

Article

Do City Exports Increase City Wages? Empirical Evidence from 286 Chinese Cities

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Abstract: The optimization of income distribution is an important index to achieve high-quality economic development in the process of urbanization. Using matched data from the *China Statistical Yearbook* and Customs Statistical Database, this paper examines the impact of city exports on city wages based on panel data from 286 Chinese cities at or above the prefecture level. The paper finds that city exports increase city wages through technology-upgrading mechanisms and profit-sharing mechanisms. This conclusion is found to be robust after a series of tests. The paper further analyses the impact of city exports on city wages by classifying the location and scale of cities. The results show that city exports increase the wages of large cities, eastern cities and central cities but have no effect on medium cities, small cities and western cities. In the process of urbanization, it is essential to further improve the quality and efficiency of exports, increase investment in R&D and education, optimise income distribution and promote regional coordinated development.

Keywords: city export; city wage; mechanism; city scale; city location



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1. Introduction

Income growth and distribution optimization are important evaluation indicators for a nation to achieve high-quality economic development. However, with the acceleration of urbanization, income inequality among cities is on the rise. The expansion of income inequality will not only cause a huge loss of social welfare but also affect social stability and sustainable development.

Among the factors affecting urban wages, urban economic agglomeration and self-selection of the labour force are mainly focused on in the existing literature. Urban economic agglomeration promotes the accumulation of high human capital, on the one hand [1–3], and enhances the matching efficiency between the labour force and posts, on the other hand [4], thus promoting an urban wage increase. Shuhong Peng (2019) found that China's large cities with 1–5 million in population and megalopolises with over 5 million in population have a significant urban scale wage premium. The agglomeration economy is the main cause of these large cities' wage premium [5]. Using data from the 2013–2020 Vietnam Labor Force Surveys, a study from Thi Bich Tran et al. (2022) also showed that agglomeration generates the wage premium in cities [6].

According to the literature on the impact of self-selection of the labour force on urban wages, the difference in urban wages is influenced not only by urban economic agglomeration but also by the different location choices of the labour force based on skills. Workers with higher skills are inclined to live in larger cities [7]. The migration of a high-skilled labour force to large cities makes wages in large cities higher than those in small and medium cities [8]. Relevant empirical studies show that the self-selection effect of the labour force has a positive effect on the wages of cities [9,10]. The difference in urban wages may also be the result of the combined effect of the economic agglomeration and self-selection of the labour force, as the impact of the self-selection effect on wages even exceeds that of the agglomeration effect [11,12].

In summary, the existing literature provides a wealth of insight for the analysis of urban wage differences. However, there is little in the literature on the impact of exports on wages at the urban level. Cities, as the spatial nodes of a country's foreign trade network system in an open economy, are the main force promoting the development of foreign trade. According to figures released by the WTO, China's exports of goods totalled USD 2590.2 billion in 2020, ranking first in the world. With the expansion of China's urban exports scale, urban wages have also shown a significant upward trend, and there is a significant positive correlation between city exports and city wages (see Figure 1). Thus, the following questions need to be studied: Do city exports raise city wages? If so, what is the mechanism? Does the impact of city exports on wages vary with the scale and location of cities? The only literature that studied the above questions comes from Deng and Zhou (2021) [13], and their study shows that the improvement of trade openness can raise the wage level of cities. However, this study does not involve the mechanism of city exports impacting city wages, nor does it consider the heterogeneity of city location and scale.

