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Will the "Pairing Assistance" Policy Trigger the Migration of Polluting Enterprises? An Empirical Study Based on the Yangtze River Delta Region

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Abstract: The migration of polluting enterprises and its mechanism are a recent research hotspot in enterprise geography and environmental economic geography. This paper finds that the "Pairing Assistance" policy (PAP) is an important driving force for the migration of polluting enterprises (MPE), which is widely ignored by the existing research. Based on the perspective of inter-regional correlations, this paper establishes an analytical framework for the MPE. The negative binomial regression model was used to conduct a big data analysis on enterprises based on the Qichacha database. The main findings are as follows. (1) The average number of polluting enterprises migrating between cities with a PAP relationship is 129.51% more than that between other cities. (2) This policy can also promote the MPE from cities that are not in a PAP relationship with cities that receive assistance from the policy. The average frequency of these cities accepting polluting enterprises was 63.76% more than that of other cities. (3) Heterogeneity analysis shows that under the influence of the policy, highly polluting and low-tech enterprises mainly migrated from developed regions to less-developed regions. (4) The mechanism mainly includes lower environmental regulations, operating costs, inter-regional differences in industrial upgrading, and the easiness for polluting enterprises to adapt into the network of government–enterprise relationships in the assistance-accepting cities. This paper, based on China's empirical research, provides a new mechanism for the migration of polluting enterprises.

Keywords: pairing assistance policy; migration of polluting enterprises; pollution shelters; organizational proximity; Yangtze River Delta region

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1. Introduction

The inter-regional "Pairing Assistance" policy (PAP) is an important means to promote coordinated inter-regional development and common prosperity in China through matching support and assistance from economically developed regions with the less-developed regions [1]. However, as the migration of polluting enterprises (MPE) has become an important strategy to reduce pollutant and carbon emissions in some regions, the implementation of the PAP may lead to "free-riding" of polluting enterprises by moving to less-developed areas. Conversely, some cities that have accepted assistance due to the PAP may become "pollution shelters", entailing huge pollution exposure risk and health risk, where "cancer villages" may even appear. Taking the Yangtze River Delta region as an example between 2016 and 2020, which is the 13th Five-Year Plan period of China, the number of polluting enterprises that migrated from developed regions to the less-developed northern Jiangsu and northern Anhui accounted for 60% of the total number of migrating polluting enterprises. However, the ratio was only 17% between 1996 and 2000. In particular, in an organization mode of group enterprises characterized by multiple sectors, multiple locations, and multiple value chain processes, the migration behavior of polluting enterprises based on equity investment can be relatively inconspicuous to academic circles, local governments, and the public. In this sense, the MPE has become an unavoidable and urgent problem to be considered.

In regard to the dynamics of the MPE, existing studies have achieved a relatively comprehensive analysis of it from the aspects of policy factors, industrial environments, and geographical locations [2,3], and it is generally believed that environmental regulation is the most critical factor influencing the MPE. Based on this academic consensus, the pollution shelter hypothesis has been proposed [4]. However, there is a lack of empirical analysis on the MPE caused by the PAP. In addition, due to the data scarcity of the MPE, most studies have divided the dynamic process of the MPE into static results of enterprises moving in and out [5–7] and have only analyzed some local factors rather than factors of inter-regional correlations. In addition, some studies have used the push–pull model [8,9], which analyzes the pushing and pulling forces of the developed and the less-developed regions and easily causes the problem of missing variables. Therefore, both the policy effect of the PAP and the analysis framework of the MPE need to be further studied.

The Yangtze River Delta is one of the densest clusters for contemporary China's manufacturing industry, especially the heavy industry and the chemical industry. However, there are large regional differences within Jiangsu, Zhejiang, and Anhui. Meanwhile, they are establishing their own PAPs with the aim of promoting coordinated development, respectively. In addition, with the industrial transformation and upgrading, the pollution enterprises in the Yangtze River Delta have manifested a trend of spatial reorganization and migration. In this context, the following questions are investigated: What is the evolutionary process of the PAP in the Yangtze River Delta region? How does the PAP affect polluting enterprises? How does one counteract the side effects of the policy if there are such effects? To answer the above questions, there are not only theoretical needs to further explore the mechanism of the MPE and provide China-based experiences, but also practical needs to optimize the PAP and policy for environmental regulation.

The main contributions of this paper are as follows: (1) Based on the perspective of inter-regional correlation, we construct an analytical framework for the MPE. The factors of inter-regional connections and differences, as well as local characteristics, are put into an analysis framework. (2) This paper finds that the "Pairing Assistance" policy causes the migration of polluting enterprises, which is widely ignored by the existing research. This paper, based on China's empirical research, provides a new mechanism for the migration of polluting enterprises.

2. Literature Review and Theoretical Framework

The PAP is an important means to rectify inter-regional economic imbalances. The establishment of the relationships of pairing assistance based on the PAP within a province is attributed to not only the requirements of the provincial government, but also the active promotion of cooperation between cities and counties. The PAP usually has two levels of meanings, i.e., aid and cooperation [10], and its coverage includes industry, capital, science and technology, culture, education, health, and other aspects [11]. Due to the differences in the methods and policy priorities for assistance in different regions, the specific definitions of the PAP are different, such as counterpart construction assistance, counterpart assistance, joint construction, counterpart cooperation, etc. The core function of the PAP is to address the spatial imbalance of resources within a given period [12]. The PAP has demonstrated good policy effects on economic growth, industrial upgrading, the construction of infrastructure and public service facilities, employment promotion, and the reduction in the urban–rural income gap of the assistance-accepting cities [1,13]. However, a small number of theoretical studies have found that the PAP may have the side effects of causing spatial injustice, such as pollution transfer and the MPE [14,15].

Hypothesis 1. *The "Pairing Assistance" policy (PAP) can push the migration of polluting enterprises (MPE).*

The migration of enterprises is an important constituent of industrial assistance. It can not only improve the economic aggregate of the assistance-accepting regions, but also result

in tax revenue, capital, technology, management experience, labor force, and agglomeration effects [11]. Within the PAP, the cities that give assistance (assistance-giving cities) are usually developed cities within their own province, and the assistance-accepting cities are usually less developed. Most of the assistance-giving cities have experienced the course of "pollution first, abatement later". In recent years, the progress of industrial upgrading and environmental regulation in these regions has been increasingly improved, which is coupled with increasing factor costs that constantly crowd out polluting enterprises.

