

# The Effects of Financial Constraints and Export Trade on Innovation Performance——An Empirical Study Based on Chinese Industrial data

QIU Kai-xin <sup>1, a \*</sup>, DONG Nan-nan <sup>2, b</sup>

<sup>1</sup> Regional Research and Development Institute at Ningbo University, Ningbo, China

<sup>2</sup> Regional Research and Development Institute at Ningbo University, Ningbo, China

<sup>a</sup>453661731@qq.com, <sup>b</sup> 183878119@qq.com

**Keywords :** Financial constraints ; Export trade ; Chinese industrial data ; Innovation performance ; R&D

**Abstract:** Based on the Chinese industrial data, Enterprises above designated size industrial data of China statistical yearbook in 2013. The paper uses SPSS software to analyze the effects of financing constraints and international trade on the innovation ability. The results show that the international trade has significant positive effect on industry innovation, while financial constraints have significant negative effects. Finally according to the results of empirical study, this paper puts forward the following Suggestions: it is beneficent to continue implementing the policy of reform and opening up. The government attaches great importance to support the high technology industry and promote the high technology industry products export; and the government should deepen reform of the financial system and construct multi-channel financing system to provide an opportunity for the development of enterprise.

Innovation is an important source and inherent power which maintains sustainable economic development of a country or region, and vital index which measures the economic strength of a country, and it is also a crucial embodiment of the core competitiveness of enterprises. A number of literatures on international trade have studied the influence of international trade to the improvement of innovative capability; there are also a lot of literatures have studied on the impact of financing constraints on the ability of innovation. But there is still little research integrating them in a theoretical framework. Obviously, innovation is not only due to the financing support, also thanks to the international trade, so this article combines International trade with financing constraints on the basis of former research and builds a new theoretical framework. Under this unified framework, it is a bit better to reflect the relative contributions value of the two factors which influence the innovation ability.

## Evidence-based Analysis

**Variable Selection.** This paper uses a method of regression analysis to estimate the relationship between these variables in the theoretical analysis. In the case of regarding the innovation ability as explained variable, it builds a theoretical model which includes research and development, financing constraints and export:

$$NPP=a_0+a_1EX+a_2LEV+a_3RD+a_4SIZE+a_5SOE \quad (1)$$

In the model, NPP stands for the innovation ability, expressed by the proportion of the sales

revenue of new products accounted for total sales revenue ,because sales of new products is recognized as a good indicator of new products by the market acceptance; LEV stands for the financing constraints, expressed by the asset-liability ratio (the proportion of total indebtedness accounted for general assets) to measures the difficulty of enterprise financing support; EX stands for industry export, expressed by the proportion of Exports accounted for total sales revenue ; In order to avoid the deviation of measurement and estimation, the paper join the following control variables: R&D stands for the industry's R & D expenditure, expressed by the proportion of the industry's R & D expenditure accounted for total sales revenue; SIZE stands for company size ,expressed by the number ratio of the industry's total value of fixed assets and the quantity of company; SOE stands for the number ratio of industry state-owned capital and total capital.

## Data Processing

### Descriptive Statistics Analysis of Each Variable

Table 1 Descriptive Statistics Analysis of Each Variable

variable	Minimum	Maximum	Mean	Std. Deviation	Minimum
NPP	39	0.0005	0.3129	0.1031	0.0808
EX	39	0.0000	0.4695	0.1174	0.1066
RD	39	0.0000	0.0247	0.0086	0.0062
LEV	39	0.2523	0.6746	0.5411	0.0796
SIZE	39	0.2721	116.9436	5.0562	18.7253
SOE	39	0.0107	0.9903	0.3367	0.2748

Table 1 is descriptive statistics analysis of each variable and shows the minimum, maximum, mean and standard deviation for each variable.

**The Correlation Analysis between the Variables.** There is a relation between the things but no direct causal explanation, which calls the correlation analysis. Correlation analysis is to use a few reasonable indicators to analyze the observed value of related things.