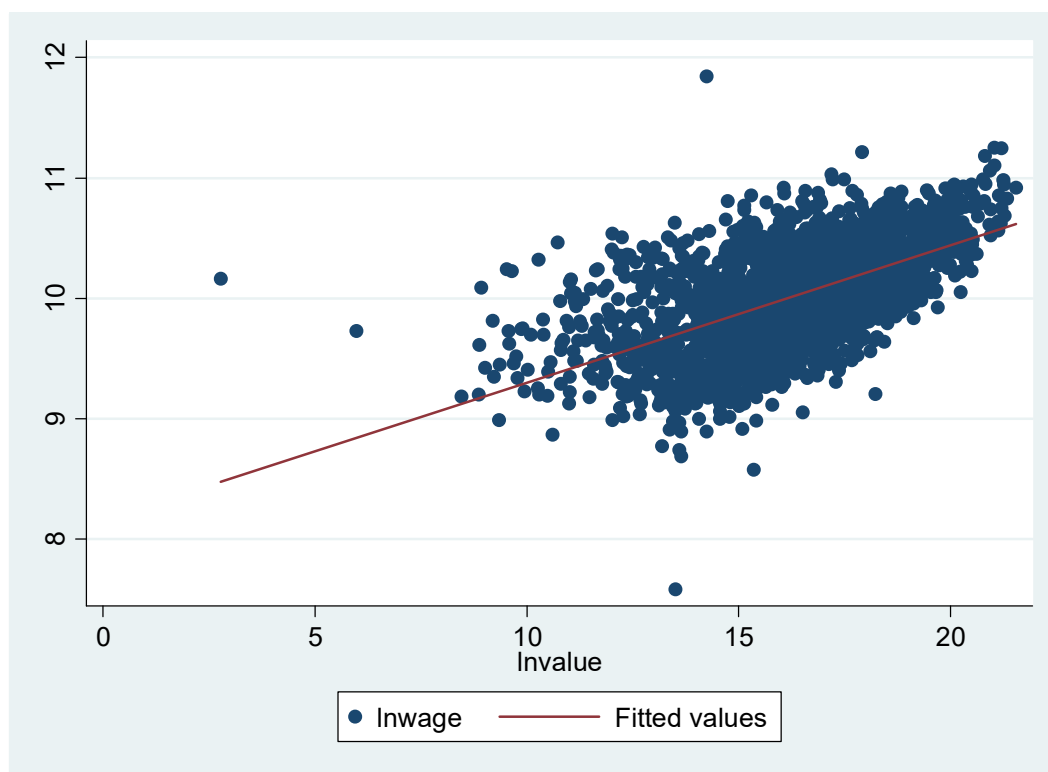


Figure 1. Correlation between city exports and city wage.

This paper studies the impact and mechanism of city exports on city wages and further explores whether the impact of city exports on city wages varies due to city size and location based on matched data from the China Urban Statistical Yearbook Database and China Customs Statistical Database from 2004 to 2013. This paper contributes to the literature as follows. First, this is the first paper that studies the mechanisms through which city exports impact city wages, which expands the research on the welfare consequences of exports. Second, through the deep mining and matching of the China Urban Statistical Yearbook Database and China Customs Statistical Database, this paper estimates the degree and mechanism of the impact of exports on wages based on data from 286 cities at or above the prefecture level. The abundant, large sample panel data guarantee the credibility of the research conclusion, thus providing evidence for China to realise its goal of harmonious growth between exports and residents' incomes during the urbanization process.

This paper is organised as follows. Section 2 explores the mechanisms through which city exports impact city wages. Section 3 sets up the model and describes the

data. Section 4 discusses the empirical results and provides a number of robustness checks. Section 5 analyses the results of heterogeneity tests. Section 6 concludes and draws some policy implications.

2. Mechanism

2.1. Technology-Upgrading Mechanism

Technological upgrading is increasingly being affected by the international environment, in which exports are considered to be the main channel of influence [14]. The abundant data in the literature have proven that the “export-learning effect” and “self-selection effect” brought by exports have improved the technology level [15–17]. The effect of export-induced technological upgrading further affects city wages by affecting the supply and demand of high-skilled labour and increasing the number of jobs for low-skilled labour. From the perspective of labour demand, with the improvement of a city’s technology level and an increase in the number of its high-tech enterprises, enterprises using emerging production technology increase the demand for high-skilled labour [18]. In terms of the supply of high-skilled labour, the upgrading of export technologies has raised the demand for the skill level of labour in cities, which requires workers to constantly learn new technologies and improve their skills, which would reduce to some extent the supply of highly skilled labour [19]. An increase in the demand and a decrease in the supply of high-skilled labour will raise the wage level of high-skilled workers. For low-skilled labour, the upgrading of export technologies has led to the introduction and use of advanced production equipment, an increase in enterprise investment and labour productivity. This not only creates new jobs to make up for some of the technological-related unemployment but also creates a wider demand for skills and broadens the labour market’s demand for low-skilled labour, which will raise the wage of low-skilled workers. With an increase in workers’ wages, the city wage will increase. Through the above analyses, this paper puts forward the following hypothesis:

Hypothesis 1. *City exports improve city wages through the technology-upgrading mechanism.*

2.2. Profit-Sharing Mechanism

Research using a negotiation model shows that enterprises are willing to share their profits with employees when the profit situation improves, to give full play to their employees’ work enthusiasm and obtain more profits [20]. Relevant studies also provide a more abundant theoretical basis and empirical evidence for profit sharing between enterprises and employees [21,22]. On the one hand, exports will increase the profits of enterprises; on the other hand, exports will enhance the wage bargaining power of the labour force and help to realise profit sharing between the labour force and enterprises [23]. With the development of city exports, low-productivity enterprises are eliminated. Due to export competition and to continue to stay in the international market, export enterprises will improve the technical level and productivity of the labour force through R&D, innovation, training and other measures and, hence, increase the profits of the enterprises. Under the mechanism of profit sharing, labour wages will increase, thus increasing the city wage. This analysis led us to develop the following hypothesis:

Hypothesis 2. *City exports improve city wages through the profit-sharing mechanism.*

3. Model, Data and Variable

3.1. Model

3.1.1. Baseline Estimation Model

This paper sets the following baseline model to test the impact of city exports on city wages.

$$\ln wage_{ct} = \alpha_0 + \alpha_1 Invalue_{ct} + \alpha_2 CV_{ct} + \varepsilon_{ct} \quad (1)$$

3.1.2. Mediating Effect Model

Following the application of the mediating effect model in the existing study [24,25], this paper tests the mechanism by which city exports impact city wages. The mediating effect model is mainly divided into three steps: first, the dependent variable regresses the independent variable; second, the intermediary variable regresses the independent variable; third, the dependent variable regresses the independent variable and the intermediary variable at the same time.

Based on the aforementioned analysis, city exports indirectly raise city wages through the technology-upgrading mechanism and profit-sharing mechanism. This paper introduces the intermediary variables of the city R&D level ($\ln RD$) and city GDP level ($\ln GDP$) to construct the mediating effect model. The specific idea is as follows: first, the mediating variables city RD and GDP are used to regress the explanatory variable city exports to verify the impact of city exports on city RD and city GDP; and then city wages are used to regress city exports as well as city RD and GDP simultaneously, to verify the impact of city exports on city wages through city RD and GDP. The mediating effect model consists of the following three models:

$$\ln RD_{ct} = \beta_0 + \beta_1 \ln value_{ct} + \beta_2 CV_{ct} + \varepsilon_{ct} \quad (2)$$

$$\ln GDP_{ct} = \gamma_0 + \gamma_1 \ln value_{ct} + \gamma_2 CV_{ct} + \varepsilon_{ct} \quad (3)$$

$$\ln wage_{ct} = \theta_0 + \theta_1 \ln value_{ct} + \theta_2 \ln GDP_{ct} + \theta_3 \ln RD_{ct} + \theta_4 CV_{ct} + \varepsilon_{ct} \quad (4)$$

Models (2) and (3) are used to test the impacts of city exports on city R&D and GDP, and Model (4) is used to examine the effects of city exports, R&D and GDP on city wages. Models (1)–(4) are combined to test whether city exports influence city wages through R&D and GDP and then verify the profit-sharing mechanism and technology-upgrading mechanism.

3.2. Data and Variable

The paper uses matched data from the China Urban Statistical Yearbook Database and China Customs Statistical Database during 2004–2013. After the processing of the original data, 2065 sample data from 286 cities at the prefecture level and above are obtained.

The explanatory variable is city wage ($\ln wage$). There are three explanatory variables: the amount of city exports ($\ln value$), city R&D ($\ln RD$) and city GDP ($\ln GDP$). The control variables mainly include (1) city labour productivity ($\ln prod$), which is defined as the logarithmic value of the total output value of the industrial enterprises and the ratio of the annual average number of employees of the industrial enterprises; (2) the level of city economic agglomeration ($\ln dens$), which is based on the related research on city economic agglomeration [26], so this paper uses enterprise density (defined as the logarithmic value of the number of enterprises to the land area ratio of municipal districts) to describe the level of city economic agglomeration; (3) city FDI ($\ln FDI$), which is, in this paper, the logarithmic value of the actual amount of foreign investment in the city; (4) city construction infrastructure ($\ln infras$), which is measured by the logarithm of a city's per capita road pavement area; and (5) city fixed asset investment ($\ln fixinv$), which is measured by the logarithm of the total investment in fixed assets.

4. Empirical Results and Analysis

4.1. Baseline Results

This paper first examines the impact of city exports on city wages by OLS and FE estimates. The results are shown in columns (1) and (2) of Table 1. It can be seen from the results that both the OLS and FE estimates show that city exports have a significant positive effect on city wages. The FE estimate results indicate that for every 1% increase in city exports, city wages increase by 3.58%.

Table 1. Baseline results.

