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Understanding the Linkage between Wage Growth and the Internationalization Strategies of Firms

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Abstract

This paper investigates the impacts of four internationalization strategies (ISs) adopted by firms on wages. In this research, we conclude four strategies a firm will adopt in developing an overseas market: (1) the "no international activity strategy"; (2) the "export strategy"; (3) the "foreign direct investment (FDI) strategy"; and (4) the export and FDI "combined strategy". Based on the dataset from the Annual Surveys of Industrial Production (ASIP) and the List of Overseas Investment Firms (Institutions) from the Ministry of Commerce of China, this research finds that wages increase as the firms' ISs evolve. And when the "combined strategy" is adopted, wages increase to the greatest extent. To understand this linkage between wage growth and the ISs, we conduct a mechanism test. The results demonstrate that the "the export strategy", "the FDI strategy" and "the combined strategy" may increase wages by improving firms' innovative capability and productivity of firms.

JEL classification numbers: F16.
Keywords: Export, Foreign Direct Investment, Internationalization Strategies, Firms Wage.

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1. Introduction

Exports and FDI practices of a firm will inevitably affect the wages. Based on the Annual Surveys of Industrial Production (ASIP) and the List of Overseas Investment Firms (Institutions) from the Ministry of Commerce of China from 1998 to 2007, we find that the average wages changed when firms launched different ISs. More specially, the averages wage paid by firms which neither exported nor carried out FDI was 12,671 yuan. But it would rise to 15,546 yuan when firms chose to export instead of FDI. If the firm had FDI with no exports, the number of the average wages increased to 19,989 yuan. And it would reach to the maximum value of 20,740 yuan in this case when firms adopted an IS combined with export and FDI (henceforth, "the combined strategy"). In a word, average wages will keep growing with the upgrade of firms' ISs.

Wage inequality is an important topic in economic research. For it will not only affect the working enthusiasm of employees, the creation of firm value, the daily life of people, but also the economic development and social stability. Research on wage has suggested that the average productivity of FDI firms is generally higher than that of exporting firms, while the productivity of latter is higher than that of those purely domestic market firms (Helpman, et al. 2004). This argument mirrors that FDI firms with more capital and technology-intensity have higher labor productivity, and are eager to hire more high-skilled labor forces which implies that labor costs of FDI firms are higher than domestic market firms (Doms and Jensen 1998).

Given the nonnegligible impact of exporting and FDI on the wages and performances of firms, it is theoretically necessary to investigate more on this topic. There is a great body of literature studying the influences of exporting and FDI on wages. On the one hand, some research has been studying the relationship between FDI and the employment or wages of home country from a national-macro perspective (Feenstra and Hanson 1999; Cuyvers and Soeng 2011; Hitoshi et al. 2012) or industrial-medium perspective (Siegel 1999; Paul and Siegel 2001). Hijzen (2007) finds that FDI in labor-intensive industries in developed countries widens the wages gap in home countries.

On the other hand, there are literature investigating the impact of firms' ISs on wages. Most studies have shown that exports significantly increases wages, and the average wages of export firms is higher than that of non-export firms (Schank et al., 2007; Amiti and Davis 2012). Some scholars seek to explain how exports affects the wages differentials of laborers with different skills from the heterogeneous firm productivity effects (Helpman et al., 2010), wages effects of process trade (Grossman and Rossi-Hansberg 2008), and employment friction effects in labor market (Anderson, 2009).

However, these research only analyzes the impact on wages from a single perspective of export or FDI, and few studies incorporate export and FDI into a unified research framework. Obviously, firms tend to adopt multiple strategies simultaneously in order to survive or maximize the profits in foreign markets.

Therefore, previous research through the lens either from export or FDI usually leads to explanatory variables omission and biased findings, which fail to provide any accurate reference in evaluating the impact of exporting or FDI choices on firms' performance. Moreover, the biases will be more explicit when the alternative relationship between export and FDI (Head and Ries 2004) is taken into account.

Therefore, we provide a taxonomy of firms' ISs, which are four derivative strategies from the two basic internationalization activities (exporting and FDI) of firms. The first strategy involves neither export nor FDI activities (the "no international activity strategy"). For the second strategy, firms adopt exports instead of FDI (the "export strategy") as the IS. The third strategy involves FDI activities but no exports (the "FDI strategy"). The last strategy is a mixed usage of exporting and FDI (the "combined strategy"). On the basis of this taxonomy, this paper examines the impact and the influential mechanism of these four ISs on wages. Existing studies have revealed that both exports and FDI will lead to a wages growth, but the question of how the wages are influenced when firms adopting different ISs is still unexplained. According to Head and Ries (2004), exporting and FDI are two alternative strategies for firms in reaching overseas market. Therefore, this paper aimed to put the influences of firms' ISs on wages into our analysis.

