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Factor Misallocation and Declining Labor Income-Share in China

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Abstract

In China's present economic development, factor misallocation and labor's low income-share both are important and interrelated, with factor misallocation being an important reason for the decline in China's labor income-share. Theoretical modeling demonstrates that if capital-labor is substitutable, the factor misallocation will lead to a decline in labor income-share. Empirical studies, using 2001-2013 provincial panel data show that factor misallocation significantly reduces labor income-share, even after controlling for other factors that affect the labor-share. The conclusion is both significant and robust. Therefore, economic policy which optimizes factor allocation will improve labor's income-share.

Keywords

market segmentation, factor misallocation, Gini coefficient, labor income-share

1. Introduction

Since the mid-1990s, labor's income-share of China's national income has been continuously declining in the primary distribution (Wei, Dong, & Zhao, 2012; Wang et al., 2012). In 1996, the share of labor compensation in China's GDP was 0.5145, falling to 0.3974 in 2007, a decrease of 0.1171; In 2012, workers' compensation share was 0.4559 and the overall decline from1996 to 2012 was 0.0586 (Note 1). China's labor share is about 15 to 20 percentage points lower than OECD averages, while China's labor income-share is on average 4 percentage points lower (Li, 2013).

Labor income is the main source of income for China's residents. For low-income families, labor income is often the sole form of income (Note 2). Declining labor income-share means income growth falls behind macroeconomic growth, which leads to slow consumption growth, reduces aggregate demand and negatively influences sustainable economic development (Li, 2010; Wang, 2014). For these reasons it is significant to study changes in national labor income-share to improve the living standards of Chinese citizens, optimize economic structures and achieve sustainable economic development.

However, due to the household registration system (hukou)—an institutional remnant of the planned economy which limits freedom of movement and determines access to government services; the land property rights system; local protectionism; weak rule of law; and financial repression and deposit interest rate controls, among other reasons, there are still strong factor segmentations (Yin & Cai, 2001; Shi & Ma, 2006) (Note 3). Different levels of factor segmentation among regions in China means factor flows between different economic areas incur higher costs. This results in suboptimal allocation of capital and labor, and results in large differences in per capita capital stock. According to our data calculations, the Gini coefficient of per capita capital among Chinese provinces reached 0.42 in 2010. Because differences in capital stock per capita lead to differences in marginal productivity, capital income-share and labor income-share are different, meaning factor misallocation has an impact on the labor-share.

Previous studies have paid little attention to factor misallocation and changes in labor-share. Because Western economies have more sophisticated market-oriented institutions, costs of factor mobility (capital, labor, land, technology) are low, and factors are often able to achieve optimum configurations. Therefore, there is relatively little foreign literature on labor income-share from the perspective off act or misallocation (i.e., non-perfectly competitive factor markets hypothesis). There has been limited research in the area since Nicholas Kaldor (1961). Recent works include Bentolila and Saint-Paul (2003), Askenazy (2005), Jayadev (2007), Kabaca (2011), and so on. Domestic scholars who study the labor-share mainly use Chinese macro and micro data for empirical analysis (Luo & Zhang, 2009; Bai & Qian, 2009; Huang & Xu, 2009; Li et al., 2010; Wei et al., 2012; Zhao et al., 2012). The use of macro data empirical studies suggest that changes in the industrial structure, technological progress, increasing globalization, age-related changes in the demographic structure, international trade and other factors have led to the decline of China's labor income-share (Luo & Zhang, 2009; Bai & Qian, 2010; Shao & Huang, 2020; Fang, 2011; Luo & Chen, 2012; Wei et al., 2013). Empirical studies using micro-data suggest that foreign investment, ownership structure, financial constraints, political relations, and trade union organization are important factors in the impact of China's labor income-share. However, none of these studies includes scope for the study of factor misallocation.

Existing literature has neglected to study labor income-share from the perspective of capital misallocation. This is likely not only for lack of a theoretical mechanism, but because the effect itself is difficult to observe. This paper attempts to analysis the reasons for China's low labor income-share from the perspective of factor misallocation. We use theoretical models and empirical analysis to show that factor misallocation causes low labor income-share in China. Compared with existing studies, the falling labor income-share caused by factor misallocation demonstrates a new perspective and the study also has some practical significance, specifically that market integration through optimizing the allocation of resources will help improve China's labor income-share.

