

Research on Global Value Chain, Labor Market Segmentation and Capital Remuneration

Rui Niu^{1, a}, Shicheng Fan^{1, b*}

^ae-mail: zora_niu@sina.com, * Corresponding author: bfreedom0230@163.com

¹Tianjin Foreign Studies University Tianjin, China

Abstract—With the integration of world economy, the participation of global value chain and the segmentation of the labor market will have a certain impact on capital remuneration. Starting from the enterprise level, using China's industrial enterprise data and customs data from 2010 to 2013, based on the calculation of capital remuneration, we study the impact of global value chain and labor market segmentation on capital remuneration by constructing a panel fixed effect model. The results show that global value chain and labor market segmentation decrease the capital remuneration. Enterprises' participation in global value chain has a great negative impact on capital remuneration of labor-intensive enterprises, and labor market segmentation has a great negative impact on capital remuneration of capital-intensive enterprises. The influence of global value chain and labor market segmentation on non-state-owned enterprises is significantly greater than that of state-owned enterprises; the expansion of enterprises' participation in the global value chain and the division of the labor market reduces the capital remuneration of enterprises by improving the total factor productivity and asset growth rate, which is more obvious in capital-intensive enterprises and non-state-owned enterprises.

Keywords-global value chain; labor market segmentation; capital remuneration; enterprise heterogeneity; influence mechanism

1 Introduction

Economic globalization promotes frequent international trade exchanges among countries all over the world, and the interests of different countries and regions are intertwined. Although international economic and trade frictions continue, win-win cooperation still becomes the main theme of international exchanges and cooperation, and the world economy is gradually integrated into an inseparable whole. As the largest developing country in the world, with the deepening of reform, opening up and the integration into the world market, Chinese products have participated in all aspects and links of the global value chain. Under the background of the world economic integration, the imbalance of labor distribution, mobility and labor market development still exist, which slows down and affects the development of international trade. At the same time, the cross regional flow of industrial products and labor force also brings the flow of production factors, and the capital remuneration will change due to the different participation of enterprises in the global value chain and the segmentation of the labor market.

In terms of the impact of global value chain on capital remuneration, Bai et al. (2010) ^[1] found that with the development of China, factor income distribution has changed, and factor income has also changed. Since China participated in the global value chain, the investment ratio and capital output ratio have increased, the capital share has increased, and the labor share has

decreased. Timmer et al. (2014) [2] found that in most global value chains, capital and high-tech labor force prefer value-added value transfer rather than low skilled labor force. Developed countries prefer highly skilled labor. In emerging economies, the share of capital in its added value gradually increases, while the share of low skilled labor in its added value gradually decreases.

With the gradual development of economy, the degree of labor market segmentation is increasing. After the capital investment reaches a certain scale, the capital remuneration will decline. The impact of labor market segmentation on capital remuneration is negatively correlated. According to Xiaoli Wang (2013) [3], monopoly sectors with substantial capital investments have less market segmentation than non-monopoly industries, indicating that the higher the capital remuneration, the smaller the labor market segmentation. From the perspective of FDI inflow, Guoming Xian et al. (2013) [4] found that the greater the degree of labor market segmentation, in order to promote FDI inflow, the investment risk will increase, and the marginal output of capital will also be reduced.

To sum up, the research on capital remuneration of enterprises' integration in global value chain is relatively less, and the impact of enterprises' participation in the global value chain on capital remuneration at the factor level is not clearly explained. In addition, labor market segmentation can often reflect the level of economic and social development. The process of economic and social development will be accompanied by the unequal distribution of capital remuneration. Therefore, based on the enterprise data, we calculate the global value chain participation index by integrating the customs data and industrial enterprise database from 2010 to 2013. We also calculate the labor market segmentation index by using the wage and regional data in the industrial enterprise database. Through the entrusted wage model and price instrument variable model to simulate the changes of price and capital remuneration and build a regression equation to study the impact of enterprises' global value chain and labor market segmentation on capital remuneration, which is benefit to further understand the impact of market segmentation on capital remuneration in the process of global value chain.

2 Materials and methods

2.1 Data source

The data of this paper come from China customs database and China industrial enterprise database from 2010 to 2013. Because the codes of the two databases are different, we use corresponding technical means to merge and match the two databases, and use this comprehensive database to construct panel data for regression analysis.