Although there is still a lack of in-depth theoretical demonstration of how the PAP affects the MPE, economic geography provides a research basis for the effect of the PAP on the MPE from different perspectives: (1) A regional window of opportunity. The PAP provides a regional window of opportunity for introducing enterprises from the developed regions to the regions that are less developed due to a lack of development opportunities or favorable locations, thereby providing a more diversified development path for the less-developed regions [16], which will attract enterprises not only from the assistance-giving cities, but also from other cities. (2) The spatial organization of enterprises. In a spatial organization mode of enterprises that is characterized by "multiple sectors, multiple locations and multiple value chain processes", enterprises can set up subsidiaries and branches through cross-regional equity investment. In particular, "pollution shelters" may exist within polluting group enterprises [17], which is a migration method that is more inconspicuous than the method of overall migration [18]. (3) Organizational proximity. The PAP improves the organizational proximity between the assistance-accepting cities and assistance-giving cities, which can encourage enterprises to overcome the limitations of geographical distance to implement migration and increase the possibility of investment in the assistance-accepting cities [19]. (4) The adaptation of the migrating enterprises into the assistance-accepting cities. The PAP helps enterprises to adapt to the new enterprises network and the government–enterprise relationship network in the assistance-accepting cities, thereby reducing the business risks of the enterprises. The PAP may trigger the "cluster migration" of enterprises from the assistance-giving cities to the assistance-accepting cities. After the migration, the original enterprise network can even be partially continued in the assistance-accepting cities [20]. In addition, the assistance-giving cities often set up enclave industrial parks and management committees in the assistance-accepting cities and send officials to work in these parks. This is conducive to the rapid adaptation of enterprises into the local relationship network between the local government and the migrated enterprises. Furthermore, this can even increase the possibility of collusion between the government and the enterprises, wherein the latter can receive special protection against environmental protection supervision from the former [21,22].

Previous studies have mainly explored the influencing factors of the MPE from the aspects of policy, industrial development environment, and geographical locations. (1) As for policy, it is generally believed that environmental regulation policy is the main factor that triggers the MPE, and based on this assumption, the pollution shelter hypothesis was proposed [4,23,24]. Due to regional differences in environmental regulations [25], the MPE tends to be located in regions with relatively low environmental regulation standards [2,26]. Moreover, policies for industrial upgrading also play an important role [27]. As the Yangtze River Delta region enters the late- and postindustrialization period, the cities enter a new stage of economic transformation and industrial upgrading [28]. Regions with high levels of industrial upgrading have greater ease transferring polluting industries to backward areas. (2) As for industrial environment, polluting enterprises will comprehensively consider the cost and benefits [29]. Based on existing research, market factors such as industrial agglomeration, labor cost, export environment, urban innovation capacity, and economic development level can, in general, affect the flow of polluting enterprises [30–32]. (3) As for geographical locations, further classification can be made into local characteristics and inter-regional correlations. The former mainly include whether it is along the river, port advantages, resource endowment, and regional boundaries [33]. For example, within a province, polluting enterprises prefer border cities, especially cities downstream

of important water bodies within the province [34]. In addition, inter-regional correlations such as geographical proximity between the origin and the destination of the MPE, as well as cultural proximity, have been demonstrated [35].

Overall, the influencing factors of the MPE have been explored from many aspects in existing studies, but they are still insufficiently investigated in the following aspects. (1) There is a lack of empirical analyses of how the MPE is affected by the PAP, the latter of which may be one of the driving forces of the MPE with Chinese characteristics. (2) The MPE is affected by both the origin and the destination. However, due to the data scarcity of the MPE, most studies have split the dynamic process of the MPE into static results of enterprises moving in and out and can only use some local factors for analysis without considerations of inter-regional correlations.

Hypothesis 2. *Highly polluting and low-tech enterprises are more strongly affected by PAPs.*

Hypothesis 3. *Both environmental regulation policies and industrial upgrading policies can interact with PAPs and promote their influence on MPE.*

The prevailing frameworks of research on the MPE mainly include two categories. First, as mentioned above, data scarcity in terms of inter-regional correlations has caused isolated research on enterprises moving in and out, with a focus on the effects of local characteristics [7]. However, since the migration of enterprises is affected by both the origin and the destination, it is difficult to use this framework to investigate the inter-regional flow of enterprises and the effect of inter-regional correlations. Second, the push–pull theory in population migration is borrowed to propose a push–pull model for the MPE [8,9]. In this model, it is assumed that developed regions mainly exert pushing forces on polluting enterprises, while less-developed areas mainly exert pulling forces. However, since both the origin and the destination will produce pushing and pulling forces, this framework can easily cause the problem of missing variables. In addition, the framework also lacks the analysis of inter-regional correlations.

Therefore, this paper aims to analyze the migration behavior of polluting enterprises from the perspective of "inter-regional correlations" (Figure 1). The pushing forces and pulling forces from the origin and the destination of the MPE are regarded as local factors, and the differences in local characteristics between the two places are represented by way of "destination value minus the origin value". Meanwhile, variables that show inter-regional differences and similarities are summarized as factors of inter-regional correlations for the MPE.

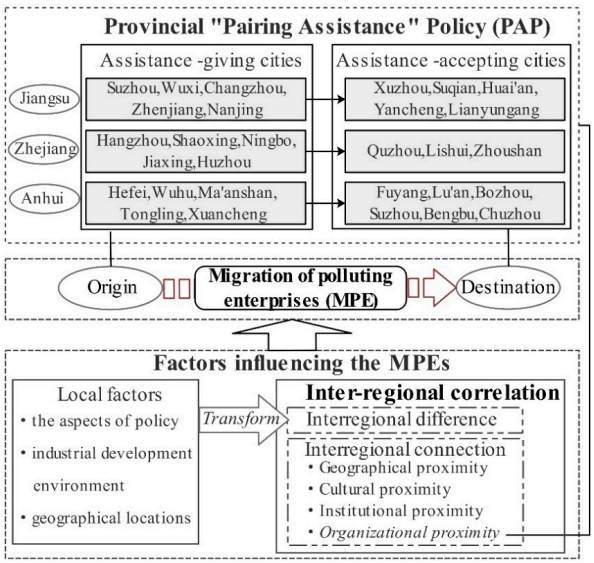

Figure 1. Analysis framework of the effect of the PAP on the MPE.

3. Data Sources and Processing

3.1. Data Sources

1. The enterprise directory and data for the investment relationships between enterprises from 2001 to 2018 are from the Qichacha database, an enterprise information inquiry platform (www.qcc.com, accessed on 1 May 2021).
2. Statistics on the provincial and city levels, including industrial wastewater and SO_2 emissions, gross industrial output value above designated size, total exports, per capita income, average land transfer price, and others, mainly come from *China Land and Resources Statistical Yearbook* in the EPS database (www.epsnet.com.cn, accessed on 8 May 2021). Data for regional dialects are from *The Distribution of Dialects in Counties and Districts of China* [36]. Data for the pairing relationships based on the PAP between cities were collected by the authors according to the official documents of each region under investigation.

3.2. Definition of Polluting Industries

A polluting industry refers to an industry that will directly or indirectly produce a large number of pollutants if not treated in the production process, thereby harming human beings, animals, plants, and the environment [4]. Enterprises belonging to polluting industries are considered to be polluting enterprises. At present, the definition of polluting industries includes a variety of methods: (1) Following the official documents issued by the state and the relevant ministries, such as *Notice on Environmental Protection Verification of Listed Companies* and *Listed Companies issued by the Ministry of Environmental Protection in China*. (2) Selecting polluting industries by setting thresholds according to the total or intensity of pollutant emissions. (3) Selecting polluting industries according to the proportion of pollution control cost to the total cost. In this paper, the three methods are organically integrated to determine 23 industrial categories as polluting industries, which can be further divided into three categories, i.e., high, medium, and low, according to the intensity of pollutant emissions based on relevant research [37,38]. In the data processing, power and heat supply enterprises are excluded, and only those engaged in power and heat production are retained (Table 1).

