The Impact of Financial Services on Import and Export Trade of the High-tech Industries in China

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Abstract: This paper studies the impact of financial services on the import and export of high-tech industries. By replacing the financial services with financial structures, it studies the impact on the import and export trade of high-tech industries from two perspectives of direct financing and indirect financing. The Stata software is applied to the regression analysis and robustness check to obtain the relationship between the financial services and the import and export of high-tech industries. The results of regression analysis suggest that the indirect financing promotes the import and export of high-tech industries, while the direct financing has an inhibitory effect on the import and export trade of high-tech industries.

Keywords: Financial services; High-tech; Import and export trade

1. Introduction

With the development of globalization, the countries are connected more closely, and the turnover of international trade is increasing. Driven by innovation as its core, the high-tech industry seizes the opportunities through innovation and takes up a significant position, which allows it to become an important part in enhancing China's competitiveness. Financial services can not only provide the financial support, but also help the high-tech industries transfer the potential risks. Therefore, studying the impact of financial services on the import and export trade of high-tech industries has the promoting and practical significance for high-quality economic development.

2. Development History and Current Situation of Financial Services

The financial industry in China is under development, and the financial service has become an important factor supporting the development of the industry gradually. As the economic support for the high-tech industries mainly comes from the banking industry, the analysis is mainly about the situation of the banking industry^[1]. And the analysis of the specific data is shown in Table 1.

Year	Interest Revenue in the Early Stage/million	Interest Revenue in the Final Stage/million	Change in Interest Revenue/million	Loan/100 million yuan	Deposit/100 million yuan	Total Assets/ 1,000 trillion	Total Liabilities/1,000 trillion
2009				425597	612006	8.339	7.743
2010	5.630	6.088	0.458	509226	733382	8.329	7.733
2011	4.260	4.633	0.373	581893	826701	8.309	7.716
2012	4.250	4.619	0.369	672875	943102	8.289	7.697
2013	4.344	4.718	0.374	766327	1070588	8.262	7.671
2014	5.782	6.253	1.133	867868	1173735	8.231	7.642
2015	6.104	6.586	0.482	993460	1397752	8.194	7.608
2016	6.068	6.550	0.482	1120552	1555247	8.095	7.566
2017	6.031	6.513	0.482	1256074	1692727	8.035	7.517
2018	5.994	6.472	0.478	1417516	1825158	7.972	7.461
2019	5.953	6.427	0.474	1586021	1981643	7.972	7.403

Table 1 Basic Situation of National Banks from 2009 to 2019

Generally speaking, the banking industry in China has been under constant development. From the perspective of interest revenue, the change in interest revenue in 2014 was taken as the cut-off point. The early and final interest revenue from 2010 to 2013 was approximately 4 million, with a change of

around 0.3 million. In the early and final stages of 2014, there was a sudden increase in the interest revenue, with a change of 1 million. From 2015 to 2019, the interest collection in the early and final stages was about 6 million, with a change of 0.4 million. According to the specific data, it can be seen that the business of the bank was being conducted successfully, and the development of the banking industry was in a sustained and stable state^[2], with the interest revenue ranging from 0.3 to 0.4 million.

Province (municipality directly under the	2019	2020	2021
central government)			
Beijing	23	23	21
Fujian Province	69	67	68
Gansu Province	2	2	2
Guangdong Province	32	26	25
Guangxi Zhuang Autonomous Region	5	5	4
Guizhou Province	4	4	3
Hebei Province	18	17	9
Henan Province	17	14	4
Heilongjiang Province	2	2	2
Hubei province	6	4	4
Hunan Province	13	8	7
Jilin Province	3	3	3
Jiangsu Province	43	41	40
Jiangxi Province	23	21	17
Liaoning Province	18	11	6
Inner Mongolia Autonomous Region	10	2	3
Ningxia Hui Autonomous Region	3	3	3
Qinghai Province	2	2	2
Shandong Province	20	17	17
Shanxi Province	10	2	1
Shaanxi Province	5	2	3
Shanghai City	20	20	19
Sichuan Province	29	26	27
Tianjin City	4	4	4
Xinjiang Uygur Autonomous Region	5	3	3
Yunnan Province	3	3	3
Zhejiang Province	46	43	41
Chongqing City	5	4	5