2. Theoretical Model

Considering a product of the economy, both for capital goods and consumer goods. Market economy i is perfectly competitive, and there is no technical change, in which the total capital stock is Ki, the amount of labor is Li, the production function $Y_i = F(K_i, L_i)$ is the second order differentiable with constant returns to scale. Per capita output is $y_i = Y_i/L_i$, per capita capital stock (capital intensive degree) $k_i = K_i/L_i$. Because of constant scale returns, the per capita output function is: $y_i = F(K_i/L_i, 1) = f(k_i)$.

Assume that the price level of output can be normalized to 1, in order to simplify the analysis, assume that the capital depreciation rate is 0, vendors produce many products to maximize their profits by choosing how much capital and labor to input. That is $\max_{K_i, L_i} F(K_i, L_i) - r_i K_i - \omega_i L_i$ where r_i is the rate of capital return, ω_i is wages (labor income). Because the regional market is perfectly competitive, manufacturers' maximize profits is 0, the return on capital is $r_i = f'(k_i)$, remuneration is $w_i = f(k_i) - k_i f'(k_i)$ and family labor income share is $e_i = 1 - k_i f'(k_i)/f(k_i)$.

Assume homogeneous manufacturers use CES production technology, the production function is then:

$$Y_i = \mathrm{A}[\alpha {K_i}^{(\sigma-1)/\sigma} + (1-\alpha){L_i}^{(\sigma-1)/\sigma}]^{\sigma/(\sigma-1)}$$

Where A > 0 is total factor productivity simply because we only study the impact of capital accumulation and capital differences in labor income-share. Therefore, the model assumes the same TFP in different regions; 0 < α <1 is a constant; $\sigma = \frac{\mathrm{d}(K_i/L_i)/(K_i/L_i)}{\mathrm{d}(\omega_i/r_i)/(\omega_i/r_i)} > 0$ is the capital-labor substitution elasticity. When σ > 1, CES production function is the Cobb-Douglas functions.

Per capita output is easily obtained:

$$\mathrm{y_i} = \mathrm{A}[\ \mathrm{k_i}^{([\ \mathrm{ap}} + (1\ \mathrm{ap}^{\sigma/(\sigma-1)}$$

Rate of capita return:

$$r_i = \mathrm{A}\alpha[\alpha {k_i}^{(\sigma-1)/\sigma} + (1-\alpha)]^{1/(\sigma-1)} {k_i}^{-1/\sigma}$$

Remuneration:

$$\omega_i = (1-\alpha)\mathrm{A}[\alpha {k_i}^{(\sigma-1)/\sigma} + (1-\alpha)]^{1/(\sigma-1)}$$

Labor income share

$$e_i = (1-\alpha)[\alpha {k_i}^{(\sigma-1)/\sigma} + (1-\alpha)]^{-1} \quad (1)$$

Further getting:

$$\omega_i = (1-\alpha)\mathrm{A}^{1-1/\sigma} {y_i}^{1/\sigma} = B {y_i}^{1/\sigma}$$

$$e_i = \mathrm{B} {y_i}^{1/\sigma - 1} \quad (2)$$

According to (1), it is easy to get the following proposition:

Proposition 1: When the elasticity of substitution of capital-labor σ > 1, this means that capital and labor are in a substitutable relationship, $\partial e_i/\partial k_i < 0$.

Proof: $\frac{\partial e_i}{\partial k_i} = -\alpha(1-\alpha)[\alpha {k_i}^{(\sigma-1)/\sigma} + (1-\alpha)]^{-2} {k_i}^{-1/\sigma} < 0$

That is, the accumulation of capital will reduce an individual labor income-share in a perfectly competitive market. Here we examine results in an imperfectly competitive market, namely the case where elements of market segmentation exist.

According to neoclassical economic theory, optimal factor allocation will be achieved in a fully competitive market. If total factor productivity is the same, aspects on labor income-share in different regions will tend to be equal. Since the factor incomes depends on the marginal output of factors, it means that the capital intensity of different areas should smooth towards uniformity to achieve the optimal allocation of resources. Therefore, if the degree of capital intensity is different in different areas, we can attribute this to factor misallocation. Learning from the most commonly used measure of an income inequality index, this article uses the Gini coefficient of per capita capital or "factor misallocation coefficient" (G_k) to measure factor misallocation. It ranges [0,1] with $G_k = 0$ indicating there is no factor mismatch, and $G_k = 1$ indicating the most serious factor misallocation.