Variable	Model 1		Model 2		Model 3		Model 4	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	FE	OLS	FE	OLS	FE	OLS	FE
lnvalue	0.0419 *** (0.0043)	0.0358 *** (0.0036)	0.0389 *** (0.0097)	0.0506 *** (0.0087)	0.0607 *** (0.0059)	0.0733 *** (0.0063)	0.0433 *** (0.0044)	0.0287 *** (0.0037)
lnprod	0.2196 ** (0.0111)	0.0419 *** (0.0096)	0.0432 * (0.0248)	0.1398 *** (0.0232)	0.0029 * (0.0153)	0.0847 *** (0.0167)	0.2239 *** (0.0109)	0.0368 *** (0.0098)
lndens	0.0019 * (0.0268)	0.0704 *** (0.0206)	0.3404 *** (0.0597)	0.3571 *** (0.0496)	0.3063 ** (0.0367)	0.2796 *** (0.0356)	0.0030 * (0.0267)	0.0441 ** (0.0207)
lnFDI	−0.0290 *** (−0.0029)	−0.0156 *** (−0.0022)	−0.0025 * (−0.0064)	−0.0129 ** (−0.0053)	−0.0120 *** (−0.0039)	−0.0028 * (−0.0039)	−0.0285 *** (−0.0028)	−0.0163 *** (−0.0022)
lninfras	0.0692 ** (0.0121)	0.0636 *** (0.0091)	0.1655 ** (0.0268)	0.1726 *** (0.0221)	0.0383 ** (0.0166)	0.0427 *** (0.0159)	0.0819 *** (0.0119)	0.0687 *** (0.0092)
lnfixinv	0.1373 *** (0.0087)	0.0894 *** (0.0068)	0.7427 ** (0.0193)	0.6973 *** (0.0164)	0.7996 ** (0.0119)	0.8191 *** (0.0119)	0.1399 *** (0.0155)	0.0149 * (0.0125)
lnGDP							0.0905 *** (0.0171)	0.0811 *** (0.0147)
lnRD							0.0955 *** (0.0105)	0.0142 * (0.0106)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2065	2065	2049	2049	2045	2045	2034	2034
R ²	0.5787	0.4058	0.7199	0.7578	0.8761	0.4994	0.5973	0.4224

Notes: *** represents a significance level of 1%, ** represents a significance level of 5%, and * represents a significance level of 10%.

After confirming the positive effect of city exports on city wages, this paper further investigates the mechanism by which city exports impact city wages through the mediating effect model. The impact of city exports on the intermediate variables city R&D and GDP is shown in columns (3)–(6) of Table 1. From the estimation results, we can see that the estimated coefficients of the lnvalue are all significantly positive at the 1% level, which indicates that city exports contribute significantly to the improvement of city R&D and GDP. Columns (7) and (8) of Table 1 report the estimation results of model (4), that is, the impact of city exports on city wages after adding the intermediary variables city R&D and GDP. The estimation results indicate that the estimated coefficients of lnRD and lnGDP are significantly positive at the 1% level. Based on the estimation results of Models (1)–(4), it can be concluded that city exports increase city wages by increasing city R&D and GDP, which support hypotheses 1 and 2.

4.2. Robustness Test

4.2.1. Endogenous Problem

There may be an endogenous relationship between city exports and city wages: the export scale of a city with a higher wage level is also larger, so the development of city exports will further enhance city wages. To solve the inconsistency and estimation error caused by the endogeneity problem, this paper further estimates the model by finding a suitable instrumental variable (IV). Referring to the study from Qian, Huang and Huang (2012) [27], this paper estimates Models (1)–(4) by using the lag phase of city exports as an instrumental variable. The results are shown in Table 2. The estimated coefficients of city exports are significantly positive after using the instrumental variable, showing that city exports increase city wages by raising city R&D and GDP, which is consistent with the previous benchmark estimation results.

Table 2. IV estimation results.

Variable	Model 1	Model 2	Model 3	Model 4
Invalue	0.1827 *** (0.0240)	0.4564 *** (0.0601)	0.0656 ** (0.0269)	0.2245 *** (0.0309)
Inprod	0.1694 *** (0.0161)	0.1934 *** (0.0403)	0.0046 * (0.0179)	0.1024 *** (0.0215)
Indensity	0.0436 (0.0043)	0.1905 * (0.1111)	0.3002 *** (0.0496)	0.0222 * (0.0315)
lnFDI	−0.0436 *** (−0.0043)	−0.0409 *** (−0.0107)	−0.0115 ** (−0.0048)	−0.0119 *** (−0.0035)
lninfras	0.0354 ** (0.0159)	0.2639 *** (0.0396)	0.0394 ** (0.0177)	0.0812 *** (0.0139)
lnfixinv	0.0235 * (0.0218)	0.4057 *** (0.0543)	0.5957 *** (0.0246)	0.1258 *** (0.0179)
lnGDP				0.1423 *** (0.0238)
lnRD				0.1067 *** (0.0121)
Year FE	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes
N	2042	2049	2045	2034
R ²	0.3620	0.4663	0.6541	0.4786

Notes: *** represents a significance level of 1%, ** represents a significance level of 5%, and * represents a significance level of 10%.