2.2 Variable description

2.2.1 Global Value Chain

Referring to the measurement method of Upward et al. (2013) [5], the participation in the global value chain is calculated by the following formula:

$$VS = (M^p + \frac{M^0}{D+X^0}) / X \quad (1)$$

Among them, VS is the import degree of intermediate goods, that is, the participation in the global value chain. M^P is the import intermediate goods of processing trade, M^0 is the import intermediate goods of general trade, X^0 is the export volume of general trade, D is the domestic sales volume, and X is the export volume. In the actual data processing process, we convert the HS code of customs data into BEC commodity code according to the coding table of the United Nations, so as to identify the data of import and export intermediate products.

2.2.2 Labor market segmentation index

Using the relative price method, the formula is as follows:

$$|\Delta Q_{ijt}^k| = \ln(W_{it}^k/P_{jt}^k) - \ln(W_{i(t-1)}^k/P_{j(t-1)}^k) = \ln(W_{it}^k/W_{it-1}^k) - \ln(W_{jt}^k/W_{j(t-1)}^k) \quad (2)$$

$$|\Delta Q_{ijt}^k| = a^k + \varepsilon_{ijt} \quad (3)$$

By constructing a three-dimensional panel data ($t \times i \times k$), where t is the time variable, i is the regional variable and k is the departmental variable, including state-owned enterprises and non-state-owned enterprises. Among them, we use the enterprise wage of the industrial enterprise (W) from 2010 to 2013 and ΔQ_{ijt}^k is the relative wage level of the labor force in adjacent provinces. The absolute value is used so that the placement order of the two regions will not affect the relative price variance. Then, the system residual term in equation (3) is eliminated by the method of de averaging. In equation (3), it means that the relative wage level (a^k) is only related to the relative wage level (ΔQ_{ijt}^k), ε_{ijt} is related to other factors such as the environmental market of the two places. In this way, the difference in relative wage levels is solely due to market segmentation between provinces. So it has nothing to do with other random factors. Finally, find the variance $\text{Var}(q_{ijt})$ between different sectors, that is, the labor market segmentation index. Due to the lack of data in Hunan and Tibet, we calculate the variance of 59 pairs of adjacent provinces. The variance of the same province is calculated and processed, and the labor market segmentation index of different provinces is obtained.

2.2.3 Factor input share

Capital component share = (capital consumption + interest) / (capital consumption + interest + wages), wage cost share = wages / (capital consumption + interest + wages), capital consumption = accumulated depreciation - accumulated depreciation of the previous year. Wages are calculated based on the actual wages obtained after adjustment in 2010 as the base year. Import penetration rate $IM = \text{import volume} / (\text{output} + \text{import volume} - \text{export volume})$, export output ratio $ER = \text{export volume} / \text{output}$.

2.2.4 Factor reward

We use the entrusted wage method to calculate the factor remuneration. The idea of the entrusted wage method model is to highlight the relationship between the price of factors and the price of products under a certain technical level, constant remuneration to scale and commodity homogeneity, and consider other random factors that may lead to the change of commodity price in practice. The regression model of the entrusted wage regression method is as follows:

$$\tilde{P}_i = \alpha + \tilde{\omega}_i \theta_i + \tilde{\tau}_i k_i + \varepsilon \quad (4)$$

\tilde{P}_i is the rate of change of commodity price, θ_i is the share of labor remuneration, $\tilde{\omega}_i$ is the

rate of change of labor remuneration, k_i is the share of capital remuneration, \tilde{r}_i is the rate of change of capital remuneration, α is a constant term and ε is a random error term.

To price the instrumental variable is based on the entrusted wage regression model, considering the significant factors affecting the change of commodity price, simulates the change of commodity price through the instrumental variable method, and then simulates the change rate of and capital remuneration. Based on the method of Rui Niu (2011) [6], since commodity prices are affected by imported commodities, exports and technological progress, the changes of import penetration rate, export output ratio and total factor productivity are used to simulate price changes, and the following price sensitivity regression model is used:

$$\Delta p_{it} = \beta_1 \Delta IM_{it} + \beta_2 \Delta ER_{it} + \beta_3 \Delta TFP_{it} + v_{it} \quad (5)$$

IM is the import penetration rate, ER is the export output ratio, and TFP is the total factor productivity.

