Can Exports Raise Workers' Wages: Mediating Effect Based on Total Factor Productivity

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Abstract: This paper studies the impact of export on firms' wage premium by matching data of China's industrial enterprise database and China's customs data from 2000 to 2015. The research result shows that: export can significantly improve the wage level of enterprise workers, and this result is still significant after changing the export measurement method, removing abnormal sample points and adding more control variables. Further analysis shows that: the premium degree in high-tech industries and state-owned enterprises is relatively higher. Enterprise productivity plays a mediating role in the process of export bringing enterprise wage premium.

1. Introduction

The distributive effect of international trade has always been a research hotspot in economists. Especially since 1990s, with the availability of enterprise-level data, the phenomenon that exporting enterprises generally pay higher dividends than non-exporting enterprises has been increasingly concerned by the academic community. Bernard & Jensen [1] which was the first use the panel data of American manufacturing enterprises for nearly 16 years confirm that: Exporting companies not only have higher productivity than non-exporting companies, but also have higher wages and welfare levels than non-exporting companies, therefore they define the wage gap between exporting companies and non-exporting companies as "export wage premium. "A number of subsequent studies have obtained similar conclusions in a sample of companies in different countries or regions. Sample [2] found that in Esinia's manufacturing industry, the wage level of exporting enterprises was almost 4 times that of non-exporting enterprises. Hahn [3] found that the wage of South Korea exporting enterprises was about 12% higher than that of non-exporting enterprises. Although most studies have confirmed the effect of export on enterprise wages, few studies have involved the mechanism of action behind this process. Therefore, this paper starts from the decision problem of enterprise wage, and examines the intermediate channel of export influencing enterprise wage level. This study is helpful for domestic enterprises to obtain better trade gains through export, and also provide policy enlightenment and experience support for understanding income gap and promoting distributional fairness from the perspective of trade.

2. Data Sources, Model Building, and Variable Definition

2.1. Data Sources

The data used in this paper are from the combined data of China Industrial Enterprise Database and China Customs Database from 2000 to 2015. The Database of China's industrial enterprises is established by the National Bureau of Statistics, the data are mainly collected from the quarterly and annual reports submitted by sample enterprises to the local statistics bureau. This data set consists of three accounting statements: asset income statement, balance sheet and cash flow statement. The total GDP of the enterprises covered accounts for about 95 percent of China's total industrial GDP. The whole set of database includes two types of enterprises: all state-owned enterprises and non-state-owned enterprises with annual sales of more than 5 million, which has the advantages of rich sample size, large number of indicators and continuous years, and can comprehensively reflect the characteristics of enterprises' economic behavior. The China Customs database includes monthly data on product-level transactions. Each product is on the HS8 bit code. This database mainly covers the import and export enterprises, export quantity and export amount, unit price, HS code, name of commodity exports, months, export destination countries, customs ports, provinces and cities, trade mode, the mode of transportation, transit countries, enterprise property, the country's economic zone, the enterprise's economic zone, the enterprise and their contact information (E-mail, address, contact, telephone, fax, address, etc.), revealing in detail the international trade activities and import business labor of Chinese import and export enterprises.

In order to obtain the research data of this topic, firstly the two databases are cleaned respectively. First, enterprises with missing or negative export delivery value in any year were removed. Second, remove the salary level, fixed assets, industrial gross output value, industrial sales income, number of employees, total profits, payable wages, payable benefits and other enterprises are negative, 0 or missing. Third, remove the total fixed assets of less than 100,000 RMB enterprises. Fourth, remove the companies with fewer than eight employees. The prcess mode for the Database of China Custom is: variable names before and after 2007 were unified, samples with missing observation values were removed, and monthly data were combined into annual data.

The next is merge the two databases. This paper uses the common field "telephone number" and "postal code" shared by two databases to proceed match. The character variables "phone number" and "zip code" shared by the two databases are used to merge strings to form a common field called "telephone zip code", and then the annual data is merged and converted into panel data by using this common field. The final sample retained was the enterprises that continued to operate from 2000 to 2015, in total 16,580 and observed value is 198,960.