4.2.2. Changing Export Metrics

This paper changes the measurement of city exports by using the sum of the number of city export types and the number of city export destinations, instead of city export amounts, to estimate Models (1)–(4). The results of Table 3 show that the estimated coefficients of city exports are significantly positive at the 1% level, which are in line with the previous benchmark estimation.

Table 3. Estimation results after changing export metrics.

Variable	Model 1		Model 2		Model 3		Model 4	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	OLS	FE	OLS	FE	OLS	FE	OLS	FE
Invalue	0.0267 *** (0.0060)	0.0286 *** (0.0049)	0.0622 *** (0.0132)	0.0753 *** (0.0117)	0.0709 *** (0.0082)	0.0443 *** (0.0087)	0.0301 *** (0.0060)	0.0226 *** (0.0048)
Inprod	0.2269 *** (0.0114)	0.0497 *** (0.0097)	0.0115 * (0.0248)	0.1295 *** (0.0231)	0.0394 ** (0.0155)	0.1008 *** (0.0172)	0.2294 *** (0.0111)	0.0402 *** (0.0098)
Indensity	0.0874 *** (0.0277)	0.0833 *** (0.0211)	0.3151 *** (0.0604)	0.3360 *** (0.0501)	0.2979 *** (0.0375)	0.3234 *** (0.0370)	0.0694 ** (0.0275)	0.0492 ** (0.0212)
lnFDI	−0.0200 *** (−0.0031)	−0.0161 *** (−0.0023)	−0.0042 * (−0.0067)	−0.0071 * (−0.0055)	−0.0061 * (−0.0042)	−0.0039 * (−0.0041)	−0.0199 *** (−0.0030)	−0.0168 *** (−0.0023)
lninfras	0.0849 *** (0.0123)	0.0661 *** (0.0093)	0.1692 *** (0.0269)	0.1765 *** (0.0221)	0.0387 ** (0.0167)	0.0349 ** (0.0164)	0.0998 *** (0.0122)	0.0095 ** (0.0127)
lnfixinv	0.1844 *** (0.0086)	0.1016 *** (0.0069)	0.7439 *** (0.0187)	0.6943 *** (0.0163)	0.8142 *** (0.0117)	0.8524 *** (0.0122)	0.1484 *** (0.0158)	0.0095 ** (0.0127)
lnGDP							0.0423 ** (0.0173)	0.1031 *** (0.0145)
lnRD							0.0971 *** (0.0107)	0.0091 * (0.0107)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Ctiy FE	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
N	2042	2042	2049	2049	2045	2045	2034	2034
R ²	0.5636	0.4624	0.7199	0.6369	0.876	0.8961	0.5812	0.4405

Notes: *** represents a significance level of 1%, ** represents a significance level of 5%, and * represents a significance level of 10%.

4.2.3. Re-Estimating Mechanism

The paper generates two interactive terms (one is city exports and city R&D (value * RD), while the other is city exports and city GDP (value * GDP)) to re-estimate the technology-upgrade mechanism and profit-sharing mechanism, respectively. The estimated results of the technology-upgrade mechanism are shown in columns (1) and (2) of Table 4, while the estimated results of the profit-sharing mechanism are shown in columns (3) and (4) of Table 4. Compared with the results of the baseline estimation, although the significance of the technology-upgrade mechanism estimation is reduced, it is still significant at the level of 5%, and the coefficients and significance of the other variables are consistent with the results of the baseline estimation.

Table 4. Re-estimating results of mechanism.

Variable	Technology-Upgrade Mechanism		Profit-Sharing Mechanism	
	(1)	(2)	(3)	(4)
	OLS	FE	OLS	FE
lnvalue	0.0522 *** (0.0114)	0.0146 * (0.0112)	0.0739 ** (0.0176)	0.0624 ** (0.0140)
ln(value * RD)	0.0955 *** (0.0105)	0.0142 * (0.0106)		
ln(value * GDP)			0.0433 *** (0.0045)	0.0287 *** (0.0037)
lnprod	0.2239 *** (0.0109)	0.0368 *** (0.0098)	0.2194 *** (0.0111)	0.0339 *** (0.0096)
lndensity	0.0031 * (0.0268)	0.0441 ** (0.0207)	0.0105 * (0.0272)	0.0459 *** (0.0206)
lnFDI	−0.0285 *** (−0.0028)	−0.0163 *** (−0.0022)	−0.0292 *** (−0.0029)	−0.0162 *** (−0.0022)
lninfras	0.0819 *** (0.0119)	0.0686 *** (0.0092)	0.0677 *** (0.0121)	0.0665 *** (0.0091)
lnfixinv	0.1399 *** (0.0155)	0.0149 * (0.0125)	0.1646 *** (0.0156)	0.0169 * (0.0124)
Year FE	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes
N	2034	2034	2036	2036
R ²	0.5973	0.4224	0.5808	0.4910