Set Total Factor Productivity and labor of N regions as the same number, $k = \left(\sum_{i=1}^{N} k_i\right)/N$ as a global per capita capital stock, $k_i(\ i = 1,2, gN)$ as the region i per capita capital stock, assuming $k_1 < k_2 < \cdots < k_N$.

Set capital stock per capita of N regions to obey classical Pareto distribution, the per capital distribution of the Lorenz curve (Wang et al., 2012; Wang & Wu, 2013) is: $L(p) = 1 - (1-p)^{\frac{1-G_k}{1+G_k}}$.

$$k_i = kN\left[L\left(\frac{i}{N}\right) - L\left(\frac{i-1}{N}\right)\right] = kN\left[(1-\frac{i-1}{N})^{\frac{1-G_k}{1+G_k}} - (1-\frac{i}{N})^{\frac{1-G_k}{1+G_k}}\right]$$

According to the definition of the Lorenz curve, the per capita capital in region i is:

$$k_i = kN\left[L\left(\frac{i}{N}\right) - L\left(\frac{i-1}{N}\right)\right] = kN\left[(1-\frac{i-1}{N})^{\frac{1-G_k}{1+G_k}} - (1-\frac{i}{N})^{\frac{1-G_k}{1+G_k}}\right]$$

Set per capita income in the region i as y_i, and per capita income of each region to obey classical Pareto distribution. The Gini coefficient is G_y, The per capita income in all regions is y, then:

$$y_i = yN\left[(1-\frac{i-1}{N})^{\frac{1-G_y}{1+G_y}} - (1-\frac{i}{N})^{\frac{1-G_y}{1+G_y}}\right]$$

$$y_i = f(k_i) = f\left(kN\left[(1-\frac{i-1}{N})^{\frac{1-G_k}{1+G_k}} - (1-\frac{i}{N})^{\frac{1-G_k}{1+G_k}}\right]\right)$$

$$y = \frac{1}{N}\left[\sum\nolimits_{i=1}^{N} f(k_i)\right] = \frac{1}{N}\left[\sum\nolimits_{i=1}^{N} f\left(kN\left[(1-\frac{i-1}{N})^{\frac{1-G_k}{1+G_k}} - (1-\frac{i}{N})^{\frac{1-G_k}{1+G_k}}\right]\right)\right]$$

We then get the following lemma:

Lemma 1: $\frac{\partial y}{\partial \mathrm{k}} > 0$; Per capita capital increases, the greater the per capita income becomes.

Proof: $\frac{\partial y}{\partial \mathrm{k}} = \sum_{i=1}^{N}\left\{f'\left(kN\left[(1-\frac{i-1}{N})^{\frac{1-G_k}{1+G_k}} - (1-\frac{i}{N})^{\frac{1-G_k}{1+G_k}}\right]\right)\left[(1-\frac{i-1}{N})^{\frac{1-G_k}{1+G_k}} - (1-\frac{i}{N})^{\frac{1-G_k}{1+G_k}}\right]\right\} > 0$

Lemma 2: $\frac{\partial \mathrm{Gy}}{\partial \mathrm{ym}} > 0$; The greater the factor mismatch coefficient is, the greater regional income disparities become.

Proof: $y_1 = yN\left[1-(1-\frac{1}{N})^{\frac{1-G_y}{1+G_y}}\right]$, $y_1 = f\left(kN\left[1-(1-\frac{i}{N})^{\frac{1-G_k}{1+G_k}}\right]\right)$, then $\frac{\partial y_1}{\partial G_y} < 0$, $\frac{\partial y_1}{\partial G_k} < 0$, finally, $\frac{\partial \mathrm{Gy}}{\partial \mathrm{yf}} > 0$.

According to (1), we can get the national labor income share:

$$e = \frac{\sum_{i=1}^{N} B{y_i}^{1/\sigma}}{yN} = B(yN)^{1/\sigma-1}\sum_{i=1}^{N}\left\{\left[(1-\frac{i-1}{N})^{\frac{1-Gy}{1+Gy}}-(1-\frac{i}{N})^{\frac{1-Gy}{1+Gy}}\right]\right\}^{1/\sigma}$$

Then we can get propositions:

Proposition 2: When σ > 1, $\frac{\partial \mathrm{h}}{\partial \mathrm{h}} < 0$; i.e., when capital-labor relations are substitutable, capital accumulation of the whole society is higher, then labor's income-share will be lower.