Table 2 The correlation analysis between the variables

		NPP	EX	RD	LEV	SIZE	SOE
NPP	Pearson Correlation	1	.397*	.837**	.081	-.212	-.146
	Sig. (2-tailed)		.012	.000	.623	.195	.376
	N	39	39	39	39	39	39
EX	Pearson Correlation	.397*	1	.481**	.040	-.235	-.546**
	Sig. (2-tailed)	.012		.002	.811	.149	.000
	N	39	39	39	39	39	39
RD	Pearson Correlation	.837**	.481**	1	.080	-.173	-.377*
	Sig. (2-tailed)	.000	.002		.628	.293	.018
	N	39	39	39	39	39	39
LEV	Pearson Correlation	.081	.040	.080	1	-.200	.090

	Sig. (2-tailed)	.623	.811	.628		.223	.586
	N	39	39	39	39	39	39
	Pearson Correlation	-.212	-.235	-.173	-.200	1	.490**
SIZE	Sig. (2-tailed)	.195	.149	.293	.223		.002
	N	39	39	39	39	39	39
	Pearson Correlation	-.146	-.546**	-.377*	.090	.490**	1
SOE	Sig. (2-tailed)	.376	.000	.018	.586	.002	
	N	39	39	39	39	39	39

\*Shows that the P value is less than 0.05, \*\*Shows that the P value is less than 0.01;

The table above is the correlation coefficient table between the variables. The correlation coefficient of EX, RD and NPP is 0.397 and 0.837 respectively. Corresponding P value is less than 0.05, which has significant statistical significance. While the correlation between LEV, SIZE, SOE and NPP is not significant (P value is greater than 0.05). Further use multiple factors regression analysis methods to analyze the influence of NPP of the EX, RD, LEV, SIZE, SOE.

**Regression Analysis.** The purpose of regression analysis is to analyze by means of a large number of sample data to find the interaction relationship between the variables and determine the mathematical relationship between the variables. At the same time, in order to distinguish variables whose effect on a particular variable is significant or not, we statistically inspect a credible program of determining the mathematical relationship. By using the identified mathematical relationship, we predict the value of another particular variable and give the accuracy of prediction or control according to one or a few variables.

**Collinearity Diagnostics.** If the variables have collinearity problem, multiple factors regression analysis will change regression system a lot. The value and direction of Regression coefficients are inconsistent with other research, which makes some variables which should impact results excluded from the model. So we deal each variable with collinearity diagnosis. If each variable Tolerance is greater than 0.1 and variance inflation factor (VIF) are less than 10, result shows that there is no complex collinear relationship between the variables. According to examination, there is no complex collinear relationship between the variables, and all can be maintained into the multiple regression analysis (see table 3).

Table 3 Collinearity Diagnostics

variable	Tolerance	VIF
EX	.609	1.643
RD	.743	1.346
LEV	.892	1.122
SIZE	.696	1.437
SOE	.515	1.940

Table 4 Model Summary

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate
1	.882 <sup>a</sup>	.779	.745	.0407992

a. Predictors: (Constant), SOE, LEV, RD, SIZE, EX

NPP is as dependent variable and the EX, RD, LEV is as independent variables. While the SIZE, SOE is for control variable to analyze multiple factors regression.

The above-mentioned results show that the correlation coefficient of model is 0.882, determination coefficient is 0.779 and after adjusting decision coefficient is 0.745, which means that the resolution of the selected independent variable is 74.5%. Because it is more than 60%, the resolution of selected

independent variable is higher.

Table 5 Test of goodness of fit (ANOVA)

Model	Sum of Squares	df	Mean Square	F	Sig.
1 Regression	.193	5	.039	23.205	.000 <sup>a</sup>
Residual	.055	33	.002		
Total	.248	38			

a. Predictors: (Constant), SOE, LEV, RD, SIZE, EX

b. Dependent Variable: NPP

The goodness of fit of the test result shows when the regression equation contains different independent variables, F value is 23.205 and the significant probability value is less than 0.05, it refuses original hypothesis that general regression coefficient is 0. Therefore, the fitting effect to establish the regression equation is very good.