Table 2 Number of Banking Institutions in the Different Provinces from 2019 to 2021

As shown in Table 2, the number of banking institutions in different provinces in China was decreasing. The data suggests that the banking industry in the regions with better economic development was more complete than that in the regions with backward economic development. And the relevant facilities and equipment in the financial industry were more perfect, which could provide more financial support for the emerging enterprises. Generally speaking, although the banking industry in China is developing continuously, the number of banking institutions is declining, which suggests that the banking industry in China is developing with high quality, and the surviving banking institutions also have their advantages in the market. And it has promoted the development of the banking industry and the financial industry in China, as well as providing the financial support to the enterprises in different industries to advance the economic development.

3. Development History and Current Situation of Import and Export Trade in High-tech Industries

The import and export trade of the high-tech industry in China mainly involves the technology carried on the products for the import and export trade. With the great amount of investment in high-tech industries, the analysis is carried out on the basis of the amount of import and export trade in high-tech industries^[3], as shown in Table 3.

Table 3 Export Trade of High-tech Industries from 2019 to 2021 Export Trade of High-tech Industries from 2019 to 2021 Compared to Compared to Compared to Unit: RMB the Same the Same the Same 2019 2020 2021 10.000 Period Last Period Last Period Last Year±% Year±% Year±% Amount Product Name Amount Amount Amount Amount Amount New and 632,660,004 High-tech 504,266,590 2.1 536,923,802 6.5 17.9 Product Biotechnology 675,220 9.9 826,680 22.4 10,816,822 1208.8 Life Science and 23,017,182 38,328,053 6.6 28,459,406 23.7 34.6 Technology Optoelectronic 18,919,146 18,577,807 23,958,050 -1.3 -1.8 29 Technology Computer and Communication 322,927,166 -3.5 338,148,479 4.7 373,941,288 10.6 Technology Electronic 114,537,936 21.3 127,085,754 11 157,180,412 23.8 Technique Computer Integrated 12,766,020 10 13,718,871 7.5 16,144,117 18.8 Manufacturing Technology Material 4,765,433 4,919,636 -3.4 3.2 6,487,573 32 Technology Aerospace 6,106,099 2 4,473,263 -26.7 4,854,807 8.5 Technology Other

Table 4 Import Trade of High-tech Industries from 2019 to 2021

713,908

29.2

948,883

32.9

552,388

Technologies

-16.4

Import Trade of High-tech Industries from 2019 to 2021						
Unit: RMB 10,000	2019	Compared to the Same Period Last Year±%	2020	Compared to the Same Period Last Year±%	2021	Compared to the Same Period Last Year±%
Product Name	Amount	Amount	Amount	Amount	Amount	Amount
High-tech Product	439,779,566	-0.8	471,603,332	7.2	540,881,491	14.7
Biotechnology	2,066,653	26.3	2,993,676	44.9	4,089,104	36.6
Life Science Technology	29,463,554	22	29,445,626	0	31,774,283	8
Photoelectric Technology	23,573,179	-12	22,925,435	-2.8	24,628,006	7.5
Computer and Communication Technology	80,342,427	-2.3	84,299,347	4.9	98,592,856	17
Electronic Technology	243,102,747	1.9	275,194,809	13.2	316,771,672	15.1
Computer Integrated Manufacturing Technology	36,064,215	-8.4	39,205,545	8.7	45,050,092	15.3
Material Technology	3,444,917	7.6	3,570,520	3.6	4,158,068	16.1
Aerospace Technology	21,066,087	-21.6	13,334,834	-37	15,356,608	14.3
Other Technologies	655,787	-0.4	633,540	-3.4	460,801	-27.3

In the export trade of national high-tech industries, the total amount of high-tech product exports has been increasing year by year, which suggests that the high-tech industry is continuously developing in China. The products exported from the high-tech industries have their advantages in the international market. Except for the decline in the export amount of the products of optoelectronic technology, material technology, the aerospace technology and other technologies from 2019 to 2021, the export finance of the other high-tech products was increasing year by year. Although there were some obstacles arising in the development of optoelectronic technology, material technology, aerospace technology and other technology, material technology, aerospace technology and other technologies, it was increasing in 2021, which suggests that the development of different high-tech technologies may meet difficulties, and the research on the high and new technologies in China will successfully overcome difficulties and promote the sustainable development

of technology^[4].