Before 2005, there is only a small number of Chinese firms carried out FDI, but this number has increased sharply since 2005. In 2004, China's FDI was only 5.5 billion U.S. dollars. In 2005, it exceeded 10 billion U.S. dollars. In 2016, the aggregate of Chinese FDI reached a historical maximum of 196.15 billion U.S. dollars. This paper investigates the impact of different ISs on wages with the Annual Surveys of Industrial Production(ASIP) and the List of Overseas Investment Firms (Institutions) from the Ministry of Commerce of China from 1998-2007. The empirical results suggest that, compared to firms that adopted the "no international activity strategy", the firms that adopted the "export strategy" pay higher wages. In other words, the "export strategy" imposes a promoting effect on the average wages' growth, but its promoting effect is weaker than the "FDI strategy". And when firms adopt an exporting and FDI combined strategy, the wages grow to the greatest extent. To understand this phenomenon, we conduct a mechanism test, which evidences that the promoting effect of the ISs on wages is generated by the improvement of firms' innovative capacity and productivity.

Our paper contributes to three strands of literature. First, it expands the research on the impact of export and FDI on wages. Some literature have explored the impact of exports or FDI on wages separately (Amiti and Davis 2012). Our research puts exporting and FDI within a unified research framework, and investigates the influential mechanism of the four ISs on wages. Second, it extends the research on ISs of firms. Previous studies mainly evaluate the ISs (exports and FDI) of firms from the perspective of vertical integration or outsourcing (Antras and Helpman 2004), this paper evaluates and empirically tests the performance of four different ISs, which include the possibility of a exporting and FDI combined strategy. Third, this paper examines the influential mechanism of the firms' ISs on wages by constructing an intermediary effect model. The research not only aims at provide

new evidence for the theoretical development on firms' ISs, but also provide policy guidance for firms on efficient implement of ISs.
The rest of the paper is organized as follows. Section 2 presents our theoretical mechanism and propositions. Section 3 describes the dataset and the stylized facts. Section 4 presents empirical approach. Section 5 addresses the influential mechanism of firms' ISs on the wages. Section 6 concludes.

2. The influential mechanism of firms' ISs on wages

Exports and investing directly abroad have been two central business activities for firms in developing foreign markets. These activities facilitate the firms' innovative capability and productivity of the home country, meanwhile it spurs the income growth of employees. First, firms exporting and/or making FDI gain opportunity in exploiting broader markets, the latest information, the most advanced management experience and technology, which are conducive to the acquisition of higher labor skills, the exchange and diffusion of knowledge, resulting in knowledge spillover and learning effect. A broader market brings more sufficient and detailed local information, enabling firms to better meet the demand of consumers, which greatly saves the cost of trial and error for firms, thereby increasing firms' productivity. The latest information, the more advanced management experience and technology enable firms to learn and update their management experience, reduce production and management costs and enhance firms productivity. As the productivity improves, wages of employees generally increase as well. Secondly, firm's participation in international markets usually implies a growing intensified market competition, enabling the exporting and/or FDI firms to gain more competitive advantages compared with those do not operate in international market, which in turn benefits the R&D sector and the innovative capability of firms and reduce production costs and improve the product quality. Thirdly, the expansion of production scale and the technical improvement of firms will attract high-quality labor, and generate labor transfer effect. To make full use of the high-quality labor, firms are eager to pay higher wages. Finally, exporting or FDI firms can increase the collective bargaining power of wages, contributing to the realization of rent sharing between employees and firms, and ultimately increase the wages. Based on these analysis, we propose the following hypotheses:

Hypothesis 1: When a firm chooses to participate in international markets, it will pay more wages. Moreover, the wages are increased by improving the firms' innovative capability as well as productivity.

The internationalization strategy of different firms may have a heterogeneous impact on wages. Compared with the "export strategy", firms conducting FDI have advantages in ownership, internalization, and location (Dunning and Narula 2009), which contributes to stronger innovative capability and productivity of firms, and the subsequent wage growth. The reasons are as follows. First of all, compared with

exports, FDI promotes the production efficiency and innovation within firms through stronger technology spillover effects and learning effects. As a consequence, wages paid by firms increase. By greenfield investment or mergers and acquisitions, FDI firms acquire the host countries' advanced technology, the latest information, and the attraction to the high-skilled labor forces of host country and other advanced production factors. Secondly, compared with exporting firms, FDI firms benefit from the shared R&D outcomes, costs and risks with the host country, promoting production efficiency and innovative capability, so as to increase wages. Finally, compared with exports, FDI has significantly increased the mark-up of firms, which improves firms' production efficiency as well as wages greatly. FDI promotes product innovation of firms, reduces the elasticity of demand, and helps firms to set higher prices, improve production efficiency and reduce the marginal costs of firms. Helpman et al. (2004) theoretically demonstrated that firms will choose different organizational forms according to their own productivity status. While firms with the lowest productivity inherently withdraw from the market competition for their inability to make profit, the low-productivity firms only have to serve the domestic market. The firms with higher productivity have the chance to export and make FDI. Based on these arguments, we propose hypothesis 2:

Hypothesis 2: Compared to the "no international activity strategy", the "export strategy" imposes a positive effect on wages, but its promoting effect is weaker than that of the "FDI strategy". And the "combined strategy" imposes the strongest promoting effect in these four ISs on wages.

3. Data and stylized facts

3.1 Data sources

Our dataset mainly sources from the Annual Surveys of Industrial Production (ASIP), conducted by the National Bureau of Statistics of China (NBSC) and the List of Overseas Investment Firms (Institutions) of the Ministry of Commerce of China.

