IJSES
Volume 6, Issue 4, pp. 28-33, 2022.
International Journal of Scientific Engineering and Science
ISSN (Online): 2456-7361

How Does Financial Development Affect GVC Position -- From the Perspective of Trade in Value Added

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Abstract— *Based on the panel economic data of 35 OECD countries and 25 non-OECD countries from 2005 to 2016, this paper measures the status of international trade in China as a proportion of the total export volume of the country, comprehensively considers the development of direct finance and indirect finance, and uses a two-way fixed effect model to test the endogeneity and robustness, and concludes that: First, indirect finance has a negative impact on the improvement of the status of international division of labor. The excessive development of indirect financial markets may cause monopoly or even squeeze the development of direct financial markets, resulting in insufficient support for emerging industries, especially the science and technology industry, affecting the improvement of the international division of labor status; secondly, direct finance has a positive impact on the improvement of the international division of labor status. Compared with the indirect financing market, the high-risk and high-return technology industry is more suitable to seek support from the direct financing market; third, compared with OECD countries, non-OECD countries have a negative impact on the status of international division of labor in terms of indirect finance, but because OECD countries are more affected by the financial crisis in 2008, direct finance reflects the promotion of international division of labor in non-OECD countries.*

Keywords— *Global value chain; international division of labor status; direct finance; indirect finance.*

I. INTRODUCTION

Since Adam Smith put forward his classic theory of division of labor in the wealth of nations, the pattern of the international division of labor has undergone evolution for hundreds of years. In the traditional model of value chain division of labor, the process of transnational goods will be disassembled and subdivided, so that each link is carried out in the place where it can play its comparative advantage best. Such a division of labor enables each country or region to find its own place in the global value chain. However, the position of different countries in the value chain is completely different. Developed countries tend to occupy the top of the value chain and get most of the profits in commodity production. Developing countries are mostly at the bottom of the value chain, with little profit after the input of resources and labor. Therefore, how to occupy a favorable position in the global value chain is a question that every country is thinking and exploring.

After reforming and opening-up, China has always taken the economic development as the central task and actively integrated itself into global value chains. In 2001, China joined the WTO formally, marking a new level of China's position in the global value chain. In 2020, the total of import and export of goods and services in the United States was $4.95 trillion, while China's was $5.31 trillion. It is undoubted that China is the world's largest trading nation. However, China still faces the risk of being stuck in some sectors such as chips and cutting-edge medical equipment. At present, China's economy is gradually shifting from the stage of high-speed growth to the stage of high-quality development. How to arrange the domestic industrial structure rationally and then occupy a favorable position in the global value chain is a problem that the academic circle needs to think and solve.

Since the third industrial Revolution, the proportion of service industry in GNP has been increasing. Some service industries not only create value themselves, but also promote the development of other industries, such as the financial industry. The financial industry can ease the financing constraints of enterprises and make them have more funds for R&D and investment, thus promoting industrial upgrading (Manova & Yu, 2016). It is especially important for tech start-ups. Therefore, finance can improve a country's domestic industrial layout and thus enhance its international division of labor or not, it has attracted the attention of scholars. Sheng & Jing, 2019; Shao et al., 2017; Gu &Yang, 2014).

Starting from the value added of trade, this paper integrates direct finance and indirect finance, and uses the panel economic data of 35 OECD countries and 25 non-OECD countries from 2005 to 2016 to investigate the possible causal relationship between financial development and global value chain. Compared with previous literature, the marginal contribution of this paper is as follows: First, if the proportion of Added Value of Trade in exports is used to measure international division of labor, all samples of Trade in Value Added (Tiva) database are covered in this paper, and the data is more comprehensive. Secondly, in the past, most indicators to measure financial development were M2 or the proportion of private credit in GDP. This paper considers both direct and indirect financial markets comprehensively and draws a more robust conclusion. Finally, this paper divides the samples into OECD countries and non-OECD countries, and the conclusion is more targeted.

The rest of this paper is arranged as follows. The second part is the theoretical analysis of financial development and global value chain. The third part is empirical analysis, including model design, variable selection, empirical results and robustness test and the last part includes conclusions and recommendations.