As can be seen from Table 4, the amount of imported high-tech products is also increasing year by year, which shows that there is some imperfect development in different aspects of the high-tech industry in China, and it is necessary to promote the development with the help of external high-tech. In 2019, compared with the same period in 2018, the import amount of most technology products decreased, while the amount of the import trade of most technology products increased in 2020 and 2021. The outbreak of the epidemic in 2019 had an impact on the development of high-tech industries, resulting in a higher dependence on the foreign high-tech industries in the following two years. The import amount of biotechnology, life science technology, electronic technology and material technology increased from 2019 to 2021, suggesting that these technologies are not immature in the high-tech development in China but rely on the foreign countries.

4. Empirical Test of the Impact of Financial Services on Import and Export Trade of High-tech Industries

4.1 Variable Measurement

The indicators for direct financing are represented by the balance of deposits and loans of financial institutions, namely Saving and Credit. The indicators of indirect financing are represented by the total turnover of the stock market and its proportion to the regional GDP, which are StockTurnover and IndirectFin, respectively. As the import and export of high-tech industries are mainly based on high-tech, the total export volume of high-tech industries is represented by the Export indicator, while the total import volume of high-tech industries is represented by the Import indicator. To focus on studying the impact of financial structure on the import and export of high-tech industries, the main factors are high-tech research and development efforts, local average education level and transportation conditions, as shown in Table 5 Variable Definition.

Variable	Name	Symbol	Unit	Definition
Dependent Variable	Total Exports of High-tech Industries	Export	USD100mn	Export amount of high-tech products
Dependent Variable	Total Imports of High-tech Industries	Import	USD100mn	Import amount of high-tech products
Independent Variable	Deposit Balance	Saving	100mn	Deposits from financial institutions
Independent Variable	Loan Balance	Credit	100mn	Loans from financial institutions
Independent Variable	Turnover of Stock Market	StockTurnover	100mn	Total trading finance in the stock market
Independent Variable	Ratio of Turnover of Stock Market to GDP	IndirectFin	100mn	Total trading finance/GDP in the stock market
Control Variable	Investment in Funds for Industrial Enterprises above Designated Size	RD	100mn	Investment from industrial enterprises with annual main business income above a certain standard.
Control Variable	Education Funding	EduExp	100mn	Show the national expenditure on education at all levels
Control Variable	Number of Buses per 10,000 Persons	РВ	Unit	Show the average number of public transportation vehicles owned by every 10,000 persons in a city, and the level of urban public transportation development.

Table 5 Variable Definition of the Model

This paper analyzes the data from 2005 to 2021 for the internal relationship between financial services and import and export trade of the high-tech industry. The data on the amount of high-tech import and export trade is sourced from the Ministry of Commerce. The total amount of deposits and loans from financial institutions and stock markets in each province is sourced from the WIND database^[5]. The Gross Domestic Product, R&D funding for industrial enterprises above designated size, education funding, and the number of buses per 10,000 persons are sourced from the National Bureau of Statistics. The Stata16 software is applied to performing the regression analysis on the above data. The years with missing data are supplemented with proximity substitution and interpolation methods. The descriptive analysis of variables is shown in Table 6.