Proof: $\frac{\partial e}{\partial y} = B(1/\sigma-1)(yN)^{1/\sigma-2}\sum_{i=1}^{N}\left\{\left[(1-\frac{i-1}{N})^{\frac{1-Gy}{1+Gy}}-(1-\frac{i}{N})^{\frac{1-Gy}{1+Gy}}\right]\right\}^{1/\sigma}$

Because $\sigma > 1$, so $\frac{\partial \mathrm{o}}{\partial \mathrm{o}} < 0$. According to Lemma 2, $\frac{\partial y}{\partial \mathrm{k}} > 0$.Then: $\frac{\partial \mathrm{h}}{\partial \mathrm{h}} = \frac{\partial \mathrm{h}}{\partial \mathrm{h}}\frac{\partial \mathrm{h}}{\partial \mathrm{h}} < 0$.

Proposition 2 shows that the impact of capital deepening on labor's income-share is the same irrespective of whether the market is perfectly competitive or segmented.

Proposition 3: When σ > 1,$\frac{\partial \mathrm{W}}{\partial \mathrm{Wh}} < 0$, that is, when capital-labor is substitutable, the resource misallocation coefficient is higher, and the national labor income-share becomes lower.

Proof:

$$\frac{\partial e}{\partial Gy} = \frac{-2B(1/\sigma)(yN)^{1/\sigma-1}}{(1+G_y)^2}\sum_{i=1}^{N}\left\{\left[(1=\frac{i-1}{N})^{\frac{1-Gy}{1+Gy}}-(1-\frac{i}{N})^{\frac{1-Gy}{1+Gy}}\right]^{1/\sigma-1}\left[(1-\frac{i-1}{N})^{\frac{1-Gy}{1+Gy}}Log(1-\frac{i-1}{N})-(1-\frac{i}{N})^{\frac{1-Gy}{1+Gy}}Log(1-\frac{i}{N})\right]\right\}$$

Referring to Wang and Wu (2013), we have the proof of Proposition 3,

when $\sigma > 1$, $\frac{\partial e}{\partial Gy} < 0$.

According to Lemma 2 $\frac{\partial \mathrm{Gy}}{\partial \mathrm{yc}} > 0$, then $\frac{\partial e}{\partial Gk} = \frac{\partial e}{\partial Gy}\frac{\partial Gy}{\partial Gk} < 0$.

Proposition 3 implies that when the substitution elasticity of labor and capital is greater than 1, the factor misallocation will reduce the national labor income-share.

Propositions above show that influence direction of resources mismatch for the labor share depends on capital-labor substitution elasticity. For the estimated capital-labor substitution elasticity, Bentolina and Saint-Paul (2003) have shown that it is more than 1; while other research findings differ: Shao and Huang (2010) suggest that capital-labor substitution elasticity in Chinese industry is less than 1, Bai and Qian (2009) consider it close to 1; Luo and Zhang (2009) find it less than but close to 1; Li et al. (2010), Wang et al. (2012) suggest that it is more than 1. Overall, more studies suggest that capital-labor substitution elasticity in China is greater than 1. The estimated results of this paper are1.33, which means that factor misallocation will reduce labor's income-share. We provide confirmation in the following empirical analysis.

3. Empirical Analysis

3.1 Econometric Models and Data

We examine the impact of misallocated capital on labor's income-share according to the above theoretic analysis. Our econometric model is set as follows:

$$LS_{it} = \beta_0 + \beta_1 pK_{it} + \beta_2 GINI_{it} + \beta X_{it} + u_i + \varepsilon_{it} \quad (*)$$

Where, i denotes province, t is year, u_i is sectional effect, ε_{it} is random error term. Explained variables LS_{it} represents labor income-share; calculated indicators are for each provinces' labor compensation share of GDP in their provinces. According to the above definition, it is proper to use the Gini coefficient of per capita capital. Due to data availability, we use provincial Gini coefficient of per capita GDP as a proxy variable which is calculated by per capita GDP at the county level (city) (Note 4); explanatory variables pK_{it} is the real per capita capital stock. Referring to the method of Zhang et al. (2004) which uses perpetual inventory, $K_t = (1-\delta)K_{t-1} + I_t/P_t$, where K_t represents the actual capital stock at the end of the t year, K_{t-1} represents actual capital stock at the end of the previous year, I_t represents nominal investment of the year, P_t is the adjusted price index, δ represents the depreciation rate taken at 5 percent in this model, and then make K capita adjusted to get per capita capital stock of the provinces in each year; X_{it} act as control variables. Referring to (Wei et al., 2012; Zhao et al., 2012) and data availability, this paper specifically selects control variables including average education attainment (pEDU), the ratio of direct foreign investment to GDP (FDI), the ratio of local public fiscal expenditure to GDP (GOV), and the ratio of capital-output (K/Y).