2.2. Model Building

In order to analyze the impact of export on enterprise wage premium, it is necessary to control all kinds of enterprise characteristic variables representing enterprise heterogeneity. In addition, it is also necessary to consider the fixed effects of year, enterprise and industry. Based on the reference of existing empirical studies, the regression model between export and enterprise wage is constructed in the following form:

$$W_{it} = \alpha + \beta * EX_{it} + \sum_{i} \gamma_i * FIRMHETERO_{it} + \sum_{cj} CV_{cj} + \varepsilon_{it} \tag{1}$$

Among them, the subscript it represents the ith enterprise in the t year. W represents the natural logarithm of the per capita wage of employees. EX represents the export status of enterprises, FIRMHETERO represents the characteristic variables of enterprises, and CV represents other

factors affecting wage changes, especially external factors that do not change over time. The reasons for selecting each variable and the definition method will be explained in detail as below.

2.3. Variable Definition

2.3.1. Explained Variable

The explained variable in the equation is the per capita income of employees, which is showed by dividing the wages payable by the number of employees. The advantage of defining wages in this way is that it provides accurate data on wages at the enterprise level, but the disadvantage is that it does not reflect the wage gap between employees.

2.3.2. Explanatory Variables

The explanatory variables in this study are divided into two categories:

The first type is the export variable. Export represents the specific impact of trade on enterprises, which is the core explanatory variable. According to whether the export delivery value is greater than 0, enterprises can be divided into export enterprises and non-export enterprises. Therefore, the export variable first defined is the enterprise export state (EX). However, the export delivery value varies greatly among enterprises. Some enterprises only export piecemeal, while others export continuously. Therefore, in order to express the degree and continuity of enterprises' participation in trade, this paper also chooses the enterprise scale (EXPORT), which is defined as the natural logarithm of export delivery amount. And export intensity (INTEN), which is defined as the proportion of export delivery value to industrial sales value. These two variables will be used to replace EX in the original model for robustness test.

The second type is enterprise characteristic variable. If not exports, what factors in the company itself contribute to wage differentials? According to Bernard & Jensen [1], enterprise characteristic variables include enterprise size, number of employees, total industrial output value, capital intensity, welfare status, profit level, etc. Becker's [4] research shows that the larger scale of the enterprise, the higher the wage payable. This paper takes the logarithm of the number of employees represent the size of the enterprise, using EMPLOY to represent it, and expects its influence on wages to be positive. The study of Heyman et al. [5] proved that there is a significant positive correlation between corporate performance and corporate wages. Here corporate profitability is defined as the natural logarithm of total profits, and represented by the symbol PRO, which is expected to have a positive impact on wages. Riley [6] believes that the stronger an enterprise's innovation ability is, the more skilled workers it contains and the higher per capita wage. In this paper, r&d subsidy RD and output value NEW of new products are selected as proxy variables of enterprise innovation capability, and the expected impact on wages is positive. The research results of Munch & Skaksen [7] shows that enterprises with higher capital intensity will adopt more advanced technology and equipment, obtaining higher production efficiency and bring higher wage level. In this paper, the ratio of fixed assets to employees is used to represent the capital intensity of enterprises, which is represented by the symbol CAP, and its impact on wages is expected to be positive. Some research results show that: foreign capital injection will significantly increase enterprise wages. Therefore, this paper chooses FDI, which is defined as the ratio of foreign capital to total capital. The impact on wages is expected to be positive. In this paper, the ratio of assets and liabilities to industrial sales output value is used to represent the capital structure of enterprises, which is represented by the symbol FC, and its impact on wages is expected to be negative. In addition, other studies have shown that enterprise survival time has a significant impact on wages. For this reason, select the enterprise age variable AGE, which value is equal to the year of

investigation minus the year of opening and plus 1, and the direction of influence on wages is uncertain.

A large number of studies believe that enterprise productivity level has a significant positive impact on enterprise wages. Since this paper intends to examine the productivity mechanism of export affecting the wage premium of enterprises, the productivity of enterprises will not be included as a control variable in the form of ordinary explanatory variable, but will appear in the form of mediating variable in the mediating effect model. Total factor productivity (TFP) is adopted as a proxy variable for enterprise productivity, and LP is used to calculate productivity.