Notes: *** represents a significance level of 1%, ** represents a significance level of 5%, and * represents a significance level of 10%.

The above tests show that the conclusion of the benchmark estimation is robust and reliable.

5. Heterogeneity Analysis

The wages in a city vary greatly with its location and scale. Take the large city of Shanghai in the east and the small city of Jiayuguan in the west as examples: according to the *Chinese Statistical Yearbook*, during the sample period, the average wage of Shanghai in 2004 was RMB 30,002.4, while the average wage of Jiayuguan was RMB 22,354.4. Thus, the average wage in Shanghai was 1.34 times that in Jiayuguan. However, the average wage of Shanghai in 2011 rose to RMB 77,144.95, while the average wage of Jiayuguan rose to RMB 53,833.81, meaning the average wage gap between Shanghai and Jiayuguan widened further by 1.43 times. To determine whether city exports with different locations and sizes have different influences on city wages, the sample cities are divided according to their location and scale. Figures 2 and 3 show that city wages are different because of city location and scale, respectively.

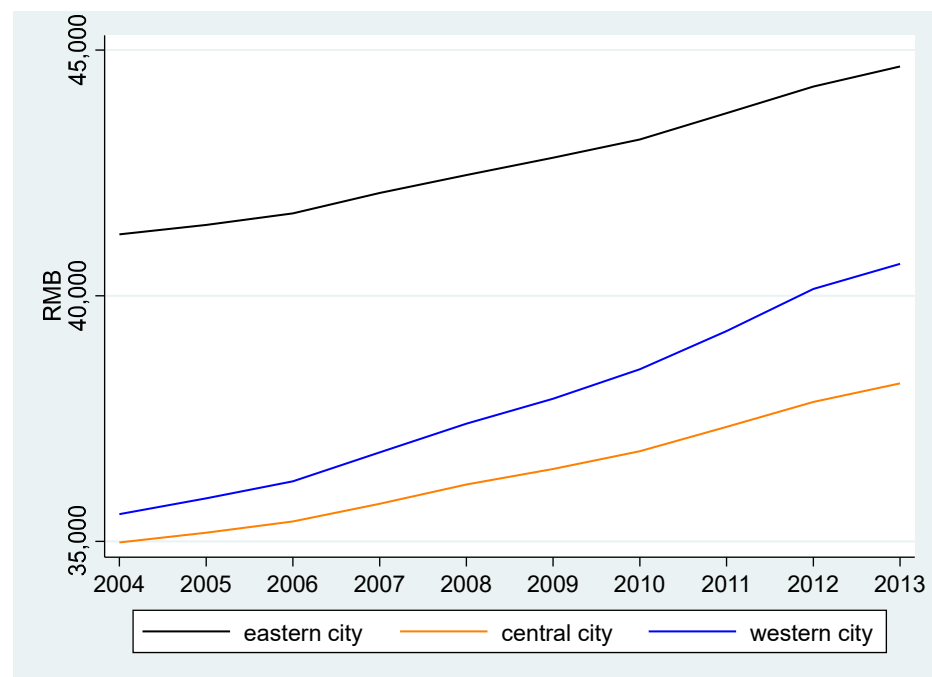


Figure 2. Wage difference because of different city locations.