The Annual Surveys of Industrial Production is the one of the most comprehensive survey data for industrial firms in China, which accounts for over 90% of industrial output and over 70% of industrial employment in 2004 (Brandt et al. 2012). The surveys include all state-owned industrial firms, and non-state-owned industrial firms with revenues above 5 million yuan, 20 million yuan after 2011. The dataset contains 40 GB/T (i.e., Chinese Industrial Classification) dichotomy industries, including all manufacturing industries.

The List of Overseas Investment Firms (Institutions) of the Ministry of Commerce of China contains information on China's FDI firms since 1980. We matched the samples of Annual Surveys of Industrial Production with the List of Overseas Investment Firms (Institutions) and dealt with the dataset as follows: First, we drop the observations whose values are missing or negative of important financial indicators such as gross industrial output value, net fixed assets, export value, etc.;

Second, we drop the observations whose total assets are less than current assets, whose accumulated depreciation is less than current depreciation, whose number of employees is less than 8, and whose wages are negative. At last, we obtain a total of 2,173,405 observations from the original sample.

3.2 Descriptive statistics

The explained variable is the logarithm of the average wages (lnwage), which is measured by the log of the ratio of paid wages to total labor employed by the firms. The main explanatory variable is the export dummy variable (exportdum), which takes value 1 if export value is greater than 1, otherwise, it is 0. An FDI dummy variable, which takes value 1 if a firm conducted FDI, otherwise, it is 0. Furthermore, we control for other variables such as LP productivity (tfp), firms' age (age), and the logarithm of the number of employees (lncyrs), and fixed effects of industries and regions.

The statistical description of the main variables is reported in Table 1. We adopt the LP method (Levinsohn and Petrin 2003) to measure firms' productivity. In the robustness check, we used the OP method (Olley and Pakes 1996) to measure firms' productivity.

Table 1: Statistical description

Variable	Name	Description	N	Mean	SD	Min	Max
Lnwage	The logarithm of the average wages	The logarithm of total wages payable this year/number of employees	2152166	2.29445	0.7808	-8.1215	11.2256
FDI	Dummy Variables of FDI	FDI firm is 1, otherwise 0	2173405	0.0005	0.0230	0	1
Exportdum	Dummy Variables of Export	If the export value is greater than 0, it is 1, otherwise 0	2173405	0.253	0.4349	0	1
tfp	Productivity	LP productivity	2088720	6.331	1.244	-3.7882	14.9376
age	Firms age		2172465	10.810	12.218	0	290
lncyrs	Logarithm of employees		2173405	4.782	1.1472	2.0794	13.2528

3.3 Stylized facts

Before 2005, there was only a small number of Chinese firms had conducted outward FDI(OFDI). In 1998, OFDI of Chinese firms was US$2.7 billion, and in 2004 it was only US$5.5 billion. However, it has increased sharply since 2005, reaching US$12.26 billion, US$21.16 billion in 2006, and US$26.51 billion in 2007. In 2016, the record of China's FDI reached a historical maximum of US$196.15 billion, but it started to decline after 2017 (see Figure 1). In a word, OFDI of China's firms was growing rapidly, OFDI flows of Chinese firms in 2016 was 72 times that of 1998.

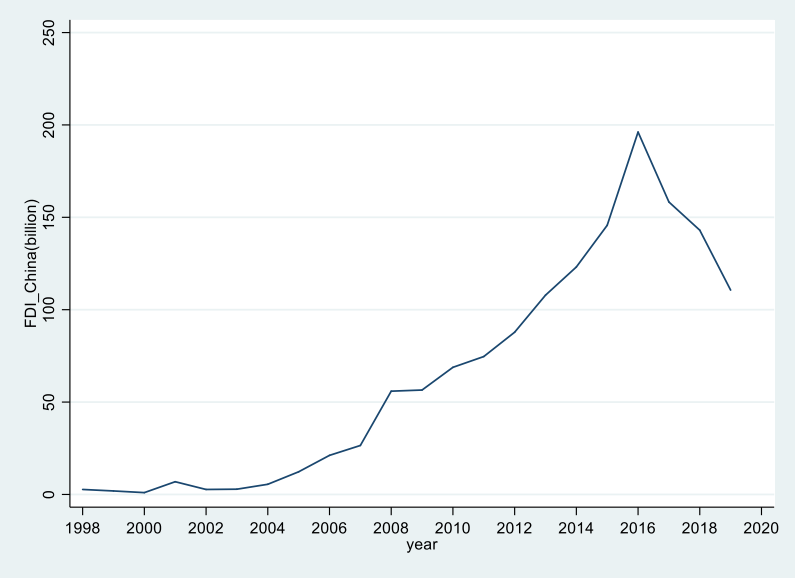

Figure 1: OFDI flows of China (billion US dollars)

Whether a firm chooses to export or invest directly abroad, it is aimed to make profit at foreign markets. Therefore, we define the firms adopt the "export strategy", the "FDI strategy" or the "combined strategy" as the firms "operating internationally", while firms that neither export nor FDI are defined as the firms "operating domestically". Figure 2 shows that the average wages of the two types of firms have been increasing from 1998 to 2007, and the average wages of the firms operating internationally are significantly higher than the firms operating domestically. This rough description of the Figure 2 illustrates a positive relationship between the adoption of firms' ISs and the average wages' growth. However, the average wages paid by firms are affected by other factors as well. This paper will adopt a rigorous quantitative analysis in following sections to reveal the heterogeneous impact of firms ISs on wages.