We use provincial panel data from 2001 to 2013 from a total of 30 provinces (Note 5) (using combined data for Sichuan and Chongqing). The original database is from Wind data, China Statistical Yearbooks and provincial statistical yearbooks. All nominal data using a fixed base price index (2001 as the base period) are adjusted to the actual value, using Stata for data analysis. Table 1 is a statistical description of all variables; Table 2 shows the correlation coefficients of the explanatory variables; Table 3 provides the inflation factor test values of the explanatory variables. It can be seen from the table that all demonstrate high tolerance and collinearity influences can be ignored.

Table 1. Variable Descriptive Statistics

Variable	Obs	Mean	Std.Dev.	Min	Max
LS	390	0.458	0.070	0.311	0.738
pK	373	1.884	1.725	0.140	10.94
GINI	351	0.298	0.0759	0.150	0.556

pEDU	373	8.575	0.928	6.040	11.09
FDI	390	0.028	0.0263	4.82e-06	0.146
GOV	390	0.187	0.121	0.0772	0.851
K/Y	373	1.411	0.966	0.227	4.441

Table 2. Explanatory Variable Correlation Coefficient

	pk	gini	pedu	FDIs	Gov	KGs
pK	1					
gini	0.2073	1.				
pEDU	0.2247	-0.0597	1			
FDI	0.3650	0.0024	0.2150	1		
GOV	-0.5442	0.3039	-0.4771	-0.4199	1	
K/Y	0.7472	0.0147	-0.0277	0.0592	-0.5038	1

Table 3. Explanatory Variables VIF

Variable	VIF	SORTVIF	Tolerance
K	3.83	1.96	0.2610
GINI	1.45	1.21	0.6886
pEDU	1.65	1.29	0.6050
FDI	1.57	1.25	0.6355
GOV	2.98	1.73	0.3351
K/Y	3.59	1.90	0.2784
MeanVIF	2.51		

3.2 Results of Basic Regression Analysis

We estimated the impact on labor income-share caused by factor misallocation using different methods. Firstly, we used an econometric model without adding any control variables, only considering two key variables (per capita capital and factor misallocation) which are in Table 3 columns 1-3 followed by fixed effects, random effects, and a hybrid sectional model estimation. The three methods obtain consistently that the influence coefficient of resource mismatch coefficient is significantly negative. Further, we added a series of control variables (pEdu, FDIs, GOV) to verify the robustness of the estimate shown in Table 3 columns 4-6. The regression results indicate that these control variables have the explanatory role of labor's income-share, while the estimated coefficient of factor misallocation is significant in this study, without significant change. In order to verify the impact of the single coefficient of factor misallocation, we also use a common interpretation variable capital-output ratio (K/Y) instead of per capita pK to do the regression. The results are shown in Table 3 columns 7-9. The regression coefficient of the resources mismatch coefficient is still significant.

Table 4. Basic Regression Estimation Results

	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
	Fe1	Re1	pOls1	Fe2	Re2	pOls2	Fe3	Re3	pOls3
GINI	-0.191**	-0.196***	-0.177***	-0.140*	-0.141**	-0.200***	-0.232***	-0.234***	-0.293***
	(0.078)	(0.068)	(0.055)	(0.064)	(0.070)	(0.064)	(0.082)	(0.072)	(0.061)
pK	-0.030***	-0.018***	-0.011***	-0.024***	-0.018***	-0.010***			
	(0.009)	(0.003)	(0.002)	(0.009)	(0.004)	(0.003)			
pEdu				-0.030**	-0.030***	-0.017**	-0.051***	-0.041***	-0.014*
				(0.015)	(0.010)	(0.007)	(0.015)	(0.010)	(0.008)
FDIs				-0.866**	-0.241	0.004	-0.308	-0.369	-0.068
				(0.412)	(0.282)	(0.196)	(0.485)	(0.291)	(0.207)
GOV				-0.629*	-0.329**	0.005	-0.856***	-0.215*	0.215
				(0.306)	(0.131)	(0.106)	(0.276)	(0.152)	(0.119)
KGs							-0.115**	-0.015*	0.001
							(0.054)	(0.009)	(0.006)
_cons	0.574***	0.555***	0.535***	0.914***	0.837***	0.681***	1.256***	0.924***	0.635***
	(0.027)	(0.021)	(0.017)	(0.123)	(0.085)	(0.065)	(0.129)	(0.097)	(0.078)
N	351	351	351	351	351	351	351	351	351
r2	0.293		0.203	0.358		0.239	0.270		0.193
r2_w	0.293	0.287		0.358	0.346		0.270	0.224	

We then analyze the impact of the control variables on labor's income-share, compared with the results from the existing literature.