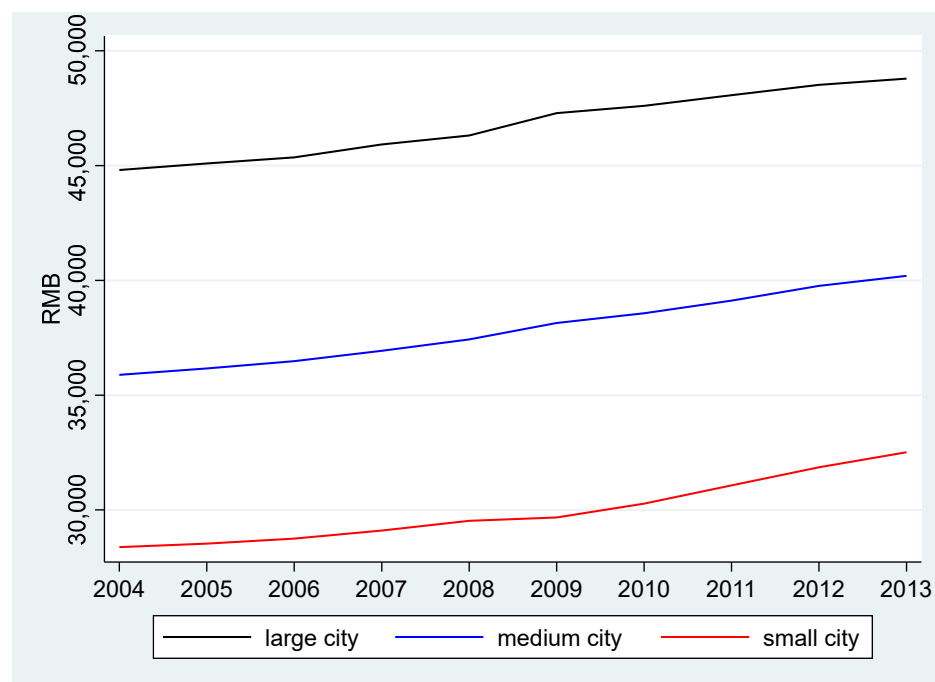


Figure 3. Wage difference because of different city scales.

5.1. Location Heterogeneity

Different cities in China have different economic development levels due to their different geographical locations and resource endowments, which will affect city wages. Since the industrial division of labour varies by region, the impact of exports on the labour market at the regional level will also be different [28]. To determine whether the impact of city exports on city wages varies with the location of a city, this paper refers to the administrative territorial entity standard of the National Bureau of Statistics of China, dividing 286 cities at the prefecture level and above into three types: eastern cities, central

cities and western cities. On this basis, Model (1) is estimated to test the effect of city exports on city wages. The results are shown in Table 5.

Table 5. Location heterogeneity estimation results.

Variable	Eastern Cities		Central Cities		Western Cities	
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	FE	OLS	FE	OLS	FE
lnvalue	0.0830 *** (0.0085)	0.0261 *** (0.0079)	0.0289 *** (0.0068)	0.0189 *** (0.0055)	0.0201 (0.0140)	0.0165 (0.0188)
lnprod	0.2991 *** (0.0199)	0.1043 *** (0.0173)	0.1937 *** (0.0197)	0.0412 ** (0.0169)	0.1716 *** (0.0196)	0.0323 ** (0.0155)
lndensity	0.0910 *** (0.0305)	0.0666 *** (0.0236)	0.2487 *** (0.0603)	0.0899 ** (0.0451)	0.1378 (0.1504)	0.1342 (0.1077)
lnfdi	−0.0413 *** (−0.0084)	−0.0052 (−0.0067)	−0.0197 *** (−0.0055)	−0.0056 (−0.0041)	−0.0219 *** (−0.0051)	−0.0113 *** (−0.0037)
lninfras	0.0112 (0.0163)	0.0022 (0.0123)	0.1339 *** (0.0226)	0.1165 *** (0.0166)	0.1128 *** (0.0266)	0.1309 *** (0.0190)
lnfixinv	0.0948 *** (0.0141)	0.0735 *** (0.0109)	0.1677 *** (0.0149)	0.1201 *** (0.0114)	0.1244 *** (0.0202)	0.0106 (0.0156)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes
N	790	790	819	819	433	433
R ²	0.6313	0.5572	0.5646	0.4581	0.4907	0.3671

Notes: *** represents a significance level of 1%, and ** represents a significance level of 5%.

The impact of city exports on the wages of eastern and central cities is significantly positive, the impact of city exports on the wages of eastern cities is greater than that on the wages of central cities, and the impact of city exports on the wages of western cities is not significant. The possible reason is that eastern and central cities have higher levels of economic development and openness to the outside world than western cities, especially because the eastern cities' degree of participation in globalization, export scale and quality are all higher. For western cities, although the government has given much policy support, due to the restrictions of natural conditions, resource endowments, institutional environments and other locational factors, openness to the outside world began late, so the exports scales are still different from those of the central and eastern cities, and the promotion of exports to wages is not exerted.