II. THEORETICAL ANALYSIS OF FINANCIAL DEVELOPMENT AND GLOBAL VALUE CHAIN

At present, the academic circles believe that there are positive and negative mechanisms of financial development on GVC. Positive mechanism includes human capital accumulation mechanism, R&D capital accumulation mechanism and space overflow mechanism.

First of all, Boyd and Smith (1992) believed that the maturity and perfection of financial market could reduce the cost of credit identification for education financiers and reduce the information asymmetry of credit and then reduce the threshold and the cost of education financing, improving the efficiency of education financing, ultimately it can accelerate the accumulation of human capital in a country and improve the overall level of human capital. Chesnokova & Krishna (2006) found that an individual's ability to learn knowledge and technology largely depends on personal or family wealth. In the mature financial market environment, due to the reduction of the cost of education financing, human capital investment is no longer limited to the family financing. A perfect education financing system will alleviate the needs of individuals for education funds effectively, thus promoting the accumulation of human capital.

Secondly, the research and the development of products with high technical complexity is difficult, facing high uncertainties and prone to adverse selection, so it is difficult to obtain external financing support. The improvement of financial development level is conducive to alleviating the adverse selection problem in the external financing process of enterprises, especially technology enterprises, disperses the R&D risk of enterprises, reducing the financing cost of enterprises, and then facilitates the accumulation of R&D capital (Wynne, 2005; Qi et al., 2011; Guo et al., 2013; Li et al., 2014) also believes that the effective development of the financial industry can promote the conversion of savings into effective investment; on the other hand, it can provide more external financing support and reduce financing costs, thus promoting the production of capital and technology-intensive products.

Finally, financial support and regional market integration can improve the value chain level, and financial support can strengthen the promotion effect of regional market integration on the value chain level, and in turn, regional market integration can also promote the development of finance and strengthen the financial support capacity (Yao, 2014).

However, some scholars believe that financial development has threshold effect in promoting real economy. When the high profit and excessive development of finance are in sharp contrast with the low profit and slow growth of the real economy, it may cause the risk of financial "decoupling from real needs". Financial development deviating from the financing needs of real enterprises will allocate funds to high-risk speculative activities and increase the possibility of systemic risks (Allen & Carletti, 2007). However, the occurrence of systemic financial crisis will lead to demand contraction and damage the normal business activities of real economy enterprises. It is not conducive for enterprises to upgrade in GVCS. Sun et al.(2020) empirically tested the factors affecting financial services to the real economy from the perspective of global value chain. The paper is concluded that the status of GVC in real economy can promote the real economy of financial services, and the influence is more significant in OECD countries. However, the relationship between financial development and financial services to the real economy is negatively correlated in countries with high level of financial development, and inverted U-shaped in countries with low level of financial development.

Therefore, whether financial development promotes the promotion of a country's global value chain status needs to be viewed dialectically, and which effect is in effect in practice needs to be tested by data. Therefore, the econometric model is used in this paper empirical analysis.

III. EMPIRICAL RESEARCH

- *Variable description and data source*

1. Explained variables

There are many indicators to measure a country's international division of labor status, among which the GVC participation index and GVC status index constructed by Koopman et al. (2010) are the most widely used. Referring to the method of Koopman et al.(2010),this paper adopts the proportion of the total value added in a country's international trade in its total export to measure the country's position in the global value chain. This indicator can be calculated manually through the Tiva database jointly developed by OECD and WTO.

2. Core explanatory variables

There are also many indicators about financial development, such as the proportion of M2 in GDP, and the proportion of the sum of private sector credit and stock market value in GDP (Rajan & Zingales, 1998). Considering the great differences between direct finance and indirect finance in institutional subjects and service objects, this paper divides the financial development of a country into direct finance and indirect finance. In terms of direct finance, this paper measures the proportion of the total value of stock market transactions in GDP. Indirect finance is measured by the ratio of bank assets to GDP. Both indicators come from the World Bank's Global Financial Development (GFD) database.