Table 1. Polluting Industries with Different Pollutant Emission Intensity.

Pollutant Emission Intensity	Industry Category	Industry Code in China
High	Coal mining and washing	06
	Oil and natural gas extraction	07
	Black metal mining	08
	Nonferrous metal mining and beneficiation	09
	Nonmetallic ore mining and beneficiation	10
	Mining assistance activities	11
	Other mining industries	12
	Paper making and paper product manufacturing	22
	Chemical raw materials and chemical product manufacturing	26
	Nonmetallic mineral product manufacturing	30
	Black metal smelting and calendering	31
	Production and supply of electricity and heat	44
Medium	Food production	14
	Production of wine, beverage, and refined tea	15
	Cotton production	17
	Petroleum processing, coking, and nuclear fuel processing	25
	Pharmaceutical manufacturing	27
	Chemical fiber Manufacturing	28

Table 1. *Cont.*

Pollutant Emission Intensity	Industry Category	Industry Code in China
	Nonferrous metal smelting and rolling processing	32
	Metal product manufacturing	33
Low	Agricultural and sideline food processing	13
	Production of leather, fur, feathers (velvet), and their products	19
	Rubber and plastic product manufacturing	29

3.3. Identification of the MPE

The MPE includes overall migration, external acquisition, the establishment of holding subsidiaries, branches, and other forms of affiliates. At present, data for overall migration are still in serious shortage. The overall migration can be divided into two situations. First, the owner of an enterprise relocates the enterprise to another place completely and changes its place of registration. Data in the database for this can only be dated back to 2016 and thus have a short time span and small sample size. Second, the owner of an enterprise shuts down a part of its holdings and sets up one or more enterprises in other places. In this case, it is difficult to establish a migration relationship between the closed enterprises and the newly established enterprises. Therefore, it is difficult to conduct an analysis for the overall MPE. Meanwhile, as group enterprises with multiple sectors have become the mainstream mode of enterprise organization, the migration behavior of most polluting enterprises adopts the method of establishing holding subsidiaries or branches. This paper analyzes the migration behavior of this type of enterprises.

The identification steps of the MPE are as follows: (1) Select the enterprise directory of the 23 polluting industries in the Yangtze River Delta region from the database. (2) Collect the holding subsidiaries and branches of the abovementioned enterprises, and screen out the samples of these enterprises that also belong to the above 23 industrial categories. (3) Transform each "one-to-many" investment relationship into a "one-to-one" polluting enterprise migration relationship. In this paper, a total of 5840 samples of the MPE across cities were identified. (4) Transform pairs of relationships between enterprises into pairs of relationships between cities, so as to form a directed association network with 41 nodes of districts in cities, and the frequency of the MPE among these nodes is used as the weight of the network.

3.4. Model Setting and Variable Selection

3.4.1. Model Setting

This paper focuses on the effects of the PAP on the MPE. A matrix of the assistance pairs among cities in the Yangtze River Delta region was formulated, with the assistance pairs as the study samples. Regression analysis was conducted through a negative binomial model, in which the frequency of the MPE between cities was the dependent variable, and various variables of the relationships between cities were used as the control variables. The baseline model is as follows:

$$PollC_{i,t} = \beta_0 + \beta_1 Ass_{i,t-1} + \beta_2 X_{i,t-1} + \mu_{t-1} + \varepsilon_{c,t-1} \quad (1)$$

where i indicates an assistance pair, t is the year, and *PollC* is the dependent variable. The *Ass* is the main independent variable indicating whether a PAP exists between cities, X represents a series of control variables, μ_t is the time attribute, $\varepsilon_{i,t}$ is a random error term, β_0 is a constant term, and β_1 and β_2 are coefficients of *Ass* and X, respectively.

3.4.2. Variable Selection

Based on the theoretical analysis, this subsection mainly shows how the effects of policy factors, industrial development environment, and geographical locations on the MPE will be examined. Table 2 shows the calculation method, the value method, and the main function of the independent variables.

Table 2. Independent variables and their specifications.

Variable Type	Variable	Measurement Method	Unit
Variables of inter-regional similarities	PAP	If two cities have a relationship of pairing assistance, the value is 1, otherwise it is 0.	\
	Geographical proximity	The geographical distance between the two cities.	kilometer
	Institutional proximity	If two cities belong to the same province, the value is 1, otherwise it is 0.	\
	Cultural proximity	If two cities belong to the same dialect area, the value is 1, otherwise it is 0.	\
Variables of inter-regional differences	Difference in environmental regulation	The value is the reciprocal of the comprehensive emission index (cf. Equations (2) and (3)).	\
	Difference in policies for industrial upgrading	The value is the ratio of the number of nonpolluting enterprises to the total number of enterprises.	%
	Difference in gross industrial output value	Gross industrial output value.	Ten billion yuan
	Difference in land prices	The value is the average land transfer fee per unit area.	Million yuan per hectare
	Difference in labor costs	The value is the average annual salary of the employees.	Ten thousand yuan
	Difference in land use density	The value is the ratio of the area of land for construction to the total area of the city;	%
	Whether to flow to the provincial border	If the destination of the MPE is a border city of a province, the value is 1, otherwise it is 0.	\

Note: The variable of inter-regional similarities adopts the original value. The variable of inter-regional differences is the value of the destination minus the value of the origin.

Following relevant studies, the reciprocal of the comprehensive emission index of pollutants was used to measure the intensity of environmental regulation. The specific measurement procedure is as follows.

1. The emissions of the industrial wastewater and the industrial sulfur dioxide per unit output value of each city were linearly standardized as follows (due to serious data insufficiency, the emission of industrial dust was excluded to ensure the sample integrity):

$$PE_{ij}^{*} = \left[PE_{ij} - \min\left(PE_j\right)\right] / \left[\max\left(PE_j\right) - \min\left(PE_j\right)\right] \quad (2)$$

where PE_{ij} is the emission of pollutant j per unit output value of city i, max $(PE)_j$ and min (PE_j) denote the maximum value and the minimum value of the indices in city i, respectively, and PE_{ij}^{*} is the standardized value of the index.

2. Considering that pollutant emissions differ from different cities and different categories of industries, the adjustment coefficient $W_j = PE_{ij} / \overline{PE}_{ij}$ was used to reflect the

differences in pollutant characteristics, where $\overline{PE}_j$ is the urban average emission of pollutant j per unit output value during the sampling period.

3. The comprehensive emission index EI_i was calculated at the city level:

$$EI_i = \frac{1}{2} \cdot \sum_{i=1}^{2} W_j \cdot PE_{ij}^* \quad (3)$$

where EI_i is the comprehensive emission index of all included pollutants, which indicates the comprehensive emission intensity of pollutants per unit output value and can manifest the local pollution tolerance during production activities. The larger EI_i is, the weaker the local environmental regulation will be. Therefore, the reciprocal of EI_i is used to measure the intensity of environmental regulation, and the difference in the intensity of environmental regulation between the destination and origin of the MPE is selected to measure the variable of difference in environmental regulation.