2.2.5 Other explanatory variables

Referring to the existing relevant literature, the control variables selected are as follows: enterprise employment scale (jygm), which is the number of employees; enterprise production scale (scgm), which is the total assets of the enterprise; the age of the enterprise (age) is the business years from the year of business operation to the statistical year plus one year; the debt ratio of an enterprise (debt) is the debt ratio of the enterprise to the total assets of the enterprise; capital intensity (mjd) is the ratio of the annual average balance of the net fixed assets of the enterprise to the number of employees of the enterprise. The above control variables are taken as natural logarithms.

2.3 Model regression

2.3.1 Benchmark regression

After simulating the price change through the price instrumental variable regression model, the relative price of capital remuneration (\tilde{r}) can be simulated according to equation (4), and then the impact of global value chain participation (GVC) and labor market segmentation index (LMSI) on capital remuneration can be studied. The formula is as follows:

$$\tilde{r} = \mu_1 \ln GVC + \mu_2 \ln LMSI + \sum \beta_j CV_j + c_j + \varepsilon_j \quad (6)$$

$\ln GVC$ is the logarithm of global value chain participation, $\ln LMSI$ is the logarithm of labor market segmentation index, CV_j is the control variable, c_j is the constant term and ε_j is the random error term.

2.3.2 Impact mechanism test

Based on literature research, we attempt to reveal the impact mechanism of enterprises' participation in global value chain and labor market segmentation on capital remuneration. We hold that enterprises' participation in global value chain and labor market segmentation mainly affects capital remuneration through the following two ways: first, enterprises' participation in global value chain and labor market segmentation will affect enterprises' total factor productivity, and then affect capital remuneration. Total factor productivity measures the production capacity and technical level of an enterprise. On the one hand, the process of enterprises participating in

the global value chain will affect total factor productivity. The improvement of total factor productivity is easy to reduce capital utilization efficiency and lead to the decline of capital remuneration; on the other hand, labor market segmentation mostly comes from the local protection policies of the government, which will improve the total factor productivity of enterprises, but the government's protective behavior is very easy to cause the low efficiency and waste of resource utilization, resulting in the decline of capital remuneration.

Secondly, the participation of global value chain and the division of the labor market may affect the growth rate of enterprise assets and change the capital remuneration. From the perspective of enterprise asset growth rate, the enterprise asset growth rate represents the enterprise's production capacity and development status. On the one hand, the enterprise's participation in the global value chain will promote the enterprise's asset accumulation and production capacity, so as to promote the enterprise's development, but the asset growth brought by participating in the global value chain often makes it impossible for the enterprise to better improve the capital utilization rate, then reduce the remuneration on capital; on the other hand, the labor market segmentation and government support brought by local protection, policies will increase the assets of enterprises, but under the protection, the utilization efficiency of capital will be reduced, the low efficiency of management and operation, and the generation of rent-seeking behavior will reduce the capital remuneration of enterprises.

In order to verify the above mechanism, we use the stepwise regression method to construct the following equation to test the above mechanism:

$$Channel_k = \alpha_0 + \alpha_1 \ln X_{km} + \sum \alpha_k CV_k + \varepsilon_i \quad (7)$$

$$FR_k = \mu_0 + \mu_1 Channel_k + \sum \mu_k CV_k + \varepsilon_k \quad (8)$$

In equation (7), $Channel_k$ representing two variables of action mechanisms. When $k = 1$, it is the total factor productivity of the enterprise and when $k = 2$, it is the growth rate of enterprise assets. In equation (8), FR_k is the capital remuneration of the enterprise and $\ln X_{km}$ is the main explanatory variable. When $m = 1$, it represents the participation in the global value chain, and when $m = 2$, it represents the labor market segmentation index. α_0 , μ_0 is intercept term and ε_{ik} is error term. The mechanism variable enterprise total factor productivity in equation (7) is calculated based on OP method, and the construction of asset growth rate is calculated by dividing the total enterprise assets by its lag period.