2.3.3. Control Variables

In order to ensure the robustness of regression results, the regression equation also controls the year factors, enterprise nature factors and industry factors that affect the wage level of enterprises. The year variable is from 2000 to 2014. Enterprise ownership structure generates 20 dummy variables according to the three-digit code of enterprise "registration type". Among them, the Public enterprises include those with registration codes of 110, 120, 130, 140 and 151. Private businesses include those with registration codes 159, 160, 170 to 175. Hong Kong, Macao and Taiwan enterprises include those with codes 210, 220, 230 and 240. Foreign-funded enterprises include those with registration codes 310, 320, 330 and 340. The industry category is based on two industry codes generate 33 industry dummy variables. According to GB/T4754-2002, industries with two-digit codes 25, 27 and 35 to 40 are classified as high-tech industries. Two industry codes 21-23, 25-26, 28-32, 34 and 38 are classified as technology industries. Two industries with industry codes 13, 14, 16-20, 25 and 33 were defined as low-tech industries.

As below the symbols and definitions of various variables are summarized in Table 1, and descriptive statistics are made for each variable.

Table 1: Variable symbols, variable definitions and description statistics

variable symbol	sample number	mean value	standard deviation	minimum value	maximum value
W	197766	2. 939	0. 914	6. 107	15. 108
EX	198960	0. 528	0. 499	0	1
EXPORT	89056	10. 407	1. 936	0	18. 671
INTEN	166111	0. 457	4. 32	0	0. 993
EMPLOY	198435	5. 832	1. 148	0	12. 019
PRO	163194	10. 363	1. 667	0	18. 992
RD	29000	7. 488	2. 090	0	16. 179
NEW	198710	0. 025	0. 169	0	8. 790
CAP	198240	2854. 403	267. 644	560. 981	44509
FDI	176296	0. 082	0. 225	0	13. 166
FC	182123	0. 864	15. 285	20. 385	5049. 131
AGE	198800	18. 835	8. 721	1	43
TFP	197440	5. 661	0. 944	1. 018	8. 983

3. Descriptive Statistics

3.1. Year Comparision

Table 2 represents conduct the statistics based on year for the wage of enterprises, exporting enterprises, non-exporting enterprises and the wage premium of exports to non-exporting enterprises. Due to the lack of wage payable indicators from 2008 to 2010 in the China Industrial Enterprise Database, the calculation results of these three years are not reported. From the comparison, it can be found that: whether in the whole sample, exporting enterprises or non-exporting enterprises, the wage level of enterprises shows an overall upward trend with years. Before 2002, the degree of premium in terms of the wage ratio of export enterprises to non-export enterprises is declined. From 2003 to 2007, the wage growth rate of enterprises increased significantly, and the wage premium between export enterprises and non-export enterprises also kept increasing monotonously. However, from 2011 to 2014, this premium level showed a significant decline.

Table 2: Wages of exporting enterprises and non-exporting enterprises year comparison

Year	Business wages(yuan)	Export enterprises wages(yuan)	Non-export enterprises wages(yuan)	Ratio
2000	2400	3596	1800	1. 997
2001	2708	3909	2105	1. 857
2002	3137	4505	2394	1. 882
2003	3570	5159	2700	1. 911
2004	4188	5896	3066	1. 923
2005	4826	6946	3533	1. 966
2006	5664	8304	3956	2. 099
2007	6741	9950	4746	2. 096
2011	111467	13002	8428	1. 543
2012	12810	14376	9706	1. 482
2013	13752	15726	10490	1. 499
2014	14399	16647	10776	1. 545
2015	16534	17536	10834	1. 618