3. Control variables

In addition to financial development, there are a number of factors that affect a country's international division of labor status. As much as possible in order to avoid the omitted variable bias, this paper chose the human capital, infrastructure, foreign investment and trade openness level as control variables, the respective measure middle school overall attendance, respectively, the number of people use the Internet to share, FDI inflows as a share of GDP and the import and export of goods and services as a share of GDP. In the robustness test, this paper further considers the impact of economic growth on a country's international division of labor status, and measures it with a country's per capita GDP. These Indicators are from the World Development Indicators (WDI) database of the World Bank. The details of all variables are shown in the following table:

International Journal of Scientific Engineering and Science
Volume 6, Issue 4, pp. 28-33, 2022. ISSN (Online): 2456-7361

TABLE 1. Variable definitions and handling methods

Variable types	The variable name	Variable symbol	Variable definitions
Explained variable	Status of international Division of Labor	Gvc	The proportion of added value of domestic trade in exports
Core explanatory variable	Indirect financial development	Fd1	Bank assets as a percentage of GDP
	Direct financial development	Fd2	The total value of stock market transactions as a percentage of GDP
	Human capital	Hum	Overall secondary school enrolment rate
Control variables	infrastructure	Inf	Percentage of people using the Internet
	The foreign investment	FDI	Ratio of FDI net inflow to GDP
	Level of trade openness	Tra	Exports and imports of goods and services as a share of GDP
	Economic growth	Gro	GDP per capita

4. Descriptive statistics of variables

Before the formal regression analysis, this paper made some descriptive statistics for all variables, and the results are shown in Table 2:

TABLE 2. Descriptive statistics of variables

Variables	(1) N	(2) Mean	(3) Sd	(4) Min	(5) Max
Gvc	720	74.64	12.27	31.16	96.97
Fd1	698	69.30	54.22	10.78	472.0
Fd2	641	64.97	53.61	0.614	270.3
Hum	621	100.7	16.95	39.74	163.9
Inf	719	57.89	25.07	0.317	98.24
FDI	709	8.118	28.83	-58.25	449.1
Tra	720	99.15	68.25	22.11	437.3
Gro	709	26,346	23,517	474.1	118,982

As can be seen from Table 2, both explained variables and explanatory variables fully meet the variability of samples, which is conducive to regression analysis. Furthermore, when we measure the international division of labor status of a country from the perspective of added value of domestic trade, we can see obvious national differences. The ratio of added value to total exports was 96.97 at the highest level and 31.16 at the lowest level, indicating the wide range of the smile curve. From the perspective of China's situation, since the reform and opening up, China has gradually formed the development mode of "both the market and the resources are outside" by relying on labor force and system dividend. On the one hand, it has greatly promoted the growth of economic volume, on the other hand, there are shortcomings of insufficient added value and core technology being controlled by others. From the perspective of financial development, whether direct or indirect, the gap between countries is further widening. Therefore, China is actively deepening the reform of the financial market, establishing a multi-level capital market structure, constantly improving the quality of financial development, and strengthening support for the real economy. Finally, the differences between variables also revealed the rationality of classifying samples into OECD and non-OECD in heterogeneity analysis.

- *Setting of benchmark model*

In order to test the possible causal relationship between a country's international division of labor status and financial development, this paper selected 35 OECD countries and 25 non-OECD countries as samples, together with their panel economic data from 2005 to 2016, and constructed the following regression equation:

$$Gvc_{it} = \alpha_0 + \beta_1 Fd_{it} + \beta_2 X_{it} + \mu_i + \lambda_t + \epsilon_{it}$$

Which represents the international division of labor status of a country; Represents the financial development level of a country in period T; Represents control variables; Denotes individual fixed effect and denotes year fixed effect. The bidirectional fixed effect model can better control unobservable factors at individual and time level. Represents the random error term.