3 Regression results

3.1 Heterogeneous regression results

We study the heterogeneity of enterprises according to the different factor intensive and different enterprise types. Using Guitian Huang (2009)^[7] and Chenguang Hu (2020)^[8] for reference, we divide the enterprises in the industrial and enterprise data into labor-intensive and capital-intensive enterprises according to their industry standards, and divides them into state-owned enterprises and non-state-owned enterprises according to the differences in the nature of enterprises in the industrial and enterprise database. We regress the equation (6) and the results are shown in Table 1.

It can be seen from the regression results in Table 1 that when enterprises are divided into labor-

intensive and capital intensive enterprises, the impact of enterprises' participation in global value chain and labor market segmentation index on capital remuneration are both negative. Participation in the global value chain and labor market segmentation have a significant impact on the capital remuneration of labor-intensive and capital-intensive enterprises.

Table 1 Heterogeneous regression results

variable	capital remuneration			
	labor-intensive	capital-intensive	state-owned enterprise	non-state-owned enterprise
lnGVC	-0.8472* (0.4472)	-0.8236* (0.4799)	-0.2975** (0.1378)	-0.7537** (0.3673)
lnLMSI	-1.2776*** (0.3705)	-0.6195*** (0.3282)	-0.0673 (0.1922)	-2.3916*** (0.2389)
control variable	yes	yes	yes	yes
cons	2.8437 (24.9985)	-85.2156 (24.6710)	1.4752 (3.0800)	-7.7790*** (17.0160)
obs	3047	12763	1180	17637

Note: the standard deviation of coefficients in brackets are respectively, *, **, *** respectively represent significant at the level of 10%, 5% and 1%.

Specifically, the negative impact of enterprises' participation in the global value chain on labor-intensive enterprises is greater than that of capital-intensive enterprises, and the capital remuneration loss of labor-intensive enterprises participating in the global value chain is greater than that of capital-intensive enterprises. This shows that China still has disadvantages in capital investment and technology compared with developed countries. In the process of participating in the global value chain and economic globalization, with the deepening of trade, capital has a greater impact on labor-intensive enterprises than capital-intensive enterprises. Labor-intensive enterprises dominated by labor are more affected by capital changes, and capital-intensive enterprises are less affected by investment fluctuations. In terms of labor market segmentation, the degree of labor market segmentation has a greater negative impact on the capital remuneration of capital-intensive enterprises than that of labor-intensive enterprises. Labor-intensive enterprises have less capital investment, and capital-intensive enterprises have larger capital investment. The labor market segmentation can easily affect the capital remuneration of capital-intensive enterprises. Small fluctuations in the labor market segmentation will easily affect the capital-intensive enterprises' capital remuneration, while the impact on the labor-intensive enterprises' capital remuneration is relatively small.

At the same time, after enterprises are divided into state-owned enterprises and non-state-owned enterprises, the impact of enterprises' participation in the global value chain and labor market segmentation on the two types of enterprises has not changed. Whether state-owned enterprises or non-state-owned enterprises, the impact of enterprises' participation in the global value chain and labor market segmentation index on the capital remuneration are both negative and significant.

The reasons may lie in the bureaucratic organizational structure of state-owned enterprises, the conservative awareness of organizational leadership, the unreasonable property right structure of state-owned enterprises and the failure of the economic transformation. In the process of

integrating into the global value chain, the efficiency of capital output decreases. Participation in the global value chain and labor market segmentation has a significant negative impact on non-state-owned enterprises, which is greater than that of state-owned enterprises. The organizational production efficiency of non-state-owned enterprises is higher, which leads to lower and lower capital input and output, and then the capital remuneration is affected.

3.2 Robustness check

The robustness test is carried out by reducing the sample. We reduce the sample size by randomly selecting 40%, 60% and 80% of the original sample size by using the commands in Stata. The regression results of the reduced samples show that the impact of global value chain participation and labor market segmentation index on capital remuneration is negative and significant, and there is no significant change, which is consistent with the previous conclusions. This shows that the research results are robust. In view of the length, the detailed robust results will not be listed here.