3.2. Industry Comparison

Table 3 represents conduct the statistics based on industry for the wage of enterprises, exporting enterprises, non-exporting enterprises and the wage premium of exports to non-exporting enterprises. In order to compare the wage premium of export enterprises in different industries, this paper re-matched and adjusted according to the Statistical Yearbook of China's High-tech Industries of the National Bureau of Statistics and the industry code GB/T4754-2002. Eight industries including nuclear fuel processing, pharmaceutical manufacturing, medical equipment manufacturing, and communication equipment manufacturing were defined as high-tech industries. For the remaining industries, the two industry with industry codes 21 to 23, 25 to 26, 28 to 32, 34 and 38 are defined as medium technology industries. Two industries with industry codes 13, 14, 16 to 20, 25 and 33 were defined as low-tech. Through the calculation of enterprise wages, it is found that the wages of export enterprises are significantly higher than those of non-export enterprises in

high, medium and low technology industries. Among them, the premium degree of exporting enterprises in high-tech industry is the highest, followed by medium technology industry, and the premium degree of exporting enterprises in low technology industry is the lowest.

Table 3: Wages of export enterprises and non-export enterprises Industry statistics

Classification of industry	Average salary (Yuan)	Average wage of export enterprises(Yuan)	Average wage of export enterprises(Yuan)	Premium level
High-tech industry	26223	39780	10860	3. 66
Medium-tech industry	25724	30073	10721	2. 81
Low-tech industry	16752	23546	9998	2. 36

3.3. Comparison of Ownership

As defined in the preceding variable definition, according to the 3-digit code of "registration type" in the industrial enterprise database, the sample enterprises are divided into four categories: public enterprises, private enterprises, Hong Kong, Macao and Taiwan enterprises and foreign-funded enterprises. Conducting statistic for the wages of export enterprises and non-export enterprises in these four types of enterprises respectively, and the specific results are shown in Table 4. It can be seen that, except for Hong Kong, Macao and Taiwan joint-stock companies there are no export wage premium (wage ratio is 0. 871), the rest enterprises all have varying degrees export premiums. Among the state-owned enterprises, the wage of state-owned export enterprises is 3. 348 times higher than that of non-export enterprises. Among the private enterprises, the export premium is the highest in joint-stock companies, and the salary of exporting enterprises is 2. 223 times higher than that of non-exporting enterprises. Among the Hong Kong, Macao and Taiwan enterprises, the highest premium of export enterprises is Hong Kong, Macao and Taiwan cooperative enterprises, the wage of export enterprises is 2. 023 times that of non-export enterprises. Among the foreign-funded enterprises, the export wage premium in foreign-invested joint-stock companies is the largest, and the income of export enterprises is 2. 061 times that of non-export enterprises.

To sum up, under any investigation years, different industry categories and different ownership structures, the wage of export enterprises is generally higher than that of non-export enterprises, and the wage premium of export enterprises is widely existed. However, descriptive statistics are only preliminary judgment, and the relationship between export and enterprise wage premium needs to be further proved and tested by regression method.

Table 4: ownership distribution of wages between export enterprises and non-export enterprises comparison

Enterprise Nature	Concrete type	Average wage of export enterprises (yuan)	Average wage of non-export enterprises (yuan)	Premium level
	state-owned business	125728	28918	4. 348

Public-owned enterprise	collective enterprises	16639	4745	3. 507
	joint-equity cooperative enterprises	6009	3080	1. 951
	solely state-owned enterprise	320012	135236	2. 366
Private enterprise	Limited Liability enterprise	53648	18608	2. 883
	incorporated company	87356	27101	3. 223
	Private limited liability enterprise	13784	6399	2. 154
	Private Incorporated enterprise	26727	9495	2. 815
Enterprises funded by investors from Hong Kong, Macao and Taiwan	Hong Kong, Macao and Taiwan joint ventures enterprise	19436	10237	1. 898
	Hong Kong, Macao and Taiwan cooperative enterprise	16479	8146	2. 023
	Hong Kong, Macao and Taiwan individual proprietorship enterprise	23796	13312	1. 788
	Hong Kong, Macao and Taiwan Joint Stock enterprise	60115	69057	0. 871
Overseas-funded enterprise	sino-foreign joint venture enterprise	28010	17717	1. 581
	chinese-foreign cooperative enterprise	25181	20085	1. 254
	exclusively foreign-owned enterprise	31626	18419	1. 717
	Foreign invested joint stock enterprise	107400	53262	2. 061