VarName	Mean	SD	Min	Max	Obs
Export	193.39	441.244	0.07	2638.19	527
Import	160.91	370.675	0.06	2526.12	527
Saving	36186.53	41548.741	456.30	293169.22	527
Credit	26792.20	29966.281	179.34	222234.29	527
StockTurnover	29037.60	53894.963	87.65	424204.14	527
RD	276.11	421.013	0.16	2902.18	527
EduExp	895.97	772.181	27.69	5386.96	527
PerBus	11.70	3.348	4.76	26.55	527

Table 6 Descriptive Statistics of Variables

To improve the understanding of descriptive statistics results, the indicators such as mean value and standard difference shown in Table 6 are calculated on the basis of the original values of variables. In order to meet the assumptions of linear regression regarding the normal distribution and stationarity of data, the natural logarithms are taken for continuous variables in the following regression analysis.

4.2 Empirical Research Analysis

4.2.1 Model Setting

This paper takes the indirect financing as the explanatory variable, and R&D investment, education investment and the number of buses per 10,000 persons of industrial enterprises above designated size as the control variables for testing the impact of empirical models on the import and export of high-tech industries^[6]. The model settings are as follows:

$$lnExport_{rt} = \beta_0 + \beta_1 lnSaving_{rt} + \beta_2 lnRD_{rt} + \beta_3 lnEduExp_{rt} + \beta_4 lnPerBus_{rt} + \varepsilon_{rt}$$
(1)

$$\ln \text{Import}_{rt} = \beta_5 + \beta_6 \ln \text{Saving}_{rt} + \beta_7 \ln \text{RD}_{rt} + \beta_8 \ln \text{Edu} \text{Exp}_{rt} + \beta_9 \ln \text{PerBus}_{rtt} + \varepsilon_{rt}$$
(2)

In the formula mentioned above, r represents the samples from the provinces, t represents the year, and ln represents logarithmic processing. And $lnExport_{rt}$ refers to the export amount of high-tech industries from r province in year t, $lnImport_{rt}$ refers to the import amount of high-tech industries from r province in year t, $lnSaving_{rt}$ refers to the financial structure of r province in year t, and $lnRD_t$ refers to the investment of industrial enterprises with annual main business income above a certain standard in year t; $lnEduExp_{rt}$ is the cost of education at all levels in r province in year t; $lnPB_{rt}$ shows the average number of public transportation vehicles per 10,000 persons in r province in year t; Random error term is represented by ϵ_{rt} .

4.2.2 Empirical Analysis Results

4.2.2.1 Baseline Regression

The regression results of Model (1) and Model (2) are shown in Table 7. The dependent variables in Columns (1) and (2) are the export amount of high-tech industries, the dependent variables in Columns (3) and (4) are the import amount of high-tech industries, and the core explanatory variables are all the deposit balance of the financial institutions. Columns (1) and (3) control the bidirectional fixed effects between provinces and years, while Columns (2) and (4) further add the control variables.

As shown in Columns (2) and (4) of Table 7, there is a positive relationship between the indirect financing represented by the deposit balance of financial institutions and the import and export of high-tech industries, which is significant at a confidence level of 1%, suggesting that the indirect financing has a positive impact on the import and export trade of high-tech industries. And it may be related to the current stage of development of the high-tech industry and a financial system based on banking in China. In past few years, under the guidance of the concept of innovation-driven development, the high-tech enterprises in China have developed rapidly and their engagement in the international market has been on the rise. For the export of high-tech industries, the financial support plays an essential part in achieving the innovative results. For the import enterprises, the financing pressure increases more significantly. Therefore, the financial support represented by the indirect financing plays an important role in the import and export trade of high-tech industries.

	(1)	(2)	(3)	(4)
	lnExport	lnExport	lnImport	lnImport
lnSaving	2.298***	1.746***	2.189***	2.288***
	(0.290)	(0.409)	(0.284)	(0.406)
lnRD		0.303***		-0.221**
		(0.112)		(0.111)
lnEduExp		0.427		0.230
		(0.305)		(0.302)
lnPerBus		0.260		0.304
		(0.199)		(0.197)
Fixed Effects of Provinces	Yes	Yes	Yes	Yes
Fixed Effects of Years	Yes	Yes	Yes	Yes
Adj. R2	0.948	0.949	0.941	0.941
N	527	52.7	527	527

Table 7 Results of Baseline Regression

4.2.2.2 Robustness Check

This paper conducts the robustness check from two aspects of reducing the measurement errors and changing the researches, which helps to test the credibility of the results of baseline regression.