3.3 Impact mechanism test

Table 2 and table 3 are the results obtained by regression of equation (7) and (8). Table 2 reports the test of the impact mechanism of labor-intensive enterprises and capital-intensive enterprises. From the perspective of labor-intensive enterprises, the impact of global value chain participation and labor market segmentation index on total factor productivity and asset growth rate is positive and significant, indicating that labor-intensive enterprises' participation in global value chain and labor market segmentation can improve total factor productivity and asset growth rate, but the increase of total factor productivity reduces capital remuneration. It is consistent with the conclusion of factor endowment theory and Samuelson's theorem. Labor-intensive enterprises intensively use labor factors and produce labor-intensive products. The price of labor-intensive products decreases, labor remuneration decreases, and the corresponding capital factor remuneration increases. In the regression results, the impact of asset growth rate on labor remuneration and capital remuneration has also changed, The increase of asset growth rate increases capital remuneration at the same time.

Table 2 Mechanism test of different factor intensive enterprises

variable	(1)				(2)	
	ln _{tfp}		ln _{zczz}		capital remuneration	
ln _{tfp}					-3.1896*	(1.7053)
ln _{zczz}					1.5329**	*(0.2814)
labor - intensive	lnGVC	0.0005* (0.0003)		0.0461** (0.0183)		
	lnLMSI		0.0006* (0.0003)		0.2167*** (0.0091)	
control variable	yes	yes	yes	yes	yes	yes
cons	1.6871 (0.0076)	2.2578 (0.0154)	- 5.7738*** (0.7658)		6.9143** (3.2164)	3.2147** *(0.8912)
obs	7095	7419	6372	6648	6746	6019
			(1)			(2)

variable	lnlfp	lnzczz	capital remuneration			
lnlfp			- 12.5983** * (2.9549)			
capital - intensive	lnzczz		- 1.8314** * (0.3242)			
lnGVC	0.0007** * (0.0002)	0.0693*** (0.0114)				
lnLMSI	0.0008*** (0.0002)	0.2253*** (0.0060)				
control variable	yes	yes	yes			
cons	1.6497** * (0.0057)	1.9338*** (0.0145)	- 4.0788*** (0.5456)	0.0690 (0.4343)	22.8423 *** (5.5288)	3.3074* (1.7442)
obs	13725	14233	13408	13908	13097	12701

Note: the standard deviation of coefficients in brackets are respectively, *, **, *** respectively represent significant at the level of 10%, 5% and 1%.

From the perspective of capital-intensive enterprises, the impact of global value chain participation and labor market segmentation index on total factor productivity and asset growth rate is positive and significant, the impact of total factor productivity and asset growth rate on capital remuneration is positive and significant. This shows that capital intensive industries can decrease capital remunerations by improving their total factor productivity and asset growth rate. Due to the low capital utilization rate of capital-intensive enterprises, their capital remunerations are significantly reduced, which is consistent with the previous analysis.

Table 3 reports the test results of the impact mechanism of state-owned enterprises and non-state-owned enterprises. From the perspective of state-owned enterprises, global value chain participation and labor market segmentation index improve total factor productivity and asset growth rate, and global value chain participation does not significantly improve asset growth rate. However, the impact of total factor productivity and asset growth rate on capital remuneration has changed. The improvement of total factor productivity and asset growth rate improves capital remuneration. Due to the government background of state-owned enterprises, the policy significance is greater than the business significance. The model is solidified. The low efficiency of state-owned enterprises leads to the loss of huge potential profits. The investment of state-owned enterprises has not reached saturation, and the capital remuneration will rise.

Table 3 Mechanism test of different enterprise types

varialbe	(1)		
	lnlfp	lnzczz	capital remuneration
lnlfp			50.8235** * (15.6366)
lnzczz			0.9494** (0.3961)