4. Empirical Test

4.1. Basic Regression and Robustness Test

First of all, OLS estimation is performed by using the econometric model (1) with enterprise data. Due to the sample size is large, in order to eliminate possible heteroscedasticity, this paperrobust adopt the standard error estimation, and the reported results are shown in the second column of Table 5: After controlling firm fixed effect, industry fixed effect and year fixed effect, the wage premium of export enterprises to non-export enterprises is 5. 6%, which is significant at 1% level, indicating that export can significantly improve the wage level of enterprise employees. The signs

and significance of regression coefficients of other control variables are basically consistent with expectations. Enterprise size, profitability, R&D investment, new product value, capital intensity, foreign investment participation, enterprise age and other enterprise characteristics have a significant positive impact on wage change, which is consistent with our expectation. In addition, only enterprise debt has no significant impact on wage level. Among the characteristics of enterprises other than export, enterprise size, foreign participation and enterprise profit level have the greatest impact on enterprise wages.

Table 5: OLS regression and robustness test

Dependent variable	Basic model regression	Change the export measurement method	Eliminate abnormal sample points	Introduce more control variables
EX	0. 056*** (5. 38)		0. 054*** (5. 31)	0. 060*** (5. 80)
EXPORT		0. 009*** (2. 41)		
EMPLOY	0. 797*** (140. 32)	0. 789*** (86. 92)	0. 794*** (139. 52)	0. 807*** (139. 80)
PRO	0. 121*** (33. 90)	0. 124*** (22. 48)	0. 121*** (33. 97)	0. 115*** (32,20)
RD	0. 056*** (21. 24)	0. 053*** (15. 24)	0. 054*** (21. 17)	0. 054*** (20. 59)
NEW	0. 038*** (2. 47)	0. 032* (1. 76)	0. 038*** (2. 46)	0. 031*** (2. 03)
CAP	0. 000*** (11. 15)	0. 000*** (11. 53)	0. 000*** (11. 18)	0. 000*** (11. 38)
FDI	0. 196*** (3. 08)	0. 168*** (2. 32)	0. 194*** (3. 05)	0. 195 (3. 06)
FC	-0. 006 (-1. 00)	0. 007 (0. 52)	-0. 007 (-1. 05)	-0. 009 (-1. 51)
AGE	0. 003*** (10. 17)	0. 003*** (8. 90)	0. 003*** (10. 15)	0. 003*** (10. 06)
GENDER				0. 278*** (10. 23)
Enterprise effect	YES	YES	YES	YES
Industry effect	YES	YES	YES	YES
Year effect	YES	YES	YES	YES
cons	2. 708*** (24. 75)	2. 775*** (10. 32)	2. 727*** (24. 86)	2. 768*** (25. 69)
Adj-R^2	0. 882	0. 878	0. 880	0. 883
OBS	11748	6651	11719	11721

In each bracket is reported the t-statistic corresponding to the estimated coefficient,***,**,* respectively represent the regression coefficients are significant at 1%, 5% and 10% levels

In order to test the robustness of regression results, the original model was re-estimated by changing the measurement method of export variables, eliminating abnormal sample points and introducing more control variables. The results are reported in columns 3 to 5 of table 5. It can be seen that when reestimated by using the enterprise export scale EXPORT replace the export status EX, the estimated coefficient of EXPORT is 0. 009, which is significant at 1% level. This conclusion is consistent with the result of export status EX participation regression. Since EXPORT represents the natural logarithm of export delivery amount, its regression coefficient reflects the elastic relationship between export and enterprise wages: that is, every 1% increase in export delivery amount, wages will increase by 0. 9%. In order to eliminate the influence of abnormal sample point disturbance on regression results and ensure the robustness of regression results, this paper also uses the method of eliminating abnormal sample point to re-estimate the original model. First, calculate the quantile of enterprise wages payable at 1%, 2%, 97% and 99%, then eliminate the sample enterprises with low and high wages, and re-estimate the remaining samples based on the new sample, the results show that the regression coefficient 0. 054 of export to enterprise wages is significant at the level of 1%. This indicates that the regression result is robust, and this coefficient is slightly lower than the regression coefficient of the basic regression model of 0,056, which reflecting that the regression result after removing outliers is more reliable. In the end, based on the econometric model (1), this paper introduces the GENDER ratio of corporate employees (i. e., the proportion of male employees in corporate employees). The results of re-estimation show that: the regression coefficient of export variables is significantly positive at the 1% level, which further proves the robustness of the basic regression results. At the same time, the regression coefficient of male employee ratio is 0. 278, which is significant at 1% level, indicating that the higher proportion of male employees in an enterprise, the higher salary of employees.