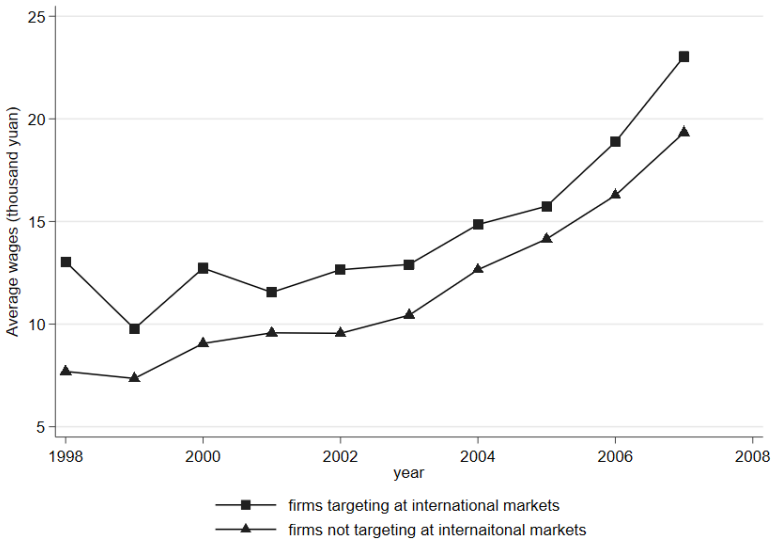

Figure 2: The gap of the average wages between the two types of firms (1,000 yuan)

4. Empirical approach

4.1 Benchmark regressions

This paper will empirically test the above theoretical hypotheses based on the matched data of the Annual Surveys of Industrial Production and the List of Overseas Investment firms (Institutions) of the Ministry of Commerce of China from 1998 to 2007, and examine the impact of firms' ISs on wages with two methods. One is to investigate whether the firms will increase the wages they pay to the labor forces when they operate internationally. The categorization of firms we provided is listed in Section 3.

The explanatory variable is the dummy variable ($oversea_{it}$), which takes value 1 if the firm operates internationally, $oversea_{it} = 1$ otherwise, it is 0. The other method is to classify the firms' ISs into four categories, and we set variables Org_{it}, and defined as follows:

When the firm chooses to conduct FDI, $OFDI_{it} = 1$, otherwise, $OFDI_{it} = 0$.
When the firm chooses to export, $exportdum_{it} = 1$, otherwise, $exportdum_{it} = 0$.

-If $OFDI_{it} = 0$, $exportdum_{it} = 0$, that is, a firm adopts "no international activity strategy", then $Org_{it} = 1$, we will regard this choice as a benchmark choice;
-If $OFDI_{it} = 0$, $exportdum_{it} = 1$ that is, a firm adopts the "export strategy", then Org_{it}=2;
-If $OFDI_{it} = 1$, $exportdum_{it} = 0$, that is, a firm adopts the "FDI strategy", then Org_{it}=3;
-If $OFDI_{it} = 1$, $exportdum_{it} = 1$, that is, a firm adopts the "combined strategy", then Org_{it}=4.

Based on the first method, our benchmark regression is specified as follows:

$$lnwage_{ijkt} = a_0 + a_1 oversea_{it} + \beta X_{it} + v_j + v_k + +\varepsilon_{ijkt} \quad (1)$$

where subscripts i represents firms, j represents industries, k represents regions, and t represents year. The explained variable is $lnwage$, which is the logarithm of the average wages of firms, X_{it} is the control variable, v_j is the industry fixed effects, v_k is the regional fixed effects, and ε_{ijkt} is the random error term.
Based on the second method, our benchmark regression is specified as follows

$$lnwage_{\mathrm{ijkt}} = b_0 + b_1 Org_{it} + \beta X_{it} + v_j + v_k + +\varepsilon_{ijkt} \quad (2)$$

This paper will examine the heterogeneous impacts of four firms' ISs on wages. To be more concrete, it seeks to answer the question: which strategy in the four ISs adopted by firms can impose the stronger promoting impact on wages?

4.2 Regression results

The results of benchmark regression are reported in Table 2. We do not include firm-level control variables and fixed effects in column (1), and column (2) are added firm-level control variables but did not control fixed effects, and columns (3) - (5) are added industry fixed effects and regional fixed effects. We find that the coefficients of the variable $oversea_{it}$ in equations (1) - (5) are significantly positive, indicating that the firms operating internationally tend to pay more wages. This is consistent with theoretical hypothesis 1. After adding other control variables, the significance level of the variable $oversea_{it}$ and the direction of the coefficient did not change, indicating that the regression results are robust.