4. Provincial PAPs in the Yangtze River Delta Region and the Spatial and Temporal Characteristics of the MPE There

Since 1978, the Yangtze River Delta region has experienced an investment boom such as village-run enterprises, township enterprises, and the development zone fever. Some developed areas have implemented industrial upgrading and intensive environmental protection policies, while a large number of polluting enterprises have been forced to migrate. The following section analyzes the spatial and temporal evolution characteristics of the PAP and the MPE in the Yangtze River Delta region after 2000 (Table 3) and analyzes the macrobackground and important measures taken in each time period. Figure 2 shows the PAP evolution in the Yangtze River Delta region. For convenience, each province within the region is subdivided (the subdivisions of the three provinces: southern Jiangsu (Suzhou, Wuxi, Changzhou, Nanjing, and Zhenjiang), central Jiangsu (Yangzhou, Taizhou, and Nantong), and northern Jiangsu (Xuzhou, Suqian, Huai'an, Yancheng, and Lianyungang); northern Anhui (Bengbu, Huainan, Huaibei, Suzhou, Fuyang, and Bozhou), central Anhui (Hefei, Anqing, Chuzhou, and Lu'an), and southern Anhui (Wuhu, Ma' Anshan, Tongling, Xuancheng, Chizhou, and Huangshan); coastal areas in eastern Zhejiang (Ningbo, Shaoxing, Zhoushan, and Taizhou), northern Zhejiang (Hangzhou, Jiaxing, and Huzhou), and southwestern Zhejiang (Wenzhou, Lishui, Quzhou, and Jinhua)).

Table 3. PAP evolution in the Yangtze River Delta region.

Period	Jiangsu Province	Zhejiang Province	Anhui Province
2001–2005	Nanjing-Huai'an; Suzhou-Suqian; Wuxi-Xuzhou; Changzhou-Yancheng; Zhenjiang-Lianyungang;	Hangzhou, Shaoxing-Quzhou; Ningbo, Jiaxing, Huzhou-Lishui;	/
2006–2010	ditto	Hangzhou, Shaoxing-Quzhou; Ningbo, Jiaxing, Huzhou-Lishui; Hangzhou, Ningbo, Shaoxing, Jiaxing-Quzhou; Ningbo-Zhoushan;	Hefei-Fuyang; Hefei-a part of counties of Lu'an; Wuhu-Bozhou; Ma'anshan-Suzhou; Tongling-a part of counties of Bengbu; Xuancheng, Ningguo-Chuzhou, a part of the county under its jurisdiction;
2011–2015	ditto	ditto	Updated: Hefei-Fuyang; Wuhu-Bozhou; Ma'anshan-Suzhou;
2016–2018	ditto	ditto	ditto

Note: The entity before "-" is the assistance-giving city, and that after is the assistance-accepting city.

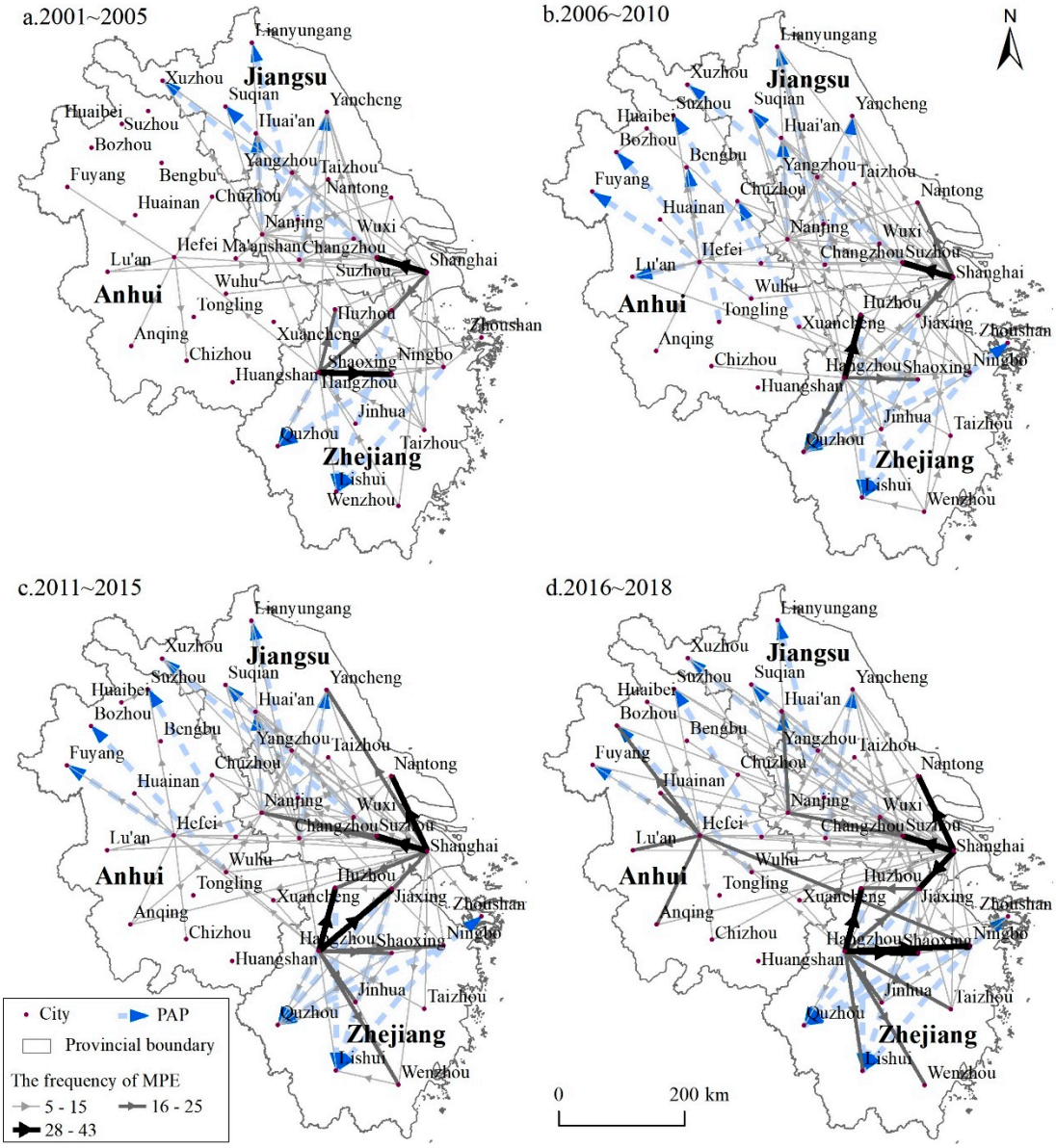

Figure 2. Trend of the MPE in the Yangtze River Delta region from 2000 to 2018. Note: the author produced the map by using ArcGIS 10.6.