Through conducting OLS regression on the econometric model (1) shows that: After controlling the characteristic variables of firm heterogeneity. And after fixing the year, ownership and industry factors, exports can still significantly raise enterprise workers' wages. The conclusion that export raises enterprise wage level is still significantly valid after changing the measurement method of export, removing abnormal sample points and adding more control variables, so it is robust.

4.2. Mediating Effect Test

It is concluded that through the preliminary regression: after controlling other related variables, export can still significantly improve the wage level of enterprises. Then, what process or channel does export raise enterprise wages? Bernard & Jensen (1995) [1]pointed out that the productivity level of exporting enterprises was higher than that of non-exporting enterprises, thus they paying higher wages, and the similar conclusions were made by Helpman et al [5].

Thus in this paper total factor productivity (TFP) is taken as a mediating variable, according to the process of Sobel-Goodman mediating effect test, carried out regression of explanatory variables and explained variables. Explanatory and intermediary variables. Explanatory variables, intermediary variables and explained variables, and the estimation results are shown in Table 6. In the second column of the table: The explained variable is total factor productivity, and the explained variable is export. The estimated coefficient of export to total factor productivity is significantly positive at the 1% level, indicating that export can significantly promote the improvement of enterprise productivity, which indicates that export indeed improve the productivity of relevant enterprises. The third column represents the impact of export on the wage level of enterprises without adding the intermediary variable TFP. Among them, the explanatory coefficient of export is 0. 046, which is significant at 1% level, it shows that there is a significant wage premium in export enterprises when other conditions remain the same. The last column is the influence of export on

enterprise wages after adding intermediary variables. The estimated coefficient of exports is still significant at the 1% level, but drops to 0. 034, which shows that the premium effect of export wages is partly explained or absorbed by mediating variables. Based on the three test paths, it is found that enterprise productivity plays a mediating role in the impact of export on enterprise wages.

Table 6: productivity mechanism inspection of wage premium in export enterprises

explained variable	TFP	W	
EX	0. 067*** (5. 45)	0. 046*** (9. 62)	0. 034*** (8. 67)
TFP			0. 067*** (8. 15)
PRO	0. 449*** (85. 90)	0. 291*** (59. 92)	0. 262*** (42. 96)
NEW	0. 002 (0. 16)	0. 01 (0. 68)	0. 010 (0. 67)
RD	0. 026*** (10. 38)	0. 054*** (22. 75)	0. 052*** (21. 97)
EMPLOY	-0. 382*** (-60. 79)	0. 676*** (115. 57)	0. 701*** (105. 96)
FC	-0. 302*** (-46. 50)	0. 024*** (4. 06)	0. 045*** (6. 86)
CAP	-0. 000*** (-2. 47)	0. 002*** (11. 10)	0. 002*** (11. 30)
FDI	0. 264*** (9. 17)	0. 596*** (22. 17)	0. 614*** (22. 82)
AGE	-0. 002*** (-10. 36)	0. 003*** (11. 53)	0. 003*** (12. 26)
Enterprise effect	YES	YES	YES
Industry effect	YES	YES	YES
Year effect	YES	YES	YES
cons	-2. 246*** (-62. 76)	1. 395*** (41. 90)	1. 545*** (40. 70)
Adj-R^2	0. 541	0. 871	0. 872
OBS	11748	11748	11748

In each bracket is reported the t-statistic corresponding to the estimated coefficient,***,**,* respectively represent the regression coefficients are significant at 1%, 5% and 10% levels

Furthermore, according to the Sobel-Goodman test, we can know the proportion of indirect effect with enterprise productivity as intermediary variable in the total effect of export on enterprise wage premium. In Table 7, the coefficient of indirect effect is 0. 012, which is significant at 1% level and accounts for 25. 2% of the total effect. On the one hand, it indicates that enterprise productivity plays an important role in the influence of export on enterprise wage premium, on the other hand, it also implies that the influence channels of export on enterprise wage premium are diversified.