- *Empirical results and analysis*

TABLE 3. Baseline regression

	(1)	(2)	(3)	(4)
	Gvc			
Fd1	-0.050***	-0.014***		
	(0.009)	(0.005)		
Fd2			0.048***	0.006**
			(0.008)	(0.003)
Hum		0.033***		0.023
		(0.010)		(0.015)
Inf		-0.011		-0.010
		(0.015)		(0.018)
FDI		0.005***		0.005**
		(0.002)		(0.002)
Tra		-0.125***		-0.124***
		(0.007)		(0.007)
_cons	79.022***	91.705***	72.532***	92.495***
	(0.909)	(1.090)	(0.675)	(1.427)
FE	No	Yes	No	Yes
Year	No	Yes	No	Yes
r2	0.034	0.988	0.043	0.989
N	708	597	641	540

Standard errors in parentheses
* p < 0.1, ** p < 0.05, *** p < 0.01

According to the setting of the benchmark model, this paper uses 35 OECD countries and 25 non-OECD countries as samples and their panel economic data from 2005 to 2016 to test the possible causal relationship between a country's financial development and its international division of labor. The results are shown in Table 3. Columns 1 and 3 of Table 3 show the results without controlling for individual and year effects, and columns 2 and 4 show the results without controlling for individual and year effects.

As can be seen from table 3, direct finance and indirect finance have significantly different impacts on a country's position in international division of labor. To be specific, although the coefficients in front of direct finance and indirect finance both pass the significance level test of 1%, there are essential differences in their directions. The coefficient in front of indirect finance is -0.014, while the coefficient in front of direct finance is 0.006. This paper argues that the reason for this difference lies in that a country must rely on its own high-tech

industry if it wants to occupy both ends of the "smile curve" in the global division of labor network. Enterprises cannot develop without the support of financial market, but indirect finance tends to prefer mature industries and companies with stable cash flow, while direct finance has a higher risk preference. Therefore, compared with the indirect financing market that pursues steady operation, the technology industry with high risk and high return is more suitable for the direct financing market. When the indirect financial market of a country is overdeveloped and the proportion of bank assets in GDP is too high, the development of direct financial market may be crowded out, resulting in insufficient support for emerging industries and affecting the improvement of a country's international division of labor status.

In terms of control variables, the role of infrastructure in the international division of labor is not obvious. This paper believes that the infrastructure of developed countries may have been relatively perfect, so its role in promoting the international division of labor is limited. Foreign direct investment to estimate coefficient is positive, but do not have significant, this is because foreign more in seeking foreign investment is the use of the host country of cheap resources and system of dividends, and will remain in the domestic real high value-added links, it will increase a country's manufacturing industry is locked in the processing, production, manufacture and so on the extent of the low end of the link. As General Secretary Xi Jinping has said, "Core technologies cannot be acquired by begging for help." If a country wants to improve its own technological level, it can only continuously improve the level of independent research and development and innovation. The estimated coefficient of trade opening level is negative and significant at the significance level of 1%, indicating that trade opening does not necessarily improve the division of labor of a country in global value chain. In the absence of cutting-edge technology and high-end human capital, trade opening may risk falling into low-end lock-in (Sheng & Jing, 2019); Finally, human capital plays a significant role in enhancing the status of international division of labor, which is consistent with economic intuition.

- *Heterogeneity analysis*

In the benchmark regression, we discuss the impact of a country's financial development on the international division of labor. It is natural, then, to wonder whether such results are of general significance. As we all know, OECD countries and non-OECD countries have huge differences in economic development level and international division of labor status. In these two types of countries, can financial development promote the improvement of international division of labor? In this section, this paper adopts the method of sub-sample regression to carry out regression for 35 OECD countries and 25 non-OECD countries respectively, and tries to answer this question. In subsample regression, confidence intervals of coefficients of different groups may overlap, so direct comparison cannot be made (Lian & Liao, 2017). Referring to the practice of Wang and Wang (2020), Fisher's Permutation Test was used in this study. The empirical results are shown in Table 4:

TABLE 4. The impact of financial development on international division of labor in OECD and non-OECD countries