Table 2: Impact of ISs on wages: based on different adoptions of ISs

	(1)	(2)	(3)	(4)	(5)
oversea	0.15038***	0.18105***	0.12273***	0.17729***	0.13519***
	(0.00150)	(0.00137)	(0.00136)	(0.00139)	(0.00137)
tfp		0.27974***	0.28248***	0.28034***	0.28142***
		(0.00045)	(0.00044)	(0.00045)	(0.00044)
age		0.00291***	0.00325***	0.00240***	0.00253***
		(0.00006)	(0.00006)	(0.00006)	(0.00006)
lncyrs		-0.26834***	-0.24933***	-0.27293***	-0.25261***
		(0.00064)	(0.00062)	(0.00064)	(0.00062)
Regional fixed effects	No	No	Yes	No	Yes
Industry fixed effects	No	No	No	Yes	Yes
_cons	2.25202***	1.72633***	1.97844***	1.46339***	1.76839***
	(0.00098)	(0.00348)	(0.00574)	(0.02090)	(0.02032)
N	2152166	2082863	2082861	2082860	2082858

Note: The values in parentheses are robust standard errors. ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

4.3 Impacts of the four firms' ISs on the wage growth

We argue that the different ISs adopted by firms have a heterogeneous effect on the wages. Thus, according to the taxonomy given in Section 1 and the theoretical hypothesis 2, there is a need to estimate the impacts of four different ISs adopted by firms on wages, namely the "no international activity strategy", the "export strategy", the "FDI strategy" and the "combined strategy". The "no international activity strategy" is served as the basic category,

Their estimated results are correspondingly shown in Table 3 from the first row (Org=2) to the third row (Org=4). We did not include firm-level control variables and fixed effects in column (1), and added firm-level control variables but did not control fixed effects in column (2). Industry fixed effects and regional fixed effects are added in columns (3)-(5).

We find that no matter whether we add control variables and fixed effects, compared with the "no international activity strategy", the other three ISs' coefficients are all significantly positive and successively increase in our estimation. The empirical results suggest that, compared to the "no international activity strategy", the "export strategy" imposes a positive effect on firm wages, but its promoting effect is weaker than the "FDI strategy". And when firms adopt a "combined strategy", wage will grow to the greatest extent. These results are consistent with theoretical hypothesis 2.

Table 3: Impact of the ISs adopted by firms on wages: based on ISs classifications

	(1)	(2)	(3)	(4)	(5)
Org=2	0.150***	0.181***	0.122***	0.177***	0.135***
	(0.00150)	(0.00137)	(0.00136)	(0.00139)	(0.00137)
Org=3	0.351***	0.282***	0.264***	0.282***	0.269***
	(0.03486)	(0.03161)	(0.03138)	(0.03153)	(0.03130)
Org=4	0.433***	0.395***	0.328***	0.391***	0.341***
	(0.02076)	(0.01885)	(0.01874)	(0.01881)	(0.01870)
tfp		0.280***	0.282***	0.280***	0.281***
		(0.00045)	(0.00044)	(0.00045)	(0.00044)
age		0.00290***	0.00325***	0.00240***	0.00253***
		(0.00006)	(0.00006)	(0.00006)	(0.00006)
lncyrs		-0.268***	-0.249***	-0.273***	-0.253***
		(0.00064)	(0.00062)	(0.00064)	(0.00062)
Regional fixed effects	No	No	Yes	No	Yes
Industry fixed effects	No	No	No	Yes	Yes
_cons	2.252***	1.727***	1.979***	1.464***	1.769***
	(0.00098)	(0.00348)	(0.00574)	(0.02090)	(0.02032)
N	2152166	2082863	2082861	2082860	2082858

Note: The values in parentheses are robust standard errors. ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

4.4 Robustness check

An important finding in the above section is that the operation of firms in overseas markets has significantly increased wages. Compared to the "no international activity strategy", the "export strategy" has a more positive effect on firms' wages, but its promoting effect is weaker than the "FDI strategy". And the "combined strategy" has the strongest effect on the raise of wages in the four ISs. To ensure the verification of this finding, we conduct an extra exploration on different sets of robustness exercises.

4.4.1 Remove the firms in the western regions of China

Due to uneven economic development, firms in the western region of China usually have much less OFDI. We removed the firms in the western region and left those firms in the eastern and central regions of China, which are more likely to conduct FDI. [2]Columns (1)-(3) of Table 4 report the results of the impact of firms' ISs on wages in the eastern and central regions. It can be seen that the firms' activities in overseas markets has significantly increased wages. This finding is consistent with the hypothesis 1. Columns (1)-(3) of Table 5 report the heterogeneous impacts of the ISs on wages in the central and eastern regions, which is consistent with the hypothesis 2, indicating that even if the firms in the western regions with less FDI are removed, the results are still robust.

4.4.2 Adopt the OP productivity method

In the previous studies, we used LP productivity as the control variable. To ensure the robustness of the regression results, OP productivity is set as the control variable in columns (4) - (6) of Table 4, which aims at investigating the impact of firms' ISs on wages. Columns (4) - (6) of Table 5 report the heterogeneous impact of firms' ISs on wages using OP productivity as a control variable. The results presented here show that the robustness of the regression results.

[2] Eastern region includes: Beijing, Tianjin, Shanghai, Hebei, Jiangsu, Shandong, Liaoning, Zhejiang, Guangdong, Guangxi, Fujian, Hainan; Central region: Anhui, Guangxi, Henan, Heilongjiang, Hubei, Hunan, Jilin, Jiangxi, Inner Mongolia, Shanxi ; Western region: Gansu, Guizhou, Ningxia, Shanxi, Sichuan, Tibet, Xinjiang, Yunnan, Chongqing.