Table 7: Significance analysis of Sobel-Goodman test

	Coefficient	Standard deviation	Z value	P>|Z|
Indirect effect	0. 012***	0. 002	5. 297	1. 2e-07
Direct effect	0. 034***	0. 010	3. 379	0. 0007
Total effect	0. 046***	0. 010	4. 425	9. 6e-06
The ratio of indirect and direct effects		33. 6%		
The proportion of mediating effect in the total effect		25. 2%		

***,**,*in the formrespectively represent the regression coefficients are significant at 1%, 5% and 10% levels

4.3. Further analysis

Previous studies have pointed out that: under the different industries or ownership structures, the impact of export on wage premium is also different. Next there will be further tests for it.

First of all, according to industry differences, the relationship between export and enterprise wages in high-tech, medium-tech and low-tech industries is estimated respectively, and the results are shown in Table 8. It can be seen that: regardless of how the level of industry is, export has significantly improved the wage level of enterprises. Among them, the export wage premium of high-tech industry is 7. 4%, the medium-tech industry is 2. 4% and the low-tech industry is 4. 2 %. This shows that export has the most significant impact on the wages of workers in high-tech industries, the influence on the wages of workers in low-tech industries is the second, and the influence on the wages of workers in medium-tech industries is the least. It is noteworthy that export has a greater impact on workers' wages in low-tech industries than in medium-tech industries, which is consistent in some extent with the previous conclusion that export has a more significant impact on the wages of low-income groups.

In addition, according to the difference of ownership nature, the regression of export and enterprise wage level is carried out under four types of public enterprises, private enterprises, Hong Kong, Macao and Taiwan enterprises and foreign-funded enterprises respectively, the regression results are shown in Table 8. It can be seen that, regardless of the form of ownership, export has significantly improved the wage level of enterprises. However, in terms of the degree of premium, the export wage premium of state-owned enterprises is the highest 7. 1%, followed by foreign enterprises 6. 4%, and the lowest premium of private enterprises is 4. 1%. The possible reasons are as follows: the public enterprises are mostly large enterprises that control national economy and people's livelihood resources, which have high productivity level and enterprise scale, and are mostly natural monopoly type. Therefore, export has the most significant impact on wages of public enterprises. Foreign-funded enterprises mostly are capital-intensive, distributed in high-end manufacturing, new energy industry, modern service industry and other fields, and their demand for talents is higher than that of domestic enterprises. Exports have raised the productivity of such firms and increased workers' incomes accordingly. By contrast, the private enterprise mainly engaged in production of labor-intensive products such as textile, clothing, printing, chemical fiber, stationery and so on. Although such companies export strength is very big, but mainly take imported materials or materials processing as the principal thing, low value-added products, although export trade effectively drive the employment of these companies, it is unable to effectively enhance the level of the salary of laborer.

Table 8: Industry category, Ownership structure and firm wage premium

	industry category			structure of ownership			
Explained	High-	Medium-	Low-tech	Public-	private	enterprises	Overseas-