Table 6 results of regression analysis (Coefficients)

Model	Unstandardized Coefficients		Standardized Coefficients	t	Sig.	Collinearity Statistics	
	B	Std. Error	Beta			Tolerance	VIF
1 (Constant)	.002	.048		.051	.959		
EX	.094	.080	.124	2.081	.046	.609	1.643
RD	11.455	1.230	.885	9.315	.000	.743	1.346
LEV	-.075	.088	-.074	-.849	.402	.892	1.122
SIZE	-.0001	.000	-.228	-2.324	.026	.696	1.437
SOE	.110	.034	.374	3.281	.002	.515	1.940

a. Dependent Variable: NPP

The Chart is the result of multiple factors regression analysis by using NPP as the dependent variable, the EX, RD, LEV as independent variables, the SIZE, SOE as control variable. The result shows that the regression coefficients of the EX, RD, the SIZE, SOE are 0.094, 11.455, 0.0001, 11.455, T value are 2.081, 9.315, 2.324, 9.315, and corresponding P value is less than 0.05, which means that they have significant statistical significance. Therefore, the EX, RD, SIZE and SOE have significant effect on NPP. The EX, RD, SOE have positive effects, which means that the EX, RD, SOE are higher, correspondingly NPP is higher. While the SIZE has the negative effects, which means that the SIZE is higher, NPP is lower. And the rest of the variables for the corresponding P values are greater than 0.05 and are not statistically significant, so the effect of NPP is not significant.

Therefore, modeling according to the regression coefficient:

$$NPP = 0.094EX + 11.455RD - 0.075LEV - 0.0001SIZE + 0.110SOE + 0.002 \quad (2)$$

## Discussion of the Results

The empirical analysis shows that the international trade has a significant and positive influence on the innovation ability and the driving factor of innovation ability is the international trade. Firstly, when exporting own goods, export enterprises have the opportunity to learn about the best, the most cutting-edge production or knowledge in the international market through fierce competition with

foreign enterprises. Thus exporters are able to create and develop new technology. The empirical results clearly show that financing constraints do exist and have a significant and negative impact on the ability of innovation. The main reason is that whether it is endogenous financing or external financing, the more financial support we get, the higher the production capacity of enterprises. Thereby, the improvement of industrialization and specialization level could reduce costs and improve efficiency.

### **The Relevant Policy Recommendations**

We should emphasize and use the positive effect of export trade on innovation. The historical experience for more than 30 years since the reform and opening up policy shows that the development of export trade is a basic national policy of China situation which is accordant with the laws of economic development and china's national conditions. Because of the advantages of adopted the reform and opening-up policy, state and local governments need to take policies to promote the trade structure adjustment. The focus of the export-oriented trade strategy comes back to the export industries and enterprises which are high efficiency and energy saving and eliminating those export enterprise only relying on the advantage of factor price, high pollution, high energy consumption.

Also, we should continue to deepen financial reform and improve the operational efficiency of the financial system, especially the basic function of the financing, and ensure that enterprises have a good external financing environment. Meanwhile, we should also support the development of private enterprises, cancel restrictions on the financing of private enterprises, guide the combination of the financial resources and the private enterprises, which in order to guarantee most of the enterprises could obtain external financing. In addition, reducing the cost of external financing could improve the intention ability of enterprise innovation.

### **References**

- [1] HuangZhiyong, The Effects of R&D, FDI and International Trade On Innovation-Evidence from Chinese Industrial Data. 163 (2013) 84-89
- [2] Almeida, R., A. Fernandes. Openness and technological innovations in developing countries: Evidence from firm-level surveys. World Bank,2006:3985.
- [3] Almeida H, Campello M. Financial constraints, asset tangibility, and corporate investment. Review of Financial Studies, 2007, 20(5): 1429-1460.
- [4] YangZhifei, The Effect of Export Trade and Financial Constraints on Enterprise Innovation: An Empirical Study Based on Private Technology Enterprises Data in Zhuhai City. (2013).
- [5] Carlin, W. and C. Mayer. Finance, investment and growth. Journal of Financial Economics,2003
- [6] Keller,W. Trade and the transmission of technology .World Bank Economic Review, 2000
- [7] Madsen, J.B. Technology spillover through trade and TFP convergence:135 years of evidence for the OECD countries .Journal of International Economics, 2007.
- [8] Egger P, Keuschnigg C. Innovation, trade, and finance. 2011.
- [9] Hall, B.H. The financing of research and development. Oxford Review of

Economic Policy,2002,8 (1) : 35-51.

[10]Demirguc-Kunt, A. and R. Levine.Finance, financial sector policies, and long-run growth. World Bank Working Paper,2008. 4469.