Table 4 :Robustness check of the impact of ISs on wages: based on whether the firm operates internationally

	(1) Eastern and central regions	(2) Eastern and central regions	(3) Eastern and central regions	(4) OP productivity	(5) OP productivity	(6) OP productivity
oversea	0.145***	0.181***	0.135***	0.150***	0.182***	0.138***
	(0.00153)	(0.00140)	(0.00140)	(0.00150)	(0.00141)	(0.00140)
tfp		0.278***	0.281***		0.256***	0.258***
		(0.00048)	(0.00047)		(0.00048)	(0.00047)
age		0.00286***	0.00243***		0.00161***	0.00134***
		(0.00006)	(0.00006)		(0.00006)	(0.00006)
lncyrs		-0.270***	-0.253***		-0.253***	-0.238***
Regional industry fixed effects	No	(0.00067) No	(0.00065) Yes	No	(0.00066) No	(0.00063) Yes
_cons	2.270***	1.753***	1.735***	2.252***	1.914***	1.887***
	(0.00102)	(0.00368)	(0.02401)	(0.00098)	(0.00359)	(0.02074)
N	1950417	1889970	1889965	2152166	2012550	2012548

Note: The values in parentheses are robust standard errors. ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

Table 5: Robustness check of the impact of ISs on wages: based on the four ISs

	(1) Eastern and central regions	(2) Eastern and central regions	(3) Eastern and central regions	(4) OP productivity	(5) OP productivity	(6) OP productivity
Org=2	0.144***	0.181***	0.135***	0.150***	0.182***	0.137***
	(0.00153)	(0.00141)	(0.00140)	(0.00150)	(0.00141)	(0.00140)
Org=3	0.327***	0.266***	0.253***	0.351***	0.306***	0.295***
	(0.03677)	(0.03342)	(0.03308)	(0.03486)	(0.03194)	(0.03164)
Org=4	0.423***	0.396***	0.340***	0.433***	0.427***	0.374***
	(0.02108)	(0.01917)	(0.01902)	(0.02076)	(0.01896)	(0.01882)
tfp		0.278***	0.281***		0.256***	0.258***
		(0.00048)	(0.00047)		(0.00048)	(0.00047)
age		0.00286***	0.00243***		0.00161***	0.00134***
		(0.00006)	(0.00006)		(0.00006)	(0.00006)
lncyrs		-0.270***	-0.253***		-0.252***	-0.238***
Regional industry fixed effects	No	(0.00067) No	(0.00065) Yes	No	(0.00066) No	(0.00063) Yes
_cons	2.270***	1.753***	1.736***	2.252***	1.914***	1.888***
	(0.00102)	(0.00368)	(0.02401)	(0.00098)	(0.00359)	(0.02074)
N	1950417	1889970	1889965	2152166	2012550	2012548

Note: The values in parentheses are robust standard errors. ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

4.5 Endogeneity test (PSM-DID)

This paper mainly examines the impacts of four different ISs adopted by firms on wages. However, since three of these ISs are inherently involved with the exports and/or FDI activities, and the causal relationship between exports and FDI, there may be endogenous problems. Therefore, this paper uses the Difference in Difference (DID) method to examine the impact of firms export and FDI on wages. We take firms adopting "no international activity strategy" as the control group and classify the firms operating internationally into three categories as treatment groups. The first type takes the firms with the "export strategy" as treatment groups, the second type set the firms with the "FDI strategy" as the treatment groups; the third type uses the firms with the "combined strategy" as the treatment groups. Our regression is specified as follows:

$$ln\,w\,age_{it} = \alpha_0 + \alpha_1 du + \alpha_2 dt + \alpha_3 du \times dt + \beta X_{it} + \varepsilon_{it} \quad (3)$$

where du is a vector of treatment variables, du equals 1 if the firm operates internationally, and dt equals 1 for every year after the firm operating internationally. The coefficient α_3 on the interaction term between du and dt is the standard DID estimator, it measures the impact of firm's international operation on wage growth.

It should be noted that the accuracy of the estimation depends on the similarity of the individual characteristics between treated firms and untreated firms. If the DID method is applied directly, sample self-selection bias will occur. Changes trend between the firms operating internationally and those operating domestically may produce systemic differences. Therefore, this paper will first apply the Propensity Score Matching (PSM) proposed by Rosenbaum and Rubin (1983) to calculate the propensity score of firms international operation by controlling the main characteristics that affect firms' performances in overseas markets, so that the mean probability of the treated firms and the untreated firms is the same. This result contributes to reduce the bias caused by direct estimation and correctly assess the impact of firms' ISs on wages. We deal with the data as follows: (1) Since China's OFDI has increased significantly after 2004, we keep the observations of China's industrial firms from 2004 to 2007, and drop the firms with discontinuous export and FDI. (2) We define the firms adopting the "export strategy", the "FDI strategy" and the "combined strategy" as treatment groups separately, and use logit regression to estimate propensity scores. Matched variables include: LP productivity, firms age, number of employees and other firms' characteristics. (3) We find the control group firms with similar characteristics to the treatment group based on the propensity scores and a 1:4 matching ratio, and then drop the observations that firms are repeatedly matched.

This paper uses the PSM-DID method to estimate the impacts of ISs on wages. After applying logit regression to estimate the propensity score based on the matched

variables, the test results show that the matched results balance the data well. There is no significant difference in the mean of the co-variate between the treatment group and the control group, indicating the validity of PSM-DID method.

