

# How does environmental pollution affect housing price

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**Abstract.** Environmental quality and housing prices have become two hot topics closely related to people's lives. When choosing housing, residents pay more and more attention to the quality of the surrounding environment. However, in view of the differences in living standards, there are huge regional differences in economic conditions and air pollution in different regions, resulting in different distributions of immigration rates, and immigration rates have a significant impact on housing prices. This article discusses the difference in immigration rate caused by environmental pollution and its impact on housing prices from a spatial perspective. In this article, we use the GIS system to analyze the impact of environmental pollution on an immigration rate. We use Chicago's immigration rate, economic conditions, pollution and other GIS data to show that environmental pollution is relevant to the immigration rate. People are willing to relocate to areas with low levels of environmental pollution. Then we use the spatial Dubin model to study the impact of environmental pollution on housing prices. We used housing price data, environmental data and other economic data from 258 cities in China from 2008 to 2019. The city data mainly comes from the city statistical yearbook. Environmental data mainly comes from environmental monitoring websites. This paper found that the increase in sulfur dioxide and nitrogen dioxide emissions will significantly reduce prices, while the increase in industrial wastewater emissions has no significant impact on housing prices. In addition, we also investigated the impact of surrounding cities on local prices. The increase in industrial wastewater discharge in surrounding cities has no significant impact on local housing prices, while the increase in environmental gas emissions has no significant impact on local housing prices. Finally, if the residents are assumed to be healthy producers, and the residents' demand-supply curve for health is transformed, it indicates that a place with a good economy in this area is often willing to pay more to maintain their health, or enjoy better medical care, or move to an area with lower air pollution levels. The conclusion of this article is that reducing the level of air pollution plays an important role in increasing the attractiveness of the city and thereby increasing housing prices. Therefore, if government policymakers want to increase the attractiveness of the city and promote economic development, they can start with improving the air quality in the city.

**Keywords:** Housing Price, Environmental Pollutants, Spatial Dubin Model, GIS

## 1. Introduction

At present, research has determined whether there is a relationship between the pollution level determined by SO<sub>2</sub> and the acute onset of respiratory diseases in patients with chronic bronchopulmonary disease [1]. A study showed that a health-oriented choice model was established, in which people regarded individuals as healthy producers and wanted good health for consumption and investment purposes. Individuals can adjust their health care consumption to resist the negative external effects caused by air pollution. The literature [2] shows that if someone has the financial ability, someone is willing to pay more to eliminate the negative effects of air pollution. Therefore, it shows from the side that there is a correlation between the pollution level and the income level of a region. People with higher income levels will choose to move to areas with low pollution [3][4], which will result in more low-income people remaining in places with high pollution, while areas with low pollution have better economic levels. Crowds move in, which will drive up housing prices.

Chay & Greenstone (2005) used the instrumental variable method to study the impact of air quality on housing prices in the United States [5], and the study showed that the MWTP of permanently

reducing 1 g/m<sup>3</sup> airborne particles was \$243, equivalent to 0.28% of the housing price. MWTP reduced by 1 g/m<sup>3</sup> for 1 year is \$12. Based on the housing transaction data from 1990 to 2006 in California, Bajari et al. (2012) found that housing prices in polluted areas were lower than those in areas with better environmental quality. Yongwei Chen and Lizhong Chen (2012) estimated the buyers' marginal willingness to pay for the improvement of air quality through the characteristic price method by using the commercial housing transaction data of Qingdao in 2008, and found the pricing of clean air [6]. The study found that for every index reduction in air pollution, consumers were willing to pay 99.785 yuan per square meter more for a house, equivalent to 1.74% of the average price of a commercial house over the same period. Xinghua Liu et al. (2020) [7] used the panel data covering 30 large cities on either side of the river for the period 2006–2015, and they found that 1 µg/m<sup>3</sup> (micrograms per cubic metre) reduction in average PM10 is associated with an approximately 1% increase in house prices.

Based on the above analysis, this paper conducts an empirical analysis on how various environmental factors affect the housing price, and tests whether the environmental quality of Chinese cities has produced a significant capitalization effect.

## 2. Methods

### 2.1. GIS map analysis

This article uses Geoda and other GIS software for visual analysis. With the continuous development of GIS technology, it is possible for people to analyze and solve environmental problems more macroscopically. GIS technology has become an indispensable research direction to realize the visualization of environmental data. Using GIS to establish environmental models and environmental information systems can realize the visualization of real-time environmental data information, analyze environmental change information and forecast its development trends, and provide decision-making basis for environmental protection through statistical analysis and simulation. Among them, data processing includes geographic boundary information processing and environmental interpolation data acquisition. The GIS-based visualization system implemented in this paper mainly includes two stages: data acquisition and processing, and visualization display. Or other GIS maps about Chicago (Data Sources: *Healthy\_Chicago\_2025\_Data-Compendium\_10222019*) are used to analyze and judge the economic level of each area of Chicago, the degree of automobile exhaust pollution, the degree of air pollution, the death rate of lung cancer, and the immigration rate of the area, and the relationship between these factors. We assume that people are regarded as healthy producers to analyze the impact of residents' economic level on health, and developed a health-oriented choice model [8]. In this model, people regard individuals as healthy producers, and want to have good health for consumption and investment purposes. Combined with the theory of negative externalities, the demand-supply curve is derived. The GIS map is also used in this article to visually see the distribution of air quality and housing prices in 258 cities in China. The data is made into a table and entered into the Geoda software. Select Natural Breaks Map, take 6 as the unit to get the details, and obtain the distribution of air quality and house prices in each city. Among the colors of different cities, red represents more serious pollution or higher house prices. This shows the approximate spatial distribution of house prices and air quality.