1) Human capital (average years of education) coefficients are significantly negative, which is contrary to the research of Wei et al. (2012). Generally speaking, if human capital measured in years of education (knowledge stock) is higher, wages in labor will be higher and labor's income-share will be greater. However, when we correlate human capital and industry (manufacturing), the higher the human capital in the areas is, the higher the level of technology or quality of industry will be in these areas, so that the industries have higher regional labor productivity. According to Wei et al. (2013), if the capital-labor substitution elasticity is greater than 1, the growth rate of wages will reduce labor's income-share, because labor productivity increases more. From this perspective, the negative impact of human capital on labor's income-share can be explained.

2) The estimated FDI coefficient is negative, but the significance level is not high. Only a fixed effects model is significant, indicating that the impact of FDI on labor income-share is uncertain. There is no clear conclusion in the previous research. Luo and Zhang (2009), Shao and Huang (2010) believe that foreign investment has a negative impact on labor income, but Xian and Yang (2009), Gorg, Strobl and

Walsh (2007) have opposing viewpoints; Wei et al. (2012) indicates that its impact is uncertain in the research. Overall, because the impact of FDI on labor's income-share mechanism is too complex, the overall impact of the results is uncertain.

3) The estimated coefficient of the government expenditure ratio to GDP (GOV) is mostly significantly negative, indicating that current Chinese government intervention in the economy will significantly reduce labor's income-share, concurring with the results of Wei et al. (2012). However, the existing results are not entirely consistent. Luo and Zhang (2009) found that the use of provincial government budget data will help improve labor's income-share, while Wang and Sheng (2010) found that study of the provincial data shows the impact of government spending on labor's income-share is not significant. We believe that excessive government intervention in the economy is in favor of capital, but to the detriment of workers overall.

4) Capital-output ratio (K/Y) of the estimated coefficient is negative, consistent with the coefficient of capital deepening (pk). The result of this study is also consistent with Bai and Qian (2010). Wei et al. (2013) which suggests that the current capital-labor relation in Chinais alternative rather than substitutable.

3.3 Endogenous Discussion

We mainly consider the impact of endogenous problems and abnormal sample points on the test results. We also used residents' income Gini coefficient as a proxy variable of capital gaps into the model test.

Firstly, endogeneity problems may arise when the explanatory variables and control variables have contemporaneous correlation with the residual error. We will replace the current variables with the lagged explanatory and control variables on the right regression equation. The model (4) is then re-estimated. The main results are shown in column 2 in Table 5. Due to a high correlation between the lagged and current variables, the results in Table 4 are still credible: the variation of factor misallocation coefficient on labor's income-share has explanatory power, and the coefficients are negative.

Secondly, considering the labor income share itself may be associated with the previous results in endogenous problems, we add the lag phase of LS of explained variables as explanatory variables based on the static model. The model turns to a dynamic panel model, namely:

$$LS_{it} = \beta_0 + \rho LS_{it-1} + \beta_1 pK_{it} + \beta_2 GINI_{it} + \beta X_{it} + u_i + \varepsilon_{it}$$

Finally, using the GMM two-stage system to estimate the model, the estimation results are shown in column 3 of Table 5. Considering AR (1) -P value is 0.012 by the first order autocorrelation test, the disturbance is free to first order autocorrelation, and the system GMM is effective. The p-value tested by Sargan is 0.323, thus accepting the null hypothesis of valid instrumental variables. Therefore, the instrumental variables used are reasonable. Estimated results using Generalized Method of Moments is that the regression coefficient of resources mismatch remains significantly negative.

3.4 Robustness Test

Our first robustness test considers the impact of the unusual geographic factors of China's economy.