The regression results are shown in Table 6. The coefficient of $du \times dt$ in the benchmark regression in column (1) is significantly positive. After controlling for the characteristics of firms in columns (2), $du \times dt$ is still significantly positive, indicating that the "export strategy" of firms can increase the wages. The coefficients of $du \times dt$ in columns (3) and (4) are significantly positive, indicating that firms with the "FDI strategy" can increase the wages regardless of whether the firm-level variables are controlled or not. The coefficients of interaction term in columns (5) and (6) are also significantly positive, indicating that the "combined strategy" can also increase the average wages.

Table 6: Impact of firms' international operation on wage growth (PSM-DID)

	Export effect		**FDI effect**		**Overall effect of exports and FDI**	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
	DID	**DID**	**DID**	**DID**	**DID**	**DID**
$du \times dt$	0.193*** (0.007)	0.193*** (0.007)	0.271*** (0.04)	0.269*** (0.039)	0.194*** (0.007)	0.194*** (0.007)
tfp		0.145 (0.001)		0.145 (0.001)		0.145 (0.001)
age		0.002 (0.000)		0.003 (0.000)		0.002 (0.000)
lncyrs		-0.101 (0.001)		-0.1 (0.001)		-0.101 (0.001)
R-square	0.14	0.05	0.13	0.05	0.14	0.05
Observations	402232	406085	402232	406085	402232	406085

5. The influential mechanism of firms' ISs on the wages

5.1 Intermediary effect test

Based on the above discussion, we argue that firms' ISs imposes a positive effect on the grow of average wages, especially when they adopt the "combined strategy". Therefore, the question we need to further explore is that how firms' ISs adoptions increase the average wages? This part will examine the influential mechanism by constructing an intermediary effect model. Combined with above theoretical analysis, we choose innovative capability and production efficiency as the intermediary variables in this model, which aims at illustrating the influential mechanism of ISs of firms on wages.

Constructing intermediary effect model involves three steps: first, regress the dependent variable to the basic independent variable; second, regress the intermediary variable (product innovation capability and production efficiency) to the basic independent variable; finally, regress the dependent variable

simultaneously to the basic independent variables and the intermediary variable. The regression is specified as follows:

$$lnwage_{ijkt} = a_0 + a_1 oversea_{it} + \alpha_2 X_{it} + v_j + v_k + \varepsilon_{ijkt} \quad (4)$$

$$C_{ijkt} = b_0 + b_1 oversea_{it} + b_2 X_{it} + v_j + v_k + \varepsilon_{ijkt} \quad (5)$$

$$lnwage_{ijkt} = d_0 + d_1 oversea_{it} + d_2 C_{ijkt} + d_3 X_{it} + v_j + v_k + \varepsilon_{ijkt} \quad (6)$$

Where C is an intermediary variable, including innovative capability and firms' productivity. Innovative capability is measured by two methods: product innovative capability 1 ($newinnov1$) is measured by the ratio of the firm's product output value to total industrial output value, and product innovative capability 2 ($newinnov2$) is measured by the ratio of the firm's product output value to the current price of industrial sales. Firm productivity (tfp), expressed by the firm's total factor productivity measured by the LP method.[3]

5.2 The influential mechanism

Table 7, Table 8, and Table 9 respectively report the results of the influential mechanism of the firms' ISs on average wages, with product innovative capability 1 ($newinnov1$), product innovative capability 2 ($newinnov2$), and productivity (tfp) as the intermediary variable.

Column (1) of Table 7, Table 8, and Table 9 show the result of benchmark regression equation (4). The coefficients are significantly positive, indicating that the firms' ISs have significantly increased the average wages. We regressed the product innovative capability 1 ($newinnov1$), product innovative capability 2 ($newinnov2$) and productivity (tfp) respectively to the basic independent variable, that is, to regress equation (5), and the results are listed in column (2) of Table 7, Table 8, and Table 9. We added product innovative capability 1 ($newinnov1$), product innovative capability 2 ($newinnov2$) and productivity (tfp) as the intermediary variables into the benchmark regression equation (4) respectively to estimate, that is, to regress equation (6), and the results are listed in column (3) of Table 7, Table 8, and Table 9. Column (4) is based on column (3), adding the interaction term between $oversea$ and product innovative capability 1 ($newinnov1$), product innovative capability 2 ($newinnov2$), productivity (tfp) respectively, to investigate whether the firms operating internationally with stronger product innovative ability and productivity will pay higher average wages.

Column (2) in Table 7 Table 8 and Table 9 respectively report the regression results with product innovative capability 1 ($newinnov1$), product innovative capability 2 ($newinnov2$), and productivity (tfp) as the outcome variables. The reported coefficients are significantly positive, indicating that the firm's participation in

[3] In addition, we also tried to apply the total factor productivity measured by the OP method to measure production efficiency, and the test results were very similar.

overseas markets has improved their product innovative capabilities and productivity. The main reason may be that before the entry into overseas markets, firms have to be prepared for potential business risks not only by improving their innovative capability of products, but also their production efficiency through technology spillover, learning effect, competition effect and rent-sharing effect.