### 2.2. Data Sources and Summary Statistics

In this paper, some data from Chicago, such as population changes, lung cancer mortalities per 100,000 persons, and economic conditions, are from [https://geodacenter.github.io/data-and-lab/comarea\\_vars/](https://geodacenter.github.io/data-and-lab/comarea_vars/). Data from 258 cities in China in 2018 are selected as the research objects. House price data are from EPS database, environmental data are from <https://www.aqistudy.cn/historydata/>, and economic data are from the Statistical Yearbook of Chinese Cities. As some city data contain missing values, this paper adopts the moving average method to complete the values.

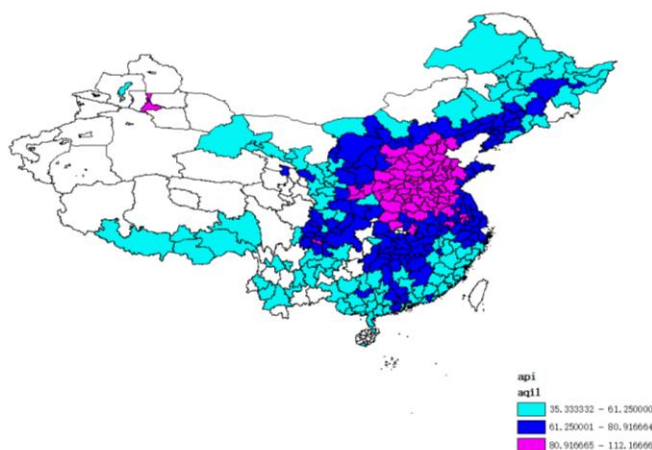
The dependent variable in this paper is the annual average housing price value (lnpri). The independent variables are the variables affecting the quality of the environment, including the log of industrial wastewater discharge (lninduwater), the log of PM2.5 emission (lnpm2.5), the log of sulfur dioxide emission (lnso2), and the log of nitrogen dioxide emission (lnno2). The control variables mainly include urban economic development and industrial structure variables, population variables, employment-related variables, and medical and cultural public service variables. Table 1 shows the descriptive statistics of the main variables.

**Table 1.** Descriptive statistics

| Variable    | Description   | Obs | Mean     | Std. Dev. | Min      | Max      |
|-------------|---|-----|----------|-----------|----------|----------|
| lnpri       | house price (yuan/m2)                                 | 258 | 8.904469 | 0.584365  | 4.727388 | 10.91453 |
| lnpm2.5     | pm2.5 emissions( $\mu\text{g}/\text{m}^3$ )           | 258 | 3.580912 | 0.325057  | 2.51904  | 4.209655 |
| lnno2       | Nitrogen dioxide emission( $\mu\text{g}/\text{m}^3$ ) | 258 | 3.319196 | 0.322775  | 2.343407 | 3.939962 |
| lnco        | Carbon monoxide emission( $\text{mg}/\text{m}^3$ )    | 258 | -0.2104  | 0.249581  | -0.99809 | 0.465462 |
| lninduwater | Industrial wastewater discharge(tons)                 | 258 | 7.880188 | 1.159323  | 3.332205 | 11.44907 |
| lnso2       | Sulfur dioxide emissions( $\mu\text{g}/\text{m}^3$ )  | 258 | 2.492225 | 0.451011  | 1.252763 | 3.755369 |
| lnpopden    | Population density (person/ $\text{km}^2$ )           | 258 | 5.838196 | 0.877249  | 2.281061 | 7.854942 |
| lnhos       | Number of hospital                                    | 258 | 4.489774 | 0.724861  | 2.564949 | 6.793466 |
| lncoll      | Number of college                                     | 258 | 1.574392 | 1.097022  | 0        | 4.521789 |
| lngdp       | Gross domestic product(yiyuan)                        | 258 | 16.89277 | 0.872839  | 15.07045 | 19.60485 |
| lnficspe    | Fiscal spending                                       | 258 | 15.21949 | 0.681755  | 13.81704 | 18.24054 |
| lnwage      | average wage of worker                                | 258 | 11.1636  | 0.18925   | 10.56872 | 11.91734 |
| greenrate   | Green rate of built-up area(%)                        | 258 | 41.1446  | 5.232787  | 24       | 93.81    |
| naturalrate | Natural growth rate                                   | 258 | 6.123304 | 4.993578  | -13.22   | 21.89    |
| secondrate  | The share of secondary industry in GDP                | 258 | 43.2337  | 9.063     | 17.72    | 72.9     |
| thirdrate   | The proportion of tertiary industry in GDP            | 258 | 46.65498 | 8.479842  | 26.54    | 80.98    |

### 2.3. Moran index and hot spot analysis

Figure 1 shows China's annual air quality distribution in 2018. It can be seen from the figure that high air quality indexes are mainly concentrated in the central region, while low air quality indexes are mainly concentrated in the southern and northeastern regions. At the same time, it can be seen from the figure that the AQI index tends to gather in the central area and spread in all directions.