	(1) OECD	(2) N-OECD	(3) OECD	(4) N-OECD
Fd1	-0.008*	-0.026*		
	(0.005)	(0.015)		
Fd2			0.002	0.016**
			(0.003)	(0.007)
Hum	0.026**	0.025	0.013	0.010
	(0.010)	(0.021)	(0.016)	(0.024)
Inf	-0.033**	0.001	-0.036*	0.011
	(0.017)	(0.026)	(0.019)	(0.027)
FDI	0.006*	0.006**	0.004	0.004
	(0.003)	(0.003)	(0.004)	(0.003)
Tra	-0.119***	-0.126***	-0.112***	-0.137***
	(0.008)	(0.014)	(0.009)	(0.015)
_cons	92.267***	91.881***	92.996***	93.111***
	(1.905)	(2.094)	(2.418)	(2.341)
Difference	-0.018*			
FE	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes
r2	0.989	0.987	0.990	0.988
N	366	231	334	206

Standard errors in parentheses
* p < 0.1, ** p < 0.05, *** p < 0.01

As can be seen from Table 4, indirect finance has a negative impact on international division of labor status in both OECD and non-OECD countries, which is consistent with the result in baseline regression. Specifically, for every unit increase in the ratio of bank assets to GDP in OECD countries, the mean value of a country's international division of Labour fell by 0.8%, compared with -2.6% in non-OECD countries. As noted earlier, further tests are needed to determine whether the difference in impact between the two groups is significant. In this paper, the Bootstrap method was used to test the differences between different groups, and the results rejected the null hypothesis that the coefficients of the two groups were equal, that is, indirect finance had a stronger negative impact on the international division of labor status in non-OECD countries. This paper believes that the possible reason is that the concentration of banks in non-OECD countries is too high, and the monopoly profits of banks are not conducive to the effective allocation of funds and hinder the improvement of a country's international division of labor.

In terms of direct finance, direct finance in OECD countries cannot significantly promote the status of international division of labor, which is not consistent with the baseline regression. This paper argues that the reason for this difference lies in the fact that the 2008 international financial crisis brought indelible disaster to the securities market of most OECD countries, and the direct financial market of each country is still recovering, so it cannot reflect the improvement of global value chain. The direct financial market of non-OECD countries reflects the promotion of international division of labor, which is consistent with the return of the benchmark.

- *Robustness test*

1. Endogenous

The existence of endogeneity will make Gaussian Markov hypothesis invalid, which will lead to the estimation coefficient bias, and this bias cannot be alleviated even under large samples. In order to accurately assess the impact of financial

development on a country's position in international division of labor, it is necessary to solve the endogenous problems that may exist in the model. In the benchmark regression, this paper has tried its best to increase control variables and fixed effects to alleviate the omission variable bias, but there may still be endogeneity problems caused by measurement errors and other factors. Therefore, based on the static panel, this paper further considers the dynamic panel model. To be specific, this paper adopts the differential GMM method to add the lag period of the explained variable into the explanatory variable and take it, together with the 2-4 order lag term of financial development, as the GMM type instrumental variable to alleviate endogeneity. The empirical results are shown in columns 1 and 2 of Table 5.

2. Handle outliers

As we all know, the OLS method assigns the same weight to each observation. Therefore, the method is susceptible to extreme values, which further reduces the estimation efficiency. In order to alleviate the adverse impact of outliers on regression results, this paper conducted tail indent treatment for the quantiles below 2.5% and above 97.5% of continuous variables, and the results are shown in columns 3 and 4 of Table 5.

3. Add control variables

In addition to the control variables in baseline regression, economic growth also affects a country's international division of labor status. In order to improve the robustness of the estimation results, this paper further considers the impact of economic growth on the international division of labor status on the basis of the original control variables, and uses a country's per capita GDP to measure. Considering the lag of economic growth to the improvement of international division of labor status, this paper added the lag period of economic growth as a control variable, and the results are shown in columns 5 and 6 of Table 5.