state	lnGVC	0.0015** (0.0007)		0.0087 (0.0332)			
- owned enterprise	lnLMSI		0.0016*** (0.0005)		0.1686** * (0.0145)		
	control variable	yes	yes	yes	yes	yes	yes
	cons	1.9420** * (0.0161)	2.0167*** (0.0349)	-0.6754 (2.4805)	0.4479** * (0.1550)	- 105.8548* ** (38.1991)	16.1802 (21.0386)
	obs	1239	2738	1121	1188	1244	1122
		(1)					
	variable	lnlfp		lnzczz		capital remuneration	
	lnlfp					-7.9334** (3.2454)	
	lnzczz					- 2.4038** * (0.4392)	
non - state - owned enterprise	lnGVC	0.0021** * (0.0002)		0.0279** * (0.0082)			
	lnLMSI		0.0007*** (0.0001)		0.2077** * (0.0047)		
	control variable	yes	yes	yes	yes	yes	yes
	cons	1.9453** * (0.0048)	1.9336*** (0.0085)	0.7044* (0.3651)	0.6664** (0.3249)	17.1647** * (5.4635)	- 69.9630* ** (16.6219)
	obs	19065	32308	19098	19824	18116	18016

Note: the standard deviation of coefficients in brackets are respectively, *, **, *** respectively represent significant at the level of 10%, 5% and 1%.

From the perspective of non-state-owned enterprises, global value chain participation and labor market segmentation index have significantly improved total factor productivity and asset growth rate, and the improvement of total factor productivity and asset growth rate has significantly reduced capital remuneration. This shows that at the saturation of capital utilization rate, the participation of non-state-owned enterprises in the global value chain and labor market segmentation will reduce capital remuneration, which also means that the total factor production rate and asset growth rate of non-state-owned enterprises can not improve the remuneration on capital.

4 Conclusions

Since entering the 21st century, with the deepening of economic globalization, the internal division of labor in the global value chain enables countries to give full play to their comparative advantages, so as to maximize the utilization of resource efficiency and reduce costs, which also has a different impact on the capital remuneration of enterprises. The existence of labor market segmentation makes the mismatch of resources, resulting in the imbalance of all aspects of the

labor market, resulting in the segmentation of the labor market, and the capital remunerations obtained by different labor market departments are also different. We study the impact of global value chain participation and labor market segmentation on capital remuneration through two core variables: global value chain participation and labor market segmentation index. The results show that:

The participation of enterprises in the global value chain is negative and significant for state-owned enterprises, the impact of labor market segmentation on state-owned enterprises is not significant, and both of them are negative and significant for the capital remuneration in non-state-owned enterprises. In terms of impact mechanism, enterprises' participation in global value chain and labor market segmentation will have an impact on enterprise capital remuneration, enterprises will reduce capital remuneration in the process of promoting asset growth rate by improving total factor productivity.

Acknowledgement. In 2020, Ministry of education, planning project, 20YJA790056, Humanities and Social Sciences Planning Project of Ministry of Education: Global Value Chain participation, labor market segmentation and poverty benefits of income growth: Research on micro data, person in charge: Rui Niu.

References

- [1] Chong-En BAI, Zhenjie QIAN. The Factor Income Distribution in China:1978-2007[J].China Economic Review,2010,21(4):650-670.
- [2] Marcel P.Timmer, Abdul Azeez Erumban, etal. Slicing Up Global Value Chains[J].Journal of Economic Perspectives,2014,28(2):99-118.
- [3] Xiaoli Wang. Urban labor market segmentation and wage decision [J]. Population and economy, 2013 (05): 70-78.(in Chinese)
- [4] Guoming Xian, Qing Xu. Does labor market distortion promote or inhibit FDI inflows [J]. World economy, 2013 (09): 25-48. (in Chinese)
- [5] Upward R,Wang Z and Zheng J.Weighing China's Export Basket: The Domestic Content and Technology Intensity of Chinese Exports[J]. Journal of Comparative Economics,2013,41(2).
- [6] Rui Niu. The impact of trade on labor wages in China's industrial sector. [J] economic longitude and latitude, 2011 (01): 32-36. (in Chinese)
- [7] Guitian Huang. Labor intensive manufacturing industry: division method and industrial scale measurement - fuzzy clustering method based on industry data from 1993 to 2007 [J]. Collection of research on socialist economic theory - Commemorating the 60th anniversary of the founding of new China (2009), 2009:82-90.(in Chinese)
- [8] Chenguang Hu, Yingzhen Li, Yaqian Lv. R & D intensity, export regulation and enterprise performance -- from the perspective of enterprise factor intensity difference. [J] financial science, 2020 (04): 95-106. (in Chinese)