4.1. 2001–2005

At this time, the preliminary exploration of the coordinated regional development was carried out in Yangtze River Delta region (*The Opinions of the CPC Jiangsu Provincial Committee and the People's Government of Jiangsu Province on Further Accelerating the Development of the Northern Jiangsu Region* (Su Fa (2001) No.12)). Industrial transfer became an important method to promote this strategy, which involved the treatment of polluting enterprises. (1) Jiangsu province implemented the policy of "north-south linked cooperation" when a large number of polluting enterprises migrated from southern Jiangsu to northern Jiangsu. In addition, the land prices and electricity costs in Jiangsu were lower than that of Zhejiang, which made Jiangsu the main destination for enterprises from Shanghai and Zhejiang. (2) Zhejiang implemented the "Mountain and Sea Cooperation Project" (In April 2002, the Zhejiang provincial government officially issued *the Opinions on the Implementation of the Mountain and Sea Cooperation Project to Help Accelerate the Development of the Underdeveloped Areas in the Province* (Zhejiang Administrative Measures (2002) No.14)) to promote the cooperation between the developed coastal areas and the less-developed areas in western

Zhejiang. In this context, the main direction of the MPE was from Hangzhou to Shaoxing, Jiaxing, Quzhou, and other places. (3) Anhui did not launch any provincial PAPs, though Hefei, Wuhu, and some other cities took in a small number of polluting enterprises from outside the province.

4.2. 2006–2010

The shutdown and migration of polluting enterprises was an important strategy to change the mode of economic growth in the developed areas in this period. (1) Jiangsu implemented the policy of "jointly building northern Jiangsu Development Zone" (*Notice of Jiangsu Provincial Government on Supporting the Policies and Measures to Jointly Build the North-South and North-North Jiangsu Development Zone* (Su Zhengfa (2006) No.119)) in southern Jiangsu and northern Jiangsu. In 2007, the Taihu Lake cyanobacteria incident broke out, which prompted southern Jiangsu to take great efforts to control pollution by shutting down and migrating a large number of polluting enterprises. Meanwhile, northern Jiangsu became an important alternative place of settlement for polluting enterprises from southern Jiangsu and Zhejiang. In addition, enterprises in southern Jiangsu began to migrate to northern and southern Anhui. (2) Zhejiang began to greatly promote the MPE in 2006, as enterprises in Hangzhou were migrated to Huzhou, Shaoxing, and Quzhou on a large scale. (3) Some cities in northern Anhui were paired with other cities in Anhui. A small amount of the MPE mainly took place from Hefei to cities such as Lu'an, Ma'anshan, and Tongling. In addition, the Wanjiang city belt took in some polluting enterprises from Nanjing and Hangzhou.

4.3. 2011–2015

China proposed firmly promoting the construction of an ecological civilization. Governments at all levels extensively improved environmental regulations. (1) Jiangsu proposed the Traditional Industry Upgrading Plan to encourage and guide enterprises in southern Jiangsu to accelerate the gradient transfer between the industries in the north and the south. The number of the polluting enterprises migrating from southern Jiangsu to northern Jiangsu was 112, accounting for the largest proportion in the Yangtze River Delta region. At the same time, enterprises in southern Jiangsu were moving to Ma'anshan, Chuzhou, and other places in Anhui. (2) With Hangzhou as the core, Zhejiang extensively migrated enterprises to Ningbo, Jiaxing, Wenzhou, Huzhou, and other places. Outside the province, southern Anhui also took in the most enterprises from Zhejiang. (3) Anhui implemented the "Build modern industrial park in North Anhui jointly" plan to facilitate the MPE from central Anhui to northern Anhui (*Implementation Plan for Jointly Building a Modern Industrial Park in North Anhui*, CPC Anhui Provincial Committee, June 2012).

4.4. 2016–2018

China issued the Three-Year Action Plan for winning the battle to protect the blue skies, and completed several rounds of environmental inspections. Environmental protection efforts in all regions were further strengthened. (1) For Jiangsu, the PAPs between cities in southern Jiangsu and northern Jiangsu continued. Jiangsu shut down 4454 chemical manufacturers during the nationwide crackdown on polluting enterprises. During this period, polluting enterprises in southern Jiangsu migrated to northern Jiangsu and Anhui on a large scale. (2) Zhejiang urged the migration of a large number of polluting enterprises from Hangzhou, Jiaxing, Ningbo, and Taizhou to other places within the province and Anhui. (3) Anhui gradually became an important destination for polluting enterprises in the Yangtze River Delta region, and polluting enterprises in Hefei were also moving to Bozhou, Huainan, Lu'an, Anqing, and other cities within the province on a large scale (*Implementation Plan for Migration, Rectification or Suspension and Shutdown of Heavily-polluting Enterprises in Urban Built-up Areas of Zhejiang Province*).

In general, under the influence of the provincial PAPs, policies for environmental protection and industrial upgrading, a large number of polluting enterprises in assistance-giving cities have migrated into the assistance-accepting cities. In addition, a large number

of enterprises have moved from cities outside of the pairing assistance network to the assistance-accepting cities. In this context, less-developed areas such as northern Jiangsu and northern Anhui may become pollution shelters.

5. Empirical Analysis of the Effects of the PAP on the MPE

5.1. The Baseline Modelling Results

As shown in Table 4, Model (1) analyzes the effect of the control variables on the MPE, and Model (2) incorporates the variables of the PAP. The comparison between the two models indicates that differences in environmental regulation are positively correlated with the MPE ($p = 0.01$), which confirms the existence of pollution shelters in the Yangtze River Delta region. However, the introduction of the factor of the PAP causes the reduction in the influence coefficient of difference in environmental regulation in Model (2) and the simultaneous increase in the influence coefficient of the PAP. To be specific, the incidence rate ratio is 2.295, or the average occurrence of the MPE between cities with a pairing assistance relationship is 129.51% more than that between cities without such a relationship. This indicates that the PAP is an indispensable and important influencing factor of the MPE, which has been largely omitted in existing studies. Therefore, hypothesis 1 is confirmed. In the past, the existing research generally believed that environmental regulation was the main factor driving the MPE [4,23,39]. We find that PAPs can still significantly promote the MPE after controlling for environmental regulation factors.

Table 4. The baseline modelling results.

Variables	Dependent Variable: The Frequency of the MPE between Cities			
	(1) Full Sample	(2) Full Sample	(3) Before 2012	(4) After 2012
PAP		0.831 ***	0.750 ***	0.765 ***
		(7.153)	(4.826)	(5.053)
Geographical proximity	−0.004 ***	−0.005 ***	−0.005 ***	−0.004 ***
	(−18.000)	(−18.251)	(−14.961)	(−10.984)
Institutional proximity	0.762 ***	0.708 ***	0.662 ***	0.848 ***
	(13.717)	(12.612)	(9.308)	(9.520)
Cultural proximity	0.220 ***	0.198 ***	0.190 ***	0.239 ***
	(4.534)	(4.068)	(2.965)	(3.129)
Difference in environmental regulation	0.630 ***	0.619 ***	2.557 ***	0.306 *
	(3.600)	(3.569)	(4.919)	(1.770)
Difference in policies for industrial upgrading	0.400	0.469	0.272	−0.455
	(0.966)	(1.121)	(0.553)	(−0.540)
Difference in gross industrial output value	28.913 ***	26.708 ***	22.255 ***	19.757 ***
	(6.084)	(5.617)	(2.720)	(3.286)
Difference in land prices	0.291 **	0.276 **	2.720 ***	0.540 ***
	(2.111)	(2.016)	(4.861)	(3.254)
Difference in labor costs	0.348 ***	0.348 ***	0.360 ***	0.298 ***
	(12.642)	(12.724)	(8.032)	(8.721)
Difference in land use density	1.516 ***	1.587 ***	0.511	1.350 **
	(4.079)	(4.268)	(1.022)	(2.226)
Whether to flow to the provincial border	−0.035	−0.026	−0.066	0.048
	(−0.882)	(−0.654)	(−1.349)	(0.678)
_cons	−1.696 ***	−1.645 ***	−1.631 ***	−1.373 ***
	(−13.425)	(−13.006)	(−11.520)	(−8.895)
year	Yes	Yes	Yes	Yes
N	22,960	22,960	16,400	6560