The robustness check for measurement errors is shown in Table 8. The main business of financial institutions represented by indirect financing is divided into taking deposits and issuing loans. In the baseline regression, this paper uses the deposit balance of financial institutions to represent the indirect financing. To avoid any possible data bias, the explanatory variable is replaced with the loan balance of various financial institutions. According to Table 8, except for Column (2), the impact of indirect financing on the import and export of high-tech industries is significantly positive, which is consistent with the baseline regression. Although Column (2) is not significant, its coefficient is still positive, which, to some extent, indicates the positive impact of indirect financing on the development of high-tech industries.

	(1)	(2)	(3)	(4)
	lnExport	lnExport	lnImport	lnImport
lnCredit	0.768***	0.152	0.910***	0.561**
	(0.174)	(0.228)	(0.168)	(0.228)
lnRD		0.375***		-0.114
		(0.113)		(0.113)
lnEduExp		1.113***		0.828***
		(0.308)		(0.307)
lnPerBus		0.079		0.142
		(0.202)		(0.202)
Fixed Effects of	Yes	Yes	Yes	Yes
Provinces				
Fixed Effects of	Yes	Yes	Yes	Yes
Years				
Adj. R2	0.943	0.947	0.937	0.938
N	527	527	527	527
Note: *, ** and *** resp	pectively refer to passi	ng the significance test	of 10%, 5% and 1%; S	Standard error in
parentheses.				

Table 8 Robustness Check: Replacing Core Explanatory Variables

Next, this paper checks the impact of financial structure on the import and export of high-tech industries from the perspective of direct financing. Generally, there is a certain substitution relationship between direct financing and indirect financing. In the regions with a high proportion of indirect financing, the direct financing is usually less. Therefore, while the indirect financing is positively correlated with the import and export trade of high-tech industries, the direct financing is more likely to be negatively correlated with the import and export trade of high-tech industries.

	(1)	(2)	(3)	(4)
	lnExport	lnExport	lnExport	lnImport
FinStru	-0.080**	-0.057*		
	(0.034)	(0.032)		
lnStockTurnover			-0.177*	0.257**
			(0.105)	(0.105)
lnRD		0.364***	0.409***	-0.191*
		(0.112)	(0.115)	(0.115)
lnEduExp		1.211***	1.240***	1.295***
		(0.242)	(0.241)	(0.242)
lnPerBus		0.025	0.034	0.044
		(0.196)	(0.196)	(0.196)
Fixed Effects of Provinces	Yes	Yes	Yes	Yes
Fixed Effects of Years	Yes	Yes	Yes	Yes
Adj. R2	0.941	0.947	0.947	0.938
N	527	527	527	527
Note: *, ** and *** respect parentheses.	tively refer to passin	g the significance test of	of 10%, 5% and 1%; St	andard error in

Table 9 Robustness Check: The Impact of Direct Financing

The results of the corresponding regression analysis are shown in Table 9. The core explanatory variables in Columns (1) and (2) are the proportion of the turnover of stock market to local GDP, while the core explanatory variables in Columns (3) and (4) are the turnover of stock market. The proportion of total turnover of stocks has a negative linear correlation with the export and import amounts of high-tech industries. The direct financing has an impact on the export and import trade of high-tech industries, which causes the negative impact on the export and import of high-tech industries. It suggests that the security of direct financing shall be improved. And it shall be aware of the potential risks of direct financing in the development of the financial market. However, the results in Columns (3) and (4) show that although the total turnover of stock has a negative impact on high-tech industry exports, it has a positive influence on the import of high-tech industry.

5. Conclusion

The indirect financing represented by the banks has a positive impact on the import and export trade of high-tech industries. As China is a financial system represented by banks, the indirect financing methods of financial institutions represented by banks are more conducive to promoting the development of import and export trade in high-tech industries. What's more, the indirect financing method of financial institutions, which has a positive impact on the development of high-tech industries in underdeveloped regions, is also a better choice.

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