**Figure 1.** Distribution of Air quality Index in China in 2018

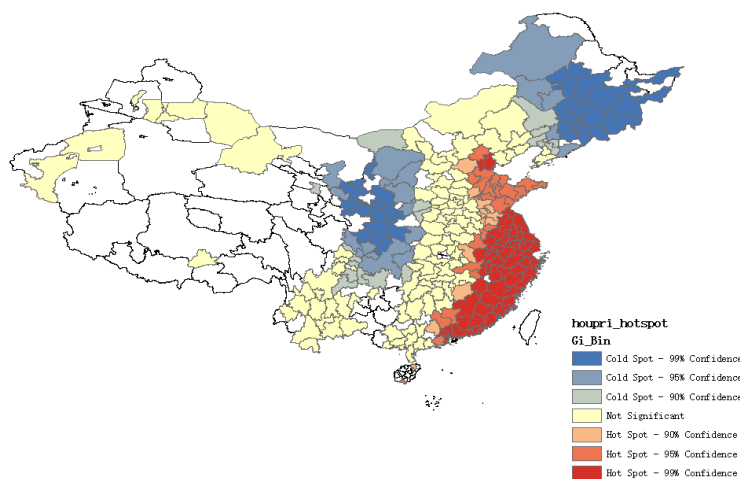
Traditional hedonic price model usually regards housing price as independent samples, however, the prices in different areas tend to have certain spatial correlation [9]. Therefore, Moran's I is adopted in this paper to test whether the main variables have spatial correlation. Table 2 lists the global spatial correlation test results of the major variables. It can be seen that both housing price and environmental variables are significant at 1% level, indicating a high positive correlation between housing price and environmental conditions in various cities in terms of spatial geographic distribution. Therefore, the

spatial distribution of housing price and the environmental variables in various cities are not random. The housing price and the environmental variables of a certain city will have a strong positive spillover effect on neighboring cities.[10]

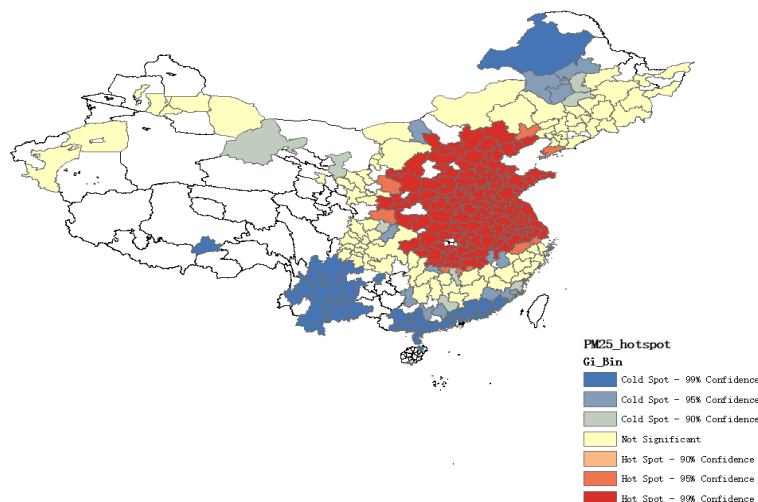
**Table 2.** The global Moran’s I of housing prices and pollution variables

| Variable    | Moran’s I | E(I)      | Var(I)   | Z score   | P value  |
|-------------|-----------|-----------|----------|-----------|----------|
| lnpri       | 0.182281  | -0.003650 | 0.000154 | 14.997751 | 0.00000  |
| lnpm2.5     | 0.356631  | -0.03650  | 0.000162 | 28.297987 | 0.0000   |
| lnso2       | 0.222503  | -0.00365  | 0.000162 | 17.757913 | 0        |
| lnno2       | 0.270299  | -0.00365  | 0.000162 | 21.508316 | 0        |
| lninduwater | 0.051803  | -0.00365  | 0.000162 | 4.350309  | 0.000014 |