Note: *, **, and *** represent the statistical significance of 10%, 5%, and 1%, respectively, with standard errors in parentheses.

The ecological civilization strategy was put forward at the 18th National Congress of the CPC in China in late 2012. Since then, the intensity of environmental regulation has been greatly strengthened in China, and the activities of pollutant emissions by enterprises have been more strictly restrained. For this reason, the estimation is based on the baseline model, using the subsamples taken in 2012 as the bound. Model (3) analyzes samples in and before 2012, while Model (4) analyzes samples in and after 2012. Both of the models

demonstrated the positive correlations between the PAP and the MPE (p = 0.01), and both the coefficients increased. However, after 2012, the effect of the difference in environmental regulation has been greatly reduced (p = 0.1). This indicates that, after 2012, the "pollution shelter effect" in the Yangtze River Delta region has been weakened, while the effect of the PAP on the MPE has intensified.

5.2. Robustness Test

5.2.1. Will the PAP Promote the MPE from the Assistance-Giving Cities and the Entrance into Assistance-Accepting Cities, Respectively?

The baseline model shows that the MPE is more frequent between cities with PAPs. As a consequence, this section examines whether it is easy for the PAP to trigger the MPE from the assistance-giving cities and the entrance into the assistance-accepting cities, respectively. The frequency of moving out and moving in of polluting enterprises in each city was used as the dependent variable. This part also adopts the negative binomial model. The core independent variables are dummy variables, namely whether it is an assistance-giving city and whether it is an assistance-accepting city. In addition, variables of inter-regional factors are used as the control variables.

As shown in Table 5, Model (1) indicates that there is no significant increase in the frequency of accepting polluting enterprises in the assistance-giving cities, while Model (2) indicates that the MPE entering into the assistance-accepting cities is 63.76% more frequent than in other cities. Therefore, it can be concluded that the MPE is more affected by the assistance-accepting cities. Combined with the results of the baseline model, the PAP will trigger the MPE not only from the assistance-giving cities to the assistance-accepting cities, but also from other cities to the assistance-accepting cities through a demonstration effect.

Table 5. Estimation results of the robustness test.

Variables	Dependent Variable:	
	Frequency of Accepting Polluting Enterprises	Frequency of Moving out Polluting Enterprises
	(1)	(2)
assistance-giving cities or not	0.216	
	(1.191)	
assistance-accepting cities or not		0.493 ***
		(2.625)
environmental regulation	0.001 ***	−0.001 **
	(3.015)	(−2.056)
policies for industrial upgrading	1.085	−2.253 *
	(0.534)	(−1.816)
gross industrial output value	0.194 *	−0.128
	(1.882)	(−1.444)
land prices	−0.008	−0.402 ***
	(−0.059)	(−2.964)
labor costs	0.078	−0.049
	(1.153)	(−0.851)
land use density	0.743 *	−0.326
	(1.742)	(−0.812)
_cons	1.557	4.370 ***
	(0.802)	(3.614)
year	Yes	Yes
id	Yes	Yes
N	574	574

Note: *, **, and *** represent the statistical significance of 10%, 5%, and 1%, respectively, with standard errors in parentheses.

5.2.2. Placebo Test with Changes in the Implementation Time of the PAP

Within the Yangtze River Delta region, there are differences in the implementation time of the PAP. Jiangsu Province and Zhejiang Province implemented such policies during the study period from 2003 to 2018, while the PAP in Zhejiang province has changed many times, and it was not implemented until 2009 in Anhui Province. In order to carry out the placebo test, it was assumed that the implementation of all PAPs was rewound to 2006, and the study period was set to 2003–2008. The samples with the PAP before 2009 were excluded. The estimated results show (Table 6) that the policy advance of 3 years does not lead to the MPE.

Table 6. Estimated results of the placebo test.

Variables	**Dependent Variable: The Frequency of the MPE between Cities**
	(1)
Placebo	−0.178 (−0.301)
Geographical proximity	−0.004 *** (−11.574)
Institutional proximity	0.697 *** (7.984)
Cultural proximity	0.253 *** (3.190)
Difference in environmental regulation	2.886 *** (4.273)
Difference in policies for industrial upgrading	0.536 (0.904)
Difference in gross industrial output value	19.878 (1.380)
Difference in land prices	4.166 *** (4.531)
Difference in labor costs	0.461 *** (7.006)
Difference in land use density	0.127 (0.137)
Whether to flow to the provincial border	−0.086 (−1.404)
_cons	−1.769 *** (−11.114)
year	Yes
N	22,960

Note: *** represents the statistical significance of 1%, with standard errors in parentheses.

5.3. Heterogeneity Analysis

5.3.1. Heterogeneity Analysis of the Intensity of Pollutant Emissions

In this section, the subsample estimation according to the intensity levels of pollutant emissions (Models 1–3 in Table 7) is introduced. Since the independent variable is the frequency of the MPE at different intensity levels of pollutant emissions between cities, the method of estimation by industry will not reduce the total sample. The estimation results show that the PAP has an effect on enterprises at three levels of pollutant emission intensity, but it has a greater effect on highly polluting enterprises, and the probability ratio is higher. Specifically, the average frequency of the MPE at a high level of pollutant emission intensity between paired assistance cities is 210.85% more than that between nonpaired cities. For those at low and moderate levels of the intensity, the values are 81.70% and 67.73%, respectively.

Table 7. Estimated results of the heterogeneity analysis.