Due to distinctive regional features of China's economic development, there are significant differences between remuneration indifferent regions of China. To test whether the results were affected by outliers, firstly we calculated the percentage of the urban labor income-share of all provinces at 5% and 95%, and then removed the samples which were below the 5th quantile and above the 95thquantile. On this basis, the remaining samples were estimated in fixed effect models. The results are shown in column 4 of Table 5, which shows that the regression coefficient of factor misallocation is significantly negative and close to the previous results from the point of value.

Our second robustness test uses the Gini coefficient as a proxy replacement variable. Previously, we use the Gini coefficient of per capita GDP as a proxy variable of the capital gap. For the further ensure robustness, we reused the Gini coefficient as a proxy variable, and then analyzed the impact of the resources mismatch coefficient on labor's income-share. The estimation results are shown in column 5 of Table 5. The variable GINI2 is based on Gini coefficients of the provinces. The results show that when we use the Gini coefficient as a proxy variable, the effect of the resource mismatch coefficient on labor's income share is still significantly negative.

Table 5. Robustness Analysis Results

	(1)	(2)	(3)	(4)	(5)
	Fe2	Lag	GMM	Outliers	GINI2
GINI	-0.140**	-0.271**	-0.152***	-0.135**	
	(0.064)	(0.108)	(0.058)	(0.066)	
pK	-0.024***	-0.031***	-0.004**	-0.021***	-0.021***
	(0.009)	(0.006)	(0.002)	(0.004)	(0.005)
pEdu	-0.030**	-0.036**	-0.036***	-0.020	-0.032**
	(0.015)	(0.015)	(0.004)	(0.013)	(0.014)
FDIs	-0.866**	-1.454***	0.078	-0.461	-0.190
	(0.412)	(0.457)	(0.163)	(0.397)	(0.305)
GOV	-0.629*	-0.315	0.312***	-0.501**	-0.378
	(0.306)	(0.307)	(0.078)	(0.224)	(0.260)
*GINI*2					-0.278***
					(0.099)
L.LS			0.632***		
			(0.034)		
_cons	0.914***	0.952***	0.439***	0.780***	0.929***
	(0.123)	(0.134)	(0.048)	(0.102)	(0.120)
N	351	321	293	345	373
*r*2	0.358	0.346		0.335	0.312
*r*2_*w*	0.358	0.346		0.335	0.312
AR(1) *P* value			0.012		

AR(2) *P* value	0.181
SarganP	0.323

4. Conclusions and Implications

This paper analyses the causes of China's low labor income-share from a new factor misallocation perspective. By constructing a theoretic model, we recognize that while the capital-labor relation is substitutable, the deepening of capital will reduce the share of labor income. This conclusion holds for both fully competitive markets (free movement of factors) and imperfectly competitive markets (elements of market segmentation). When the relation of capital-labor is substitutable, factor misallocation caused by market segmentation will reduce the labor income share. This novel contribution will enrich the study of the existing literature on labor income-share.

Provincial panel data from 2001 to 2013 show that Chinese capital-labor substitution elasticity is significantly greater than 1, indicating that capital-labor relations are alternative rather than substitutable. Furthermore, conducting the factor misallocation coefficient of provincial panel data from 2001 to 2013, empirical results also indicate that the factor misallocation has a significant negative impact on labor's income-share. In addition, human capital, government spending and the ratio of capital-output all have significant negative impacts on labor's income-share. In the case of controlling the endogenous variable, abnormal sample points and the use of different proxy variables, these findings are still significant and robust.

Overall, when the current relationship of capital-labor is alternative, it would be prudent government economic policy to optimize factor allocation and increase labor's share-income by enacting policies to remove barriers to interregional factor mobility and promoting institutional to increase levels of regional market integration.

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Notes

Note 1. Calculated according to *China Statistical Yearbook* data.

Note 2. Regional nationwide presence in eastern, central and western division and the Provinces of market segmentation, region segmentation interior provinces, such as the regional market of the Pearl River Delta in Guangdong Province, eastern, western, northern Guangdong segmentation.

Note 3. Capital and income distribution of the most common is the classic Pareto distribution, followed by lognormal distributions, and different conclusions unanimously.

Note 4. GDP per capita of provincial level basically is stable to reflect the relative level of per capita capital stock, in general, the capital stock is a multiple of GDP (Zhang, 2004).

Note 5. Does not include Hong Kong, Macao or Taiwan; Beijing, Shanghai and Tianjin of the provinces and each year, Tibet is missing Gini coefficient of per capita GDP data for some years.