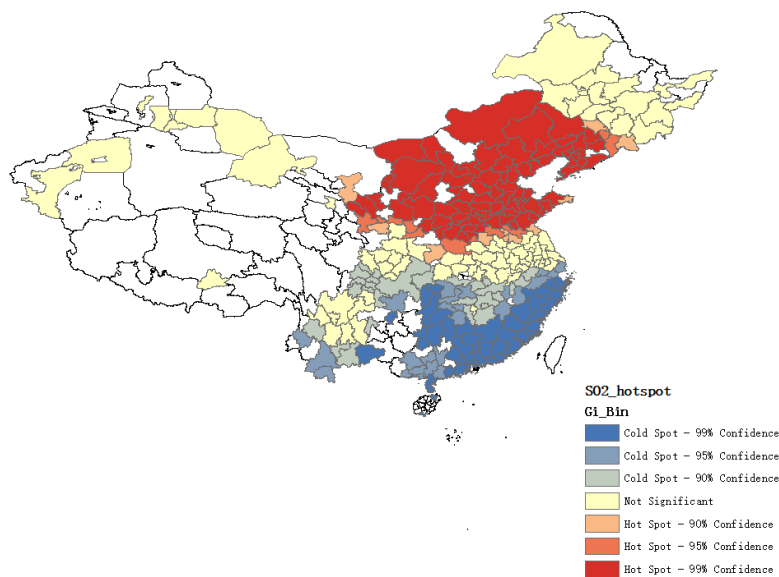
Compared with Global Moran's I index, which focuses on describing the overall clustering situation, local spatial correlation analysis can take into account the possible characteristics of local regions. Figure 2 shows the hot spot analysis of housing price. The hot spot area of housing price is more concentrated in southeast coastal areas. The cold spots are concentrated in the northeast and central regions. Figure 3 shows the hot spot analysis of PM2.5. Hot spots of PM2.5 are mostly in the eastern and central regions. The cold spots are concentrated in the northeast and the south. Figure 4 shows the hot spot analysis of sulfur dioxide. Hot spots of sulfur dioxide are mostly concentrated in the north. The cold spots are concentrated in the south. The hot spot area of housing price is mostly the cold spot area of sulfur dioxide.



**Figure 2.** Distribution of house price in China in 2018



**Figure 3.** Distribution of pm2.5 in China in 2018



**Figure 4.** Distribution of sulfur dioxide in China in 2018

**B. Model specification**

Spatial econometric models include Spatial Autoregressive Model (SAR), Spatial Error Model (SEM) and Spatial Durbin Model (SDM). Among them, the Spatial Durbin Model not only considers the spatial correlation of dependent variables, but also considers the spatial correlation of independent variables. Dependent variables are affected not only by local independent variables, but also by other local independent variables and dependent variables. Its basic form is:

$$y = \rho Wy + \alpha l_n + X\beta + WX\gamma + \varepsilon \tag{1}$$

Where  $Wy$  is the spatial hysteresis of the dependent variable and  $WX$  is the spatial hysteresis of the independent variable.

In order to weaken the effect of collinearity, the four environmental pollution factors are regressed with four econometric models respectively. The model is as follows:

$$\ln pri = \beta_0 + \beta_1 \ln pm2.5 + \lambda * W \ln pri + \gamma * W \ln pm2.5 + \sum_{i=2}^{11} \beta_i X_i + \varepsilon \tag{2}$$

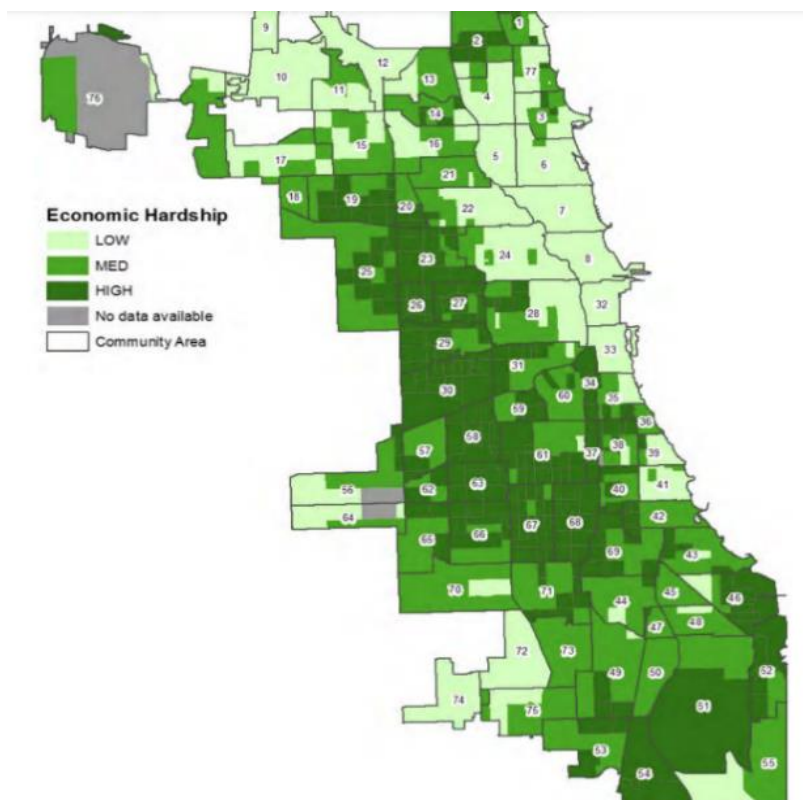
$$\ln pri = \beta_0 + \beta_1 \ln so2 + \lambda * W \ln pri + \gamma * W \ln so2 + \sum_{i=2}^{11} \beta_i X_i + \varepsilon \tag{3}$$

$$\ln pri = \beta_0 + \beta_1 \ln induwater + \lambda * W \ln pri + \gamma * W \ln induwater + \sum_{i=2}^{11} \beta_i X_i + \varepsilon \tag{4}$$

$$\ln pri = \beta_0 + \beta_1 \ln no2 + \lambda * W \ln pri + \gamma * W \ln no2 + \sum_{i=2}^{11} \beta_i X_i + \varepsilon \tag{5}$$