Variables	Dependent Variable: The Frequency of the MPE between Cities				
	(1) Low Polluting Industry	(2) Medium Pollution Industry	(3) Highly Polluting Industry	(4) High Technology Industry	(5) Low Technology Industry
PAP	0.597 **	0.515 ***	1.134 ***	0.596	0.845 ***
	(2.229)	(2.894)	(7.396)	(1.144)	(7.072)
Geographical proximity	−0.004 ***	−0.005 ***	−0.005 ***	−0.003 ***	−0.005 ***
	(−8.515)	(−12.664)	(−14.193)	(−2.894)	(−18.268)
Institutional proximity	0.519 ***	0.783 ***	0.751 ***	1.091 ***	0.696 ***
	(4.441)	(9.822)	(10.251)	(4.892)	(12.231)
Cultural proximity	0.194 *	0.141 **	0.214 ***	−0.084	0.202 ***
	(1.911)	(1.997)	(3.538)	(−0.433)	(4.099)
Difference in environmental regulation	0.938 ***	0.664 ***	0.583 ***	0.424	0.623 ***
	(2.907)	(2.759)	(2.945)	(0.417)	(3.522)
Difference in policies for industrial upgrading	1.738 *	2.497 ***	−0.187	4.377 ***	0.426
	(1.912)	(4.247)	(−0.311)	(2.593)	(1.000)
Difference in gross industrial output value	24.163 **	18.628 **	31.549 ***	21.554	27.120 ***
	(2.409)	(2.372)	(5.564)	(1.084)	(5.654)
Difference in land prices	0.638 **	0.720 ***	0.118	0.795	0.261 *
	(2.459)	(3.565)	(0.754)	(1.604)	(1.888)
Difference in labor costs	0.223 ***	0.293 ***	0.399 ***	0.277 **	0.353 ***
	(3.959)	(7.309)	(11.408)	(2.523)	(12.702)
Difference in land use density	2.389 ***	1.617 ***	1.778 ***	0.399	1.564 ***
	(3.256)	(3.204)	(3.960)	(0.263)	(4.149)
Whether to flow to the provincial border	−0.103	−0.071	0.042	−0.020	−0.029
	(−1.344)	(−1.352)	(0.779)	(−0.126)	(−0.715)
_cons	−3.149 ***	−2.669 ***	−2.413 ***	−5.604 ***	−1.649 ***
	(−12.018)	(−14.339)	(−14.382)	(−10.044)	(−12.869)
year	Yes	Yes	Yes	Yes	Yes
N	22,960	22,960	22,960	22,960	22,960

Note: *, **, and *** represent the statistical significance of 10%, 5%, and 1%, respectively, with standard errors in parentheses.

5.3.2. Heterogeneity Analysis of Technological Levels

In order to explore the possible heterogeneity of technological levels in the MPE, pharmaceutical manufacturing, chemical raw material manufacturing, and chemical product manufacturing are considered to be high-tech industries, while others are deemed low-tech [40]. The results show that (Models 4 and 5 in Table 7) the PAP has a significant positive correlation with the MPE of low-tech industries (p = 0.01). To be more specific, the average frequency of the MPE of low-tech industries between paired cities is 132.74% higher than that between nonpaired cities. In contrast, the correlation between the PAP and the MPE of high-tech industries is not significant.

In summary, the effect of the PAP is characterized by causing more highly polluting and low-tech enterprises to flow from developed areas to less-developed areas, which is an imperative to be tackled with. Therefore, hypothesis 2 is confirmed. The PAP, originally designed to improve the economic and social development in underdeveloped areas, has eventually promoted the formation of the pollution shelter in underdeveloped areas.

5.4. Mechanism Analysis

In the last section of this chapter, analysis based on interaction terms, including difference in operating costs, and difference in policies for industrial upgrading, reveals that these terms can interact with the PAP and drive the effect of the PAP on the MPE. Through field research, it is further found that the reduction in environmental regulation intensity and cluster migration in some areas of the destination will also aggravate the effect.

5.4.1. The Environmental Regulation Intensity in Some Areas inside the Assistance-Accepting Cities Is Relatively Low

The baseline model shows that environmental regulation and the PAP can affect the MPE. The results of the author's field investigation further reveal that low environmental regulation intensity in some parts of the assistance-accepting cities has promoted the migration effect of the PAP. However, Model (1) in Table 8 shows an inconsistent result that indicates no interactions between environmental regulation and the PAP. This may be because the environmental regulation intensity of the assistance-accepting cities has also improved under the background of extensive environmental protection campaigns in various regions. The low levels of environmental regulation intensity in some development zones within these cities can boost the effect of the PAP on the MPE. But the environmental regulation intensity in these cities has not been generally reduced. For example, *in order to deal with the central government's environmental inspectors, some civil servants in assistance-accepting cities colluded with enterprises by tipping them off* via *WeChat in northern Anhui. The officials also ordered companies to fake hazardous waste disposal contracts, wash contaminated storm drains and temporarily shut down production. Some officials have even suggested enterprises fudge the central government's inspections by forging hazardous waste disposal contracts, flushing contaminated storm drains, and temporarily halting production* ("The Central Environmental Protection Inspection Group criticism: Wuhu, Bozhou fraud is bad in nature" on 11 May 2019, 21:09 p.m. source: People's Daily Online-current political channel http://politics.people.com.cn/n1/2019/0511/c1001-31079538.html, accessed on 20 May 2022).

Table 8. Estimated results of the mechanism analysis.

Variables	Dependent Variable: The Frequency of the MPE between Cities			
	(1)	(2)	(3)	(4)
PAP	0.842 ***	0.605 ***	0.668 ***	0.842 ***
	(6.961)	(4.183)	(4.461)	(7.561)
PAP * Difference in environmental regulation	−0.376			
	(−0.805)			
PAP * Difference in land prices		1.674 **		
		(2.407)		
PAP * Difference in labor costs			0.222 **	
			(2.406)	
PAP * Difference in policies for industrial upgrading				9.892 ***
				(4.088)
Difference in policies for industrial upgrading	0.470	0.454	0.450	0.360
	(1.122)	(1.084)	(1.074)	(0.854)
Difference in land prices	0.276 **	0.256 *	0.289 **	0.277 **
	(2.016)	(1.860)	(2.105)	(2.029)
Difference in labor costs	0.348 ***	0.350 ***	0.340 ***	0.342 ***
	(12.732)	(12.783)	(12.177)	(12.457)
Control variables	Y	Y	Y	Y
_cons	−1.644 ***	−1.642 ***	−1.649 ***	−1.653 ***
	(−12.996)	(−13.000)	(−13.037)	(−13.038)
year	Yes	Yes	Yes	Yes
N	22,960	22,960	22,960	22,960

Note: *, **, and *** represent the statistical significance of 10%, 5%, and 1%, respectively, with standard errors in parentheses.

The pressure of economic growth and the lack of awareness of environmental protection lead to the reduction in environmental regulation intensity in some areas of the assistance-accepting city, and even the collusion between local governments and enterprises, which intensifies the MPE under the PAP. In X city, an assistance-accepting city in northern Jiangsu, some local officials once claimed that "death by poison rather than death by poverty" (Ma Junjian, a former member of the Party Leadership Group and deputy director of the Standing Committee of the Yancheng Municipal People's Congress, Jiangsu Province, was expelled from the party and removed from public office for serious violations of discipline and law, according to the official website of the Jiangsu Provincial Commission

for Discipline Inspection and Supervision (https://www.ccdi.gov.cn/yaowen/202103/t20210303_236880.html, accessed on 20 May 2022)) when they tried to improve the gross industrial output value, and absorbed a large number of polluting enterprises that had been eliminated in Zhejiang and southern Jiangsu. K, the director of the county's environmental protection bureau, even added: "*In the face of "food and clothing" and environmental protection, people will definitely choose the former. It's not that we're stupid, it's that we have no choice* ("Food and clothing first" or "environmental protection" first? A Choice of a Poor County, published in China News Network, 23 January 2006)".