TABLE 5. Robustness test

	(1) c5	(2) c6	(5) c3	(6) c4	(3) c1	(4) c2
L.Gvc	0.325***	0.245***				
	(0.038)	(0.021)				
Fd1	-0.030***		-0.014**		-0.017***	
	(0.006)		(0.006)		(0.005)	
Fd2		0.007***		0.006**		0.006*
		(0.002)		(0.003)		(0.003)
Hum	0.008	0.020***			0.032***	0.014
	(0.005)	(0.004)			(0.010)	(0.016)
Inf	-0.027***	-0.007			-0.006	-0.004
	(0.008)	(0.005)			(0.017)	(0.020)
FDI	-0.001	0.000			0.005***	0.006***
	(0.001)	(0.001)			(0.002)	(0.002)
Tra	-0.124***	-0.131***			-0.127***	-0.125***
	(0.005)	(0.008)			(0.008)	(0.008)
L.Gro					0.000***	0.000**
					(0.000)	(0.000)
_cons			91.511***	92.244***	90.925***	92.485***
			(1.102)	(1.449)	(1.190)	(1.491)
AR(1)-p	0.000	0.008				
AR(2)-p	0.062	0.607				
Hansen-p	0.551	0.439				
FE	Yes	Yes	Yes	Yes	Yes	Yes
Year	Yes	Yes	Yes	Yes	Yes	Yes
r2			0.988	0.988	0.989	0.990
N	472	422	597	540	544	488

Standard errors in parentheses
* p < 0.1, ** p < 0.05, *** p < 0.01

As can be seen from columns 1 and 2 of Table 5, the P value of AR (1) is less than 1%, and the P value of AR (2) is greater than 5%, indicating that differential GMM is applicable, and the P value of Hansen statistic also indicates that the tool variable is exogenous enough. After using differential GMM estimation, the regression results of financial development remain consistent with the baseline regression. As can be seen from columns 3-6 in Table 5, after a series of robustness tests, the results are still consistent with the baseline regression, indicating that the conclusions in this paper are robust.

IV. Conclusions and Suggestions

- *Research conclusions*

This paper selects 35 OECD countries and 25 non-OECD countries and conducts empirical analysis on their panel data from 2005 to 2016 to investigate the impact of financial development on a country's position in international division of labor. After considering endogeneity and robustness, it comes to the following conclusions:

First, indirect finance has a negative impact on the promotion of a country's international division of labor. When the indirect financial market of a country is overdeveloped and the proportion of bank assets in GDP is too high, it may lead to monopoly or even crowding the development of direct financial market, resulting in insufficient support for emerging industries, especially the technology industry, and affecting the improvement of a country's international division of labor status.

Second, direct finance has a positive impact on the improvement of a country's international division of labor status. Compared with the indirect financing market that pursues steady operation, the technology industry with high risk and high return is more suitable to seek support from the direct financing market. The more developed and larger the direct financial market of a country is, the higher the possibility for enterprises to obtain external financing is. This will help to increase the proportion of capital - and technology-intensive products in the country's trade structure, thus improving the country.

Third, compared with OECD countries, non-OECD countries have a greater negative impact on the international division of labor in terms of direct finance. The possible reason is that the concentration of banks in non-OECD countries is too high, which is not conducive to the effective allocation of funds. However, since OECD countries were deeply affected by the financial crisis in 2008, non-OECD countries are more able to promote the international division of labor in terms of direct finance.

- *Policy Suggestions*

First, we should pay full attention to the importance of finance in enhancing a country's position in the global division of labor. If a country wants to occupy both ends of the "smile curve", it cannot do without the development of its own science and technology industry. In this process, it is necessary to give play to the role of financial market, especially direct financial market, to continuously improve the possibility of obtaining external financing for enterprises and disperse the risks in the process of enterprise innovation.

Second, we should focus on the integration of the financial system with the real economy, especially the demand for innovative investment. Once the bubble bursts, it will take a long time for the financial system to recover and then support the entity, which will even have a restraining effect, which is not conducive to the promotion of international division of labor.

Third, although China is not a member of the OECD, we are implementing the "Made in China 2025" plan, striving to overcome a series of bottleneck technologies, and strive to realize the transformation from "Made in China" to "smart Made in China". In this process, we will continue to deepen reform in the financial sector, expand financial scale, improve financial efficiency, optimize the structure of the capital market, and constantly enhance support for the real economy, especially high-tech industries, so as to enhance China's position in the international division of labor.

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