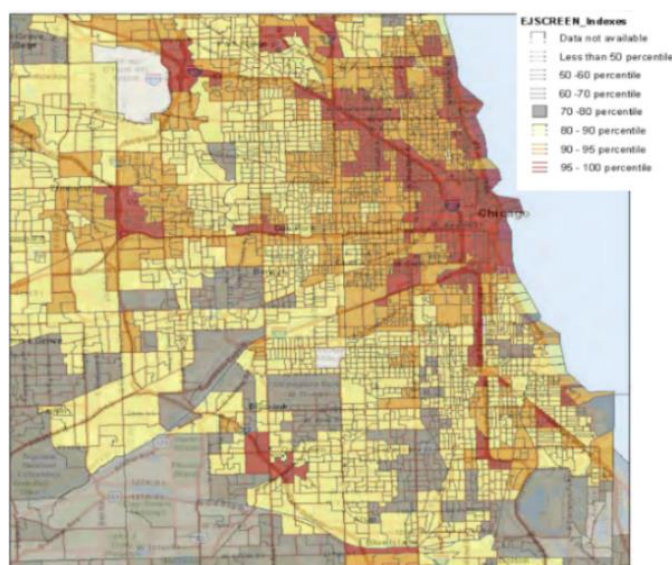
**3. Results and Discussion**

Figure 5 is a map of Chicago's economic hardship level. It showed that the economic conditions of the northeastern coast of Chicago are very good, while the economic conditions of the Midwest and the South are not very good. Economic conditions determine whether residents can pay for good medical care and affect the mortality rate due to diseases in an area.



**Fig. 5** The Economic Hardship\* of Residents in Chicago

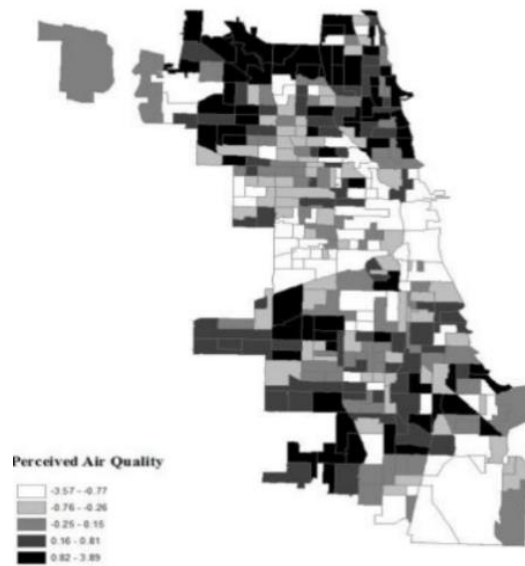
\*The Economic Hardship Index is a score that incorporates each of the following six socioeconomic indicators: Unemployment, defined as the percent of the civilian population over the age of 16 who are unemployed; Dependency, the percentage of the population that are under the age of 18 or over the age of 64; Education, the percentage of the population over the age of 25 who have less than a high school education; Income, the level of household income per person; Crowded Housing, measured by the percent of occupied housing units with more than one person per room; and poverty, the percent of people living below the federal poverty level. The Index is calculated according to the method described in An Update on Urban Hardship. [http://www.rockinst.org/pdf/cities\\_and\\_neighborhoods/2004-08-an\\_update\\_on\\_urban\\_hardship.pdf](http://www.rockinst.org/pdf/cities_and_neighborhoods/2004-08-an_update_on_urban_hardship.pdf). Source: US Census, ACS, 2013-2017.



**Fig. 6** Population-weighted percentile for the average 24-hour concentration of vehicle exhaust particulate matter in Chicago

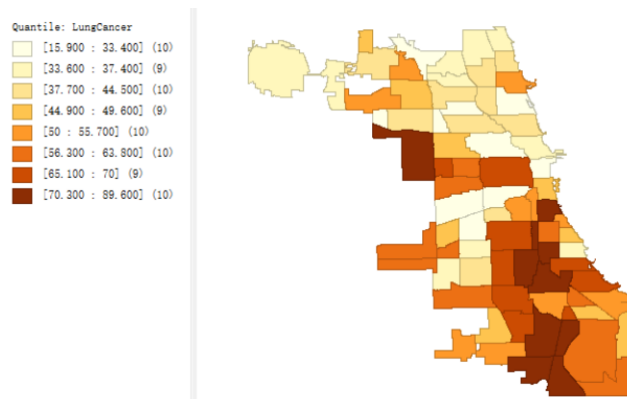
Figure 6 is a map of population-weighted percentile for the average 24-hour concentration of vehicle exhaust particulate matter in Chicago. It can be seen that the pollution in the downtown area of Chicago is the most serious, and air pollution is linear with the main roads in the downtown area. The trend of expansion shows that due to the good economic level in the downtown area, local residents generally own cars and the traffic is heavier. This picture can reflect the air pollution caused by vehicles.

