively.

4.3. Regional heterogeneity analysis

In order to test the impact of heterogeneous labor inflow on the economic growth of the regions on both sides of the Hu Huanyong, the article conducts a fixed-effects panel model regression for the regions on both sides of the Hu Huanyong line. On the one hand, the Hu Huanyong line is divided by population density, and population congestion has an important impact on the relationship between labor inflow and economic growth; on the other hand, there are significant economic disparities between regions on both sides of the Hu Huanyong line, and there is a significant difference in the attractiveness of the regional rich-poor gap to labor inflow, so it is of practical significance to take the Hu Huanyong line as the basis of division to consider the heterogeneity of regions. The southeast side of the Hu Huanyong line contains 25 provincial administrative regions, and the northwest side contains 6. Considering the availability of data, the data of Tibet in the northwest side is excluded, and the data of 2009-2019 is used as the sample interval to examine the impact gap of labor inflow on the economic growth of the regions on both sides, and a fixed model is used for the empirical test. The regression results are shown in Table 4:

The results of the sub-regional test show that the impact coefficient of high-skilled labor inflow on the economic growth of the region on the southeast side of the line is 0.0484, which is significant at the 5% level, and the impact coefficient on the economic growth of the region on the northwest side of the line is 0.1250, which is significant at the 5% level, which indicates that the inflow of high-skilled labor is a significant positive contributor to the economic growth of the regions on both sides of the Hu Huanyong line; the estimated coefficient of the low-skilled labor on the economic growth of the region on the southeast side of the line is significantly negative, while the estimated coefficient of the low-skilled labor is significantly positive. The estimated coefficient of the southeast side of the line is significantly negative, while the estimated coefficient of the northwest side of the line is significantly positive, indicating that the inflow of low-skilled labor force into the southeast side of the region will have a dampening effect on the economic growth of the region's provinces, while when it flows into the

northwest side of the region, it will have a boosting effect on the economic growth of the region's provinces. This is due to the fact that the southeast side of the region has a high population density, a high degree of labor agglomeration, and a serious phenomenon of involution, in which the highly skilled labor force is not affected by the situation, and the low-skilled labor force does not have a strong ability to contribute to the side of the region or even inhibit the productivity of the economy due to the mismatch of skills and other reasons. On the other hand, the northwestern side of the Hu Huanyong line has a lack of labor resources and a simple industrial structure, so that simple factor inputs can promote economic growth.

Table 4: Regional heterogeneity test results.

	Southeast side	Northwest side
gdp(t-1)	0.7460***(0.0458)	0.4580***(0.0908)
lab1	0.0484**(0.0169)	0.1250**(0.0424)
lab2	-0.0435*(0.0171)	0.6050**(0.2181)
Control variables	YES	YES
_cons	1.7060***(0.2099)	2.9650***(0.4101)
R ²	0.9664	0.9753
N	275	55

Note: Standard errors are shown in brackets in the table, where ***, **, and * are significant at 1%, 5%, and 10% confidence levels respectively.

5. Conclusions and enlightenment

This study portrays the intrinsic link between heterogeneous labor inflow and regional economic growth, and tests the effect of heterogeneous labor inflow on regional economic growth on both sides of the Hu Huanyong Line through model design. Specifically, labor mobility can promote economic growth, but it is regionally heterogeneous. Specifically, the inflow of high-skilled labor promotes economic growth on both sides of the Hu huanyong Line, while the role of low-skilled labor on the economic growth of both sides of the Hu huanyong Line shows heterogeneity, promoting the economic growth of the region on the northwest side of the Hu huanyong Line and suppressing the economic growth of the region on the southeast side of the Hu huanyong Line. The conclusions of this study are of strong revelation and practical significance.

First, strengthen the education and training of the workforce and improve the quality of the workforce. In order to solve key technological innovation problems and achieve high-quality economic growth, it is necessary to upgrade the manufacturing industry and develop high-end service industries, but also to increase the cultivation of the quality of the workforce. First, more attention should be paid to strengthening the general education of the workforce and enhancing their cognitive and learning abilities, so as to improve their adaptability to the market; second, various channels should be explored to enhance the professionalism of the workforce in terms of academic qualifications and skills.

Second, accelerate the industrialization of the northwest side of the region to achieve a rapid economic leap. The northwestern side of the Hu Huanyong Line should upgrade its industrial structure and increase the attraction of skill-matched talents. On the one hand, attracting the skill-matched labor force back to the northwest side will help the reasonable allocation of labor factors; on the other hand, it will be conducive to the undertaking of the industrial transfer of the southeastern side of the Hu Huanyong Line and the use of the latecomer's advantage to achieve economic catching up, which will be conducive to narrowing the economic gap between the two areas on both sides of the Hu Huanyong Line, and to realize common prosperity.

Third, differentiated regional policies to guide the rational flow of labor factors. Firstly, the southeastern side of the Hu Huanyong Line should increase its talent attraction efforts to accelerate economic growth. Secondly, the northwest side of the region should take the initiative to reduce the institutional barriers to the flow of talent, increase and accelerate the reform of the household registration system, infrastructure construction and the promulgation of preferential policies on the side of the region to enhance the attractiveness of the northwest side of the region to the labor force, and promote the flow of labor force to the northwest side.

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