5.2. Scale Heterogeneity

City wage varies greatly with the scale of cities. There is a positive correlation between the size of a city and its wage premium [29,30]. A study using China's Comprehensive Social Survey Data and city data found that the wage premium in large cities ranges from 14.4% to 38.9% [4]. To test the heterogeneous impact of city exports on city wages due to the city-scale difference, this paper divides cities into large cities (including megacities), medium cities and small cities. According to the circular of the State Council of China of 2014 on the adjustment of the criteria for the division of city scale, this paper defines a megalopolis as a city with a population of more than 5 million people, a large city as a city with a population of 1 million to 5 million, a medium city as a city with a population of 500,000 to 1 million, and a small city as a city with a population of less than 500,000. The subdivided samples are estimated by the OLS and FE methods. The results are shown in Table 6.

Table 6. Scale-heterogeneity estimation results.

Variable	Large Cities		Medium Cities		Small Cities	
	(1)	(2)	(3)	(4)	(5)	(6)
	OLS	FE	OLS	FE	OLS	FE
lnvalue	0.0508 *** (0.0062)	0.0433 *** (0.0054)	0.0072 (0.0157)	0.0048 (0.0075)	0.0091 (0.0084)	0.0067 (0.0064)
lnprod	0.3505 *** (0.0191)	0.1159 *** (0.0167)	0.2339 *** (0.0241)	0.0146 * (0.0210)	0.1412 *** (0.0169)	0.0341 ** (0.0143)
lndensity	0.1559 *** (0.0346)	0.1799 *** (0.0249)	0.0486 (0.0489)	0.0102 * (0.0367)	0.0979 * (0.0552)	0.0135 (0.0441)
lnfdi	−0.0296 *** (−0.0070)	−0.0008 * (−0.0051)	−0.0303 *** (−0.0061)	−0.0139 *** (−0.0046)	−0.0284 *** (−0.0038)	−0.0151 *** (−0.0031)
lninfras	0.0636 *** (0.0212)	0.0408 *** (0.0149)	0.0038 (0.0256)	0.0571 *** (0.0194)	0.1045 *** (0.0178)	0.0763 *** (0.0143)
lnfixinv	0.1504 *** (0.0159)	0.1079 *** (0.0117)	0.1931 *** (0.0232)	0.1268 *** (0.0177)	0.1658 *** (0.0176)	0.0663 *** (0.0149)
Year FE	Yes	Yes	Yes	Yes	Yes	Yes
City FE	Yes	Yes	Yes	Yes	Yes	Yes
N	569	569	661	661	812	812
R ²	0.6148	0.4944	0.5059	0.3880	0.4848	0.4458

Notes: *** represents a significance level of 1%, ** represents a significance level of 5%, and * represents a significance level of 10%.

This shows that the exports of large cities have a significant positive effect on wages, while the exports of medium and small cities have no significant effect on wages. This paper holds that the possible reason is that large cities have diversified their exports, and, by entering the market through new product categories, they can not only maintain the stability of export income but also, overall, promote the improvement of productivity, thus promoting city wages. While the exports of medium cities and small cities are more dependent on the expansion of their export quantities, there is still a large gap between them and large cities in the research and development of new products and technological innovation, and exports cannot play an effective role in raising wages through the technological-upgrading mechanism.

6. Conclusions

This paper analyses the impact and mechanism of exports on wages of 286 cities at or above the prefecture level in China by using matched data from the China Urban Statistical Yearbook Database and China Customs Statistical Database during 2004–2013. The main findings are as follows. First, city exports raise city wages through technology-upgrading mechanisms and profit-sharing mechanisms. This conclusion is robust in the case of using instrumental variable estimation, which changes the measurement of city exports and retests the mechanism. Second, the impact of city exports on city wages varies with a city's scale and location heterogeneity. The results show that the exports of eastern and central cities increase city wages, while the exports of western cities have no significant effect on wages. The exports of large cities raise city wages, while the exports of medium and small cities have no impact on wages.

Based on the above findings, we put forward the following policy recommendations. First, in the process of urbanization, it is imperative to promote diversified exports by enlarging export amounts, expanding export destinations and enriching the types of exports, to give full play to the role of exports in raising wages. Second, the government and enterprises should attach great importance to the role played by R&D and education investment in raising wages and increasing the vocational and technical training of the labour force.

Finally, the limitations of this study are as follows. First, we could only obtain export data from the China Customs Statistical Database during the period of 2004–2013. In

the future, empirical studies on the long-term effect of exports on city wage should be conducted based on other available survey data. Second, as there was no significant policy change during the analysed period, we could not investigate the effect of export-promotion policy on the income level. An in-depth study using a quasi-experimental method should be conducted in the future. Despite the above-mentioned limitations, we believe that our study, which fully exploits the abundant data, provides new insights into the causal relationship between exports and city wage.

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