Figure 7 shows the maps of Perceived Air Quality in Chicago [11]. Pollutants are two of the six “standard air pollutants” required by the EPA to establish standards under the Clean Air Act. The three types of health hazards come from air toxicity. It can be seen that the toxic air pollution in downtown Chicago is very slight, while the pollution in the northern and southern parts is very serious. This picture can be seen as the level of toxic air pollution in Chicago.



**Fig. 7** Perceived Air Quality in Chicago

Figure 8 is a map of lung cancer mortality rate per 100,000 persons in Chicago. It can be seen that the lung cancer mortality rate in the south of Chicago is very high, while the lung cancer mortality rate in the downtown and northern areas is not high. Although the air quality here is not high, it is speculated that it is due to the north, the economic level is good, so patients will get good medical treatment, and the mortality rate of lung cancer is not high. In Fig 6, even if the exhaust emissions from automobile fuel combustion in developed downtown areas are high, it will not cause excessive lung cancer mortality rate. Therefore, automobile exhaust emissions are not the main cause of lung cancer.



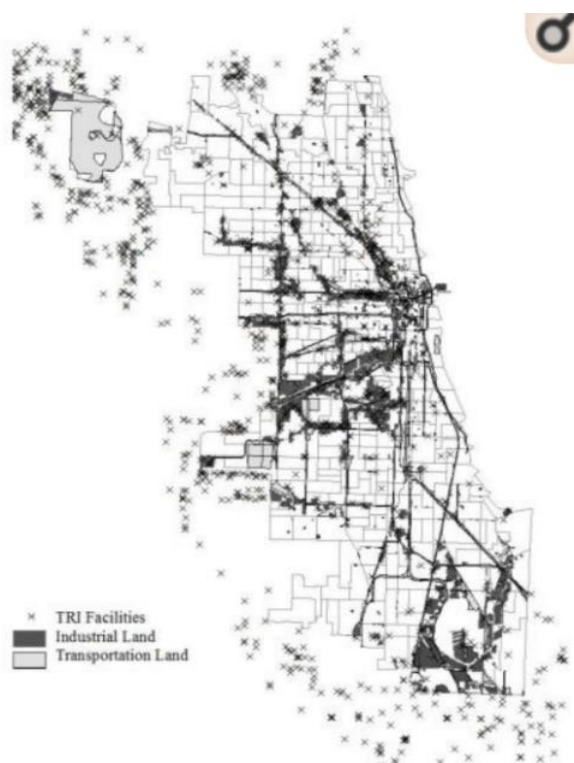
**Fig. 8** Lung cancer mortalities per 100,000 persons in Chicago

Figure 9 is the Industrial and Transportation Land Uses in Chicago, shown with Toxic Release Inventory Industrial Facilities within 4 KM of Chicago map [5]. It can be seen that there are more industrial factories in the south, coupled with poor economic conditions in the south, and a higher

poverty rate, so residents usually cannot afford the high cost of cancer treatment, which is also the reason for the high lung cancer mortality rate in the south. And we can also see that the negative externalities of these industrial factories are very high, which will make residents pay a high price to compensate for the negative externalities caused by industrial pollution. For the northern region, the air quality is poor, but there is little industrial land, the economic situation is good, and the lung cancer mortality rate is low. It can also be concluded that the cause of serious air pollution in the north is not caused by industrial pollution, and the mortality rate of lung cancer caused by industrial pollution is even higher. Moreover, as shown in Figure 8, there are two reasons for the low mortality rate of lung cancer in the north.

1. The economic conditions in the north are good and people can receive better medical treatment.

2. The air pollution in the downtown area does not come from industrial pollution, so industrial pollution maybe the cause of lung cancer.

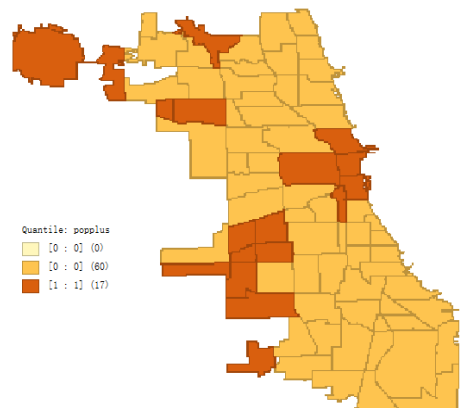


**Fig. 9** Industrial and Transportation Land Uses in Chicago

Based on the above conclusions, we can know that the high economic status of residents can reduce the negative external effects of pollution that harm health, and industrial land will cause the mortality rate of lung cancer to increase. In the northern region and the eastern city centers, even if there is air pollution in some areas, the mortality rate of lung cancer is not high, and industrial land is scarce. This shows that residents in areas with good economic conditions are more concerned about the negative external effects caused by industry. For example, high-income residents are more opposed [12] to set industrial land near their homes.