5.4.2. Interactions of Inter-Regional Differences in Factor Costs

For the less-developed areas, the low factor costs are conducive to the introduction of enterprises. Models (2) and (3) in Table 8 show that the interaction terms of intercity land price differences, intercity labor cost differences, and the PAP can promote the MPE ($p = 0.05$). This suggests that the relatively low operating costs in less-developed areas can benefit the implementation of the PAP, thereby facilitating the introduction of polluting enterprises. The author's field research can also support these findings. S, the director of Jiangsu LB Textile Co., Ltd., Suqian, China, said: "*We moved from X city in southern Jiangsu to S city in northern Jiangsu in 2008. At that time, the PAP provided us with a lot of flexibility and preferential terms. We also attach great importance to the low operating costs there*". B, the director of the planning and construction bureau of the development zone where S's company is located, also said: "*Before 2010, the land prices and labor costs here are very low. In order to attract investment, we kept frequent negotiations with some textile enterprises, called them for bidding and hanged the auction, so that they could acquire the land through '0 land price', 'first auction and then return' and other policies*."

5.4.3. Interactions of Industrial Upgrading

The MPE is also the result of the upgrading of local industries [28]. Due to the differences in development stage and industrial structure, there are some differences in industrial upgrading between developed regions and underdeveloped regions. On the one hand, the developed areas have realized local industrial upgrading by closing down or moving out enterprises with high pollution, high emissions, and low efficiency. For example, J, an employee of a migrated company, said: "*We were all from some other companies in the south China before we moved to move to these underdeveloped cities. If the enterprise is very good, the local area is also reluctant to let out*". On the other hand, the MPE into underdeveloped regions can not only improve the fiscal and tax revenue and promote employment but can also form the knowledge overflow effect.

Model (4) in Table 8 shows that the differences in polices for industrial upgrading between cities can accelerate the effect of the PAP on the MPE. The authors' field interviews in many places in the Yangtze River Delta region also support the above argument. Director L of the Development and Reform Commission of a Zhejiang coastal city said: "*We will regularly assess the output of enterprises within our jurisdiction. Some steel enterprises are characterized by high pollution and high energy consumption. Although they have considerable output values, they had to move to southwestern Zhejiang. And cities in southwestern Zhejiang are also facing ecological and economic pressure. But there are always some areas that are pursuing economic development, so some highly polluting enterprises have been introduced there*" (The data were obtained from the author's field interviews). Therefore, hypothesis 3 is partially confirmed. Industrial upgrading between cities can accelerate the effect of the PAP on the MPE. However, the environmental regulation intensity just in some areas inside the assistance-accepting cities can interact with the PAP and promote their influence on the MPE.

5.4.4. The PAP Drives "Cluster Migration" and Reduces Business Risks

The PAP can trigger the cluster migration of enterprises, which aggravates the MPE in many respects. (1) Some industrial clusters containing many polluting enterprises, in whole or in part, move to assistance-accepting cities. After moving, they can still form a network

of enterprise cooperation. (2) With the migration of some major enterprises and core enterprises in an industrial chain to the assistance-accepting cities, their partners, suppliers, and supporters (including polluting enterprises) in other cities may also be attracted to the assistance-accepting cities. As a result, the cooperation relationship between enterprises, which was originally separated in space, turns to local cooperation and local agglomeration in the assistance-accepting cities. (3) The assistance-giving cities usually set up industrial parks and management committees, such as co-built parks, parks within parks, and enclave parks in the assistance-accepting cities and send some officials to work in the assistance-accepting cities and these parks. All these are convenient for enterprises to quickly adapt to the local government–enterprise network and the local interenterprise network, and greatly reduces business risks.

In this context, many polluting enterprises have established good relations with the governments of the less-developed regions before their migration. After migration, the assistance-accepting cities may also be tolerant to these enterprises in terms of environmental assessment, environmental supervision, and other aspects. For example, the author found that *the government of S city, an assistance-accepting city, once openly made an admonition with "Z South Jiangsu and North Jiangsu Jointly built Industrial Park" within its jurisdiction. The key enterprise, A, in the park directly emitted organic waste gas without treatment. The environmental pollution of the park and its surrounding areas was serious, and the exhaust odor released by local enterprises was frequently complained about and became the target of numerous petitions. However, it has not been solved by the administrative committee of the park for a long time*.

6. Conclusions

Based on the perspective of inter-regional correlations, this paper established an analytical framework of the MPE under the PAP. Using the Qichacha database, a negative binomial regression model was formulated for analysis. The main findings are as follows.

1. From the perspective of the relationships between cities, the average frequency of the MPE between the paired cities is 129.51% more than that between nonpaired cities. Moreover, the PAP can also promote the MPE from other cities into the assistance-accepting cities. The existing research generally believe that environmental regulation is the main factor driving the MPE [4,23,39]. In this paper, the role of environmental regulation decreased after the PAP was added. The coefficient of the PAP is much higher than that of environmental regulation.
2. The heterogeneity analysis shows that, under the influence of the PAP, enterprises that migrate from developed areas to less-developed areas are mainly highly polluting and low-tech enterprises. Related studies also found that enterprise groups that have shorter control chains, are non-state-owned, have a lower degree of diversification, and have smaller scale differences among member enterprises are more prone to migrate [17,41,42]. In the future, relevant research should be carried out under the condition of sufficient data.
3. The mechanism of the effect of the PAP on the MPE mainly includes low environmental regulation and operating costs, inter-regional differences in industrial upgrading, and the easy adaptation of migrated enterprises into the government–enterprise relationship network of the assistance-accepting cities.

The main contributions of this paper are as follows: (1) Based on the perspective of inter-regional correlation, we constructed an analytical framework for the MPE. The factors of inter-regional connections and differences, as well as local characteristics, were put into an analysis framework. (2) This paper found that the "Pairing Assistance" policy caused the migration of polluting enterprises, which is widely ignored by the existing research. This paper, based on China's empirical research, provides a new mechanism for the migration of polluting enterprises.

Based on the conclusions of this paper, the following policy recommendations can be proposed: (1) to take unified measures for environmental regulation and promote spatial justice of the environment; to reduce the differences in environmental regulation, and leave

buffering space for the MPE caused by the PAP; and (2) to establish a diversified PAP system that includes assistance, monitoring, and compensation to avoid overemphasis on economic development. For example, in reference to *The Superfund Law* of the United States and the Dark Green revolution of the four Nordic countries, an environmental tracking and monitoring system for the whole life cycle against polluting enterprises and stakeholders needs to be established.

In recent years, regional assistance policies have become increasingly more flexible and diverse, and the implementation of PAPs between counties, provinces, enterprises, communities, and others has been explored, which is worth studying. Furthermore, the MPE includes various scenarios that this paper does not take into account. Moreover, this paper focuses on inter-regional investment and the establishment of holding subsidiaries. The data of interenterprise investment relationships should be applied more to the study of enterprise migration. As for other forms of PAPs and MPEs, more data with higher integrity are needed to provide support for further research.

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