Column (3) of Table 7, Table 8 and Table 9 suggest that the coefficients of product innovative capability are all significantly positive, which indicates that the firms' ISs increase the average wages by improving their innovative ability of products and firm's productivity. Because firms' international operation will improve innovative capability of products, leading to more technology spillover effect and learning ability, increase the demand for skilled labor, which are beneficial to the improvement of firm production efficiency. More productive firms tend to raise the average wages. This further verifies the existence of the intermediary effect of product innovative capability and firm's productivity. That is, the improvement of innovative capability and firm's productivity are two possible channels for firms' ISs to increase the average wages, thus the hypothesis 1 is supported.

Column (4) of Table 7 and Table 8 and Table 9 are based on column (3), adding the interaction term between $oversea$ and product innovative capability 1 ($newinnov1$), product innovative capability 2 ($newinnov2$), Productivity (tfp) respectively, to investigate whether the firms operating internationally with stronger product innovative capabilities and higher productivity will pay more average wages. The results show that the coefficients of interaction terms are all significantly positive, indicating that the firms operating internationally with stronger product innovative ability and productivity will increase the average wages.

Table 7: The influential mechanism-Product Innovative Capability 1

	(1)	**(2)**	**(3)**	**(4)**
	lnwage	**inno1**	**lnwage**	**lnwage**
oversea	0.135***	0.0258***	0.140***	0.139***
	(0.00137)	(0.00030)	(0.00149)	(0.00152)
inno1			0.136***	0.125***
			(0.003666)	(0.00468)
oversea×inno1				0.02515***
				(0.00696)
tfp	0.281***	0.00450***	0.29741***	0.29740***
	(0.00044)	(0.00010)	(0.00048)	(0.00048)
age	0.00253***	0.00006***	0.00209***	0.00209***
	(0.00006)	(0.00001)	(0.00006)	(0.00006)
lncyrs	-0.253***	0.00520***	-0.25554***	-0.25556***
	(0.00062)	(0.00014)	(0.00065)	(0.00065)
Regional industry fixed effects	Yes	Yes	Yes	Yes
_cons	1.76839***	0.04281***	1.70255***	1.70330***
	(0.02032)	(0.00441)	(0.02072)	(0.02072)
N	2082858	1827177	1821697	1821697

Note: The values in parentheses are robust standard errors. ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

Table 8: The influential mechanism-Product Innovative Capability 2

	(1)	(2)	(3)	(4)
	lnwage	**Inno2**	**lnwage**	**lnwage**
oversea	0.135***	0.0260***	0.143***	0.137***
	(0.00137)	(0.00077)	(0.00149)	(0.00151)
Inno2			0.0198***	0.01171***
			(0.00144)	(0.00150)
oversea×inno2				0.102***
				(0.00515)
tfp	0.281***	0.00413***	0.29724***	0.29701***
	(0.00044)	(0.00025)	(0.00048)	(0.00048)
age	0.00253***	-0.00002	0.00213***	0.00211***
	(0.00006)	(0.00003)	(0.00006)	(0.00006)
lncyrs	-0.25261***	0.00543***	-0.255***	-0.255***
	(0.00061)	(0.00034)	(0.00065)	(0.00065)
Regional industry fixed effects	Yes	Yes	Yes	Yes
_cons	1.768***	0.0488***	1.709***	1.711***
	(0.02032)	(0.01094)	(0.02075)	(0.02074)
N	2082858	1826682	1821253	1821253

Note: The values in parentheses are robust standard errors. ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

Table 9: The influential mechanism-productivity

	(1)	(2)	(3)	(4)
	lnwage	**tfp**	**lnwage**	**lnwage**
oversea	0.13519***	0.13448***	0.13519***	0.09046***
	(0.00137)	(0.00217)	(0.00137)	(0.00619)
oversea×tfp				0.00684***
				(0.00092)
tfp	0.281***		0.281***	0.279***
	(0.00044)		(0.00044)	(0.00049)
age	0.00253***	-0.00612***	0.00253***	0.00251***
	(0.00006)	(0.00009)	(0.00006)	(0.00006)
lncyrs	-0.253***	0.38882***	-0.253***	-0.253***
	(0.00062)	(0.00098)	(0.00062)	(0.00062)
Regional industry fixed effects	Yes	Yes	Yes	Yes
_cons	1.76839***	3.46356***	1.76839***	1.77763***
	(0.02032)	(0.03533)	(0.02032)	(0.02036)
N	2,082,858	2088715	2082858	2082858

Note: The values in parentheses are robust standard errors. ***, **, and * indicate significance levels of 1%, 5%, and 10%, respectively.

6. Conclusion

This paper incorporates exporting and FDI two basic internationalization activities of firms into a unified research framework. We propose a taxonomy includes four ISs derived from these two internationalization choices, namely the "no international activity strategy", the "export strategy", the "FDI strategy" and the "combined strategy". Based on this taxonomy, this research investigates not only these strategies' distinguished effects on wages, but also respectively analyzes their influential mechanism. Our empirical results suggest that, compared to the "no international activity strategy", the "export strategy" adopted by firms imposes a positive effect on wages, but its promoting effect is weaker than that of the "FDI strategy". And the promoting effect of the "combined strategy" on wage growth is the strongest in the four ISs. The results of the influential mechanism suggest that the "export strategy", the "FDI strategy" and the "combined strategy" may increase wages by improving firms' innovative capability and productivity of firms.

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