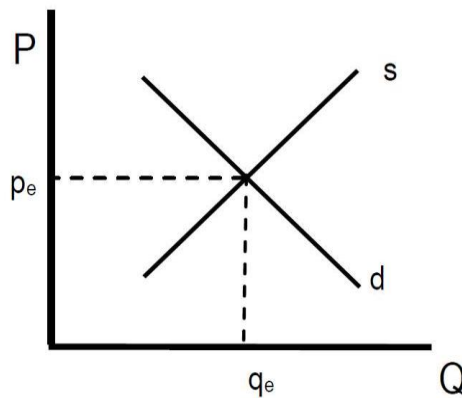
Figure 10 illustrates the population migration rate in Chicago. Places greater than 1 prove that there is population migration. It can be seen that people are more willing to move into areas with low pollution levels. Even in the downtown area of eastern Chicago, the per capita income is very high. But because the pollution in the northern part of the city center is more serious, people are more willing to move to the southern part of the city center where the air pollution is light. For the northern region, even though the air quality is bad because of the relatively high per capita income and the low mortalities caused by lung cancer, more people move into the northwestern enclaves because the air pollution is not serious.

Binary variable (1 if a positive population change is observed between 2000 and 2010)



**Fig. 10** Population changes in Chicago

So we assume that individuals are viewed as producers of health. As shown in Figure 11,  $P$  represents the amount spent on health, and  $Q$  represents environmental factors that are beneficial to health, such as low levels of toxic air pollution and less industrial land distribution. If the residents are healthy producers, then as for  $Q$ , the more environmental factors that are beneficial to health, the residents can “produce” more health, which means that the residents will be healthier, but this will cost more. The  $s$ -curve represents the health level of residents; as environmental factors that are beneficial to health increase, the negative externalities of health problems caused by environmental pollution by residents will decrease, and they will not need to pay more to protect themselves. The  $d$ -curve represents the compensation made by residents for negative externalities such as diseases caused by pollution.  $P$  is determined by the economic level of residents in each area, and  $Q$  is determined by the level of air pollution in each area.



**Fig. 11** Healthy supply-demand curve

It can be judged that population migration is indeed related to the environmental level, because of the worse the environmental level, people with high incomes are more willing to spend money to move to areas with low pollution levels, which will inevitably lead to housing prices in areas with low pollution levels uplift. The following is a specific analysis of environmental pollution. This article uses pollution and housing price data in 258 cities in China to illustrate the specific pollution factors that affect housing prices.

Table 3 shows the regression results of the impact of pollutant emissions on housing price. Column (1) is listed as the regression result of the least square method. Column (2) shows that PM2.5 emissions have a significant negative impact on housing price. For every 1% increase in PM2.5 emissions, housing price drops by 0.335%. Column (3) shows that sulfur dioxide emissions have a significant negative impact on housing price. For every 1% increase in sulfur dioxide emissions, housing price drops by 0.226%. In Column (4), it can be seen that the emission of nitrogen dioxide

has no significant impact on housing price, but its negative coefficient indicates that nitrogen dioxide will have a negative impact on housing price to a certain extent. In Column (5), it can be seen that local industrial wastewater discharge has no significant impact on housing price, but the more industrial wastewater discharge around it, the higher local housing price will be. For every 1% increase in industrial wastewater discharge in surrounding cities, the local housing price will increase by 0.855%.

**Table 3.** The impact of pollutants on housing price

|                       | (1)                   | (2)                  | (3)                   | (4)                   | (5)                   |
|-----------------------|-----------------------|----------------------|-----------------------|-----------------------|-----------------------|
|                       | lnpri                 | lnpri                | lnpri                 | lnpri                 | lnpri                 |
| lnpm25                | -0.208<br>(-1.515)    | -0.335**<br>(-2.552) |                       |                       |                       |
| lnso2                 | -0.206***<br>(-2.959) |                      | -0.226***<br>(-3.364) |                       |                       |
| lnno2                 | 0.146<br>(1.041)      |                      |                       | -0.144<br>(-1.23)     |                       |
| lninduwat             | 0.009<br>(0.271)      |                      |                       |                       | -0.036<br>(-1.073)    |
| lnpopden              | 0.158***<br>(4.218)   | 0.144***<br>(3.746)  | 0.125***<br>(3.266)   | 0.131***<br>(3.378)   | 0.139***<br>(3.639)   |
| lnhos                 | -0.064<br>(-1.447)    | -0.064<br>(-1.444)   | -0.07<br>(-1.554)     | -0.079*<br>(-1.762)   | -0.102**<br>(-2.426)  |
| lncoll                | 0.025<br>(0.622)      | 0.045<br>(1.086)     | 0.02<br>(0.509)       | 0.031<br>(0.753)      | 0.018<br>(0.455)      |
| lngdp                 | 0.174*<br>(1.687)     | 0.214**<br>(2.342)   | 0.19**<br>(2.122)     | 0.204**<br>(2.217)    | 0.225**<br>(2.231)    |
| lnficspe              | 0.069<br>(0.662)      | 0.046<br>(0.448)     | 0.048<br>(0.479)      | 0.063<br>(0.608)      | 0.086<br>(0.818)      |
| lnwage                | 0.748***<br>(3.794)   | 0.88***<br>(4.782)   | 0.94***<br>(5.081)    | 1.053***<br>(5.847)   | 1.05***<br>(5.886)    |
| greenrate             | 0.012**<br>(2.433)    | 0.009*<br>(1.782)    | 0.011**<br>(2.31)     | 0.01*<br>(1.866)      | 0.012**<br>(2.399)    |
| naturalrate           | 0.004<br>(0.777)      | 0.001<br>(0.111)     | 0.005<br>(1.06)       | 0.003<br>(0.496)      | 0.006<br>(1.17)       |
| secondrate            | -0.005<br>(-0.847)    | -0.01*<br>(-1.814)   | -0.005<br>(-0.802)    | -0.008<br>(-1.319)    | -0.011*<br>(-1.804)   |
| thirdrate             | 0.004<br>(0.623)      | 0<br>(-0.055)        | 0.005<br>(0.869)      | 0.002<br>(0.326)      | -0.002<br>(-0.288)    |
| _cons                 | -3.907*<br>(-1.748)   | -4.94**<br>(-2.474)  | -6.084***<br>(-3.121) | -7.596***<br>(-4.145) | -7.986***<br>(-4.312) |
| W:lnpm25              |                       | -0.55<br>(-0.826)    |                       |                       |                       |
| W:lnpri               |                       | 0.301<br>(1.085)     | -0.026<br>(-0.174)    | 0.302<br>(1.002)      | -0.769*<br>(-1.764)   |
| W:lnso2               |                       |                      | 0.176<br>(0.334)      |                       |                       |
| W:lnno2               |                       |                      |                       | -0.701<br>(-0.892)    |                       |
| W:lninduwat           |                       |                      |                       |                       | 0.855*<br>(1.801)     |
| Observations          | 258                   | 258                  | 258                   | 258                   | 258                   |
| Pseudo R <sup>2</sup> |                       | 0.586                | 0.591                 | 0.573                 | 0.582                 |