variable	tech industry	tech industry	industry	owned enterprise	enterprise	funded from Hong Kong; Macao and Taiwan	funded enterprise
EX	0. 074*** (5. 54)	0. 024*** (2. 05)	0. 042*** (2. 47)	0. 071*** (2. 68)	0. 041*** (3. 93)	0. 060* (1. 77)	0. 064** (1. 91)
EMPLOY	0. 783*** (109. 9)	0. 832*** (68. 86)	0. 830*** (55. 52)	0. 816*** (61. 96)	0. 827*** (115. 4)	0. 820*** (49. 10)	0. 735*** (59. 86)
PRO	0. 118*** (29. 8)	0. 105*** (13. 90)	0. 104*** (10. 91)	0. 101*** (12. 85)	0. 104*** (25. 19)	0. 125*** (12. 62)	0. 146*** (18. 01)
RD	0. 066*** (20. 04)	0. 046*** (8. 05)	0. 039*** (5. 88)	0. 052*** (8. 31)	0. 056*** (16. 79)	0. 044*** (6. 06)	0. 071*** (11. 99)
NEW	0. 062*** (3. 37)	-0. 043 (-1. 06)	-0. 046 (-0. 75)	0. 041 (0. 77)	0. 043*** (2. 33)	-0. 074 (-1. 50)	0. 101*** (2. 50)
CAP	0. 000*** (11. 87)	0. 000***(6. 95)	0. 000*** (9. 46)	0. 000*** (3. 86)	0. 000*** (12. 47)	0. 000*** (4. 64)	0. 000*** (4. 85)
FDI	0. 137** (1. 99)	0. 151 (1. 49)	0. 278*** (2. 93)	-0. 052 (-0. 04)	0. 934*** (2. 54)	0. 350 (1. 61)	0. 206*** (3. 85)
FC	-0. 011 (-1. 23)	-0. 015 (-0. 67)	-0. 062*** (2. 35)	-0. 030* (-1. 74)	-0. 006 (-0. 76)	-0. 071*** (-2. 34)	-0. 040 (-1. 12)
AGE	0. 003*** (7. 80)	0. 003*** (4. 00)	0. 002*** (2. 45)	0. 002*** (5. 26)	0. 002*** (7. 09)	0. 008*** (3. 50)	0. 005*** (2. 53)
Enterprise effect	YES	YES	YES	YES	YES	YES	YES
Industry effect	YES	YES	YES	YES	YES	YES	YES
Year effect	YES	YES	YES	YES	YES	YES	YES
cons	2. 765*** (42. 71)	2. 636*** (29. 96)	2. 651*** (26. 19)	2. 876*** (15. 43)	2. 431*** (18. 98)	2. 405***(20. 46)	2. 038*** (20. 26)
adj-R^2	0. 860	0. 895	0. 882	0. 932	0. 878	0. 849	0. 811
OBS	3977	2328	4493	1752	6220	1375	2401

In each bracket is reported the t-statistic corresponding to the estimated coefficient,***,**,* respectively represent the regression coefficients are significant at 1%, 5% and 10% levels

5. Conclusion

Based on the data of Chinese industrial enterprises and Chinese custom, this paper not only verifies whether export can significantly increase enterprise wages after controlling the heterogeneity of

enterprises, but also examines the intermediate channels which export can increase enterprise wages, and finally discusses the difference in the impact of export on enterprise wage premium. In toal obtained some important conclusions as following.

First, after controlling enterprise characteristic factors and other influencing factors, export can still significantly improve enterprise wage level. The estimation results of the econometric model based on micro-data show that: the wage of export enterprises is significantly higher than that of non-export enterprises, with a premium of 5. 6%. After changing the measurement method of export variables, removing abnormal sample points and adding more control variables, re-estimated the original equation, the results show that the estimated coefficients of export on enterprise wages are significant at 1% level, which indicate that this result is robust. The results of robustness test also show that: every 1% increase in export delivery, export enterprises' wages will increase by 0. 9%. After removing the abnormal sample point disturbance, the estimated coefficient of the outlet variable has a decreasing trend.

Second, enterprise productivity plays a mediating role in the process of export influencing firm wage premium. By using Sobel-Goodman test and Bootstrap test respectively, it is found that export significantly improves the total factor productivity of enterprises, and then driving the increase of enterprise wage level. Sobel-goodman test indicates that: the mediating effect accounts for 25. 2% of the total effect of export on enterprise wages. The results of the Bootstrap test were 25. 5%. This also reflects the existence of other intermediate channels which exports influence corporate wages.

Thirdly, the impact of export on wage premium varies with industry and ownership structure. Exports in high-tech industries have the most significant impact on workers' wages, followed by those in low-tech industries, and the lowest in middle-tech industries. Under the different types of enterprises, export has the most significant impact on workers' wages in publicly owned enterprises, followed is foreign-funded enterprises, and the least impact on workers' wages is Hong Kong, Macao and Taiwan enterprises and private enterprises.

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