t-values are in parentheses

\*\*\* p<.01, \*\* p<.05, \* p<.1

## 4. Conclusion

Based on the Chicago GIS research survey, the following conclusions can be drawn:

1. The main source of the impact of air pollution on lung cancer mortality rate is the pollution produced by industrial land, not the air pollution caused by vehicle exhaust emissions.
2. Residents with good economic conditions can pay more to compensate for the negative externalities caused by air pollution.
3. Residents are more willing to move to areas with less air pollution.
4. Even in areas with severe air pollution, if the economic conditions in the area are good, the health rate will be higher than areas with severe air pollution but worse economic conditions.

After deriving the impact of air quality on migrants, combining the above conclusions and analyzing 258 cities in China, based on the housing market and environmental monitoring data of 258 cities in 2018, this paper starts from the perspective of housing transaction behavior closely related to residents' daily life and takes housing price as a proxy variable for the consequences of their behavior decision-making. On the basis of considering the spatial correlation of housing price, the economic value of environmental characteristics is separated from a series of characteristics affecting housing price by using the spatial Durbin model and the pricing thought based on the characteristic price method, so as to investigate the influence of environmental pollution on housing price by urban residents in the process of housing transaction. The following conclusions are drawn:

1. Environmental pollution has a certain negative impact on urban housing price.
2. An increase in industrial wastewater emissions in a city has no significant negative impact on housing price.
3. An increase in sulfur dioxide, PM2.5 and nitrogen dioxide emissions will cause a significant drop in housing price.
4. The increase of industrial wastewater discharge in surrounding cities has no significant effect on the local housing price, while the increase of ambient gas emission has no significant effect on the local housing price.

Based on the above conclusions, this paper proposes policy suggestions:

1. Local governments should strengthen environmental regulations.
2. The government should strive to reduce the emission of pollutants.
3. The government should improve the rate of harmless treatment of various pollutants.
4. The government should strengthen urban planning to prevent pollution from affecting the lives of residents. Only in this way, can we make cities more attractive to live in, avoid the real estate industry being frustrated by environmental pollution and hinder the healthy and sustainable development of economy.

This article has two shortcomings: First, in Beijing and areas around Beijing, the air quality is poor, but there are high housing prices, because Beijing is the capital of China, has the highest GDP in the north, and is the political center of China. It is the economic center and cultural center of northern China. Therefore, Beijing has more job opportunities and richer industries, which has an adsorption effect on the population of North China. A large number of northern immigrants will tend to seek jobs in Beijing. Beijing is located in the north of China, and the cities in the north are closer to Beijing. This shows that these immigrants are more willing to choose Beijing, which has serious air pollution, for more opportunities or other non-environmental factors, which leads to rising housing prices. The reasons for this are very complicated. In future research, I may study whether there is an equilibrium point. The equilibrium point is between the loss of health and the economic gain. If the benefits of living in areas with high air pollution are greater enough than this equilibrium point, then people will choose to ignore their own health and choose to immigrate to air-polluted areas. Second, the research on housing prices in this article is based on 258 cities in China as the basic unit. For Beijing, the air pollution levels in different areas of Beijing are also different, so in future research, I will specifically take Beijing as the research object and conduct research to explore whether different levels of air pollution between different areas or even different communities in Beijing will affect housing prices.

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