Research on Manufacturing and Haze Based on Spatial Metrology

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Abstract. Based on the environmental Kuznets curve (also known as EKC curve), PM10 is selected and their global correlation indices are calculated respectively. A local correlation map of the Moran'I index scatterplot is drawn, Matrix and weight matrix of gravity matrix, the classical panel data model, the spatial error panel model and the space lag panel model are constructed respectively. The EKC curves are tested under stochastic and fixed effects respectively. At the same time, 31 Chinese Spatial Spillover Effects of Air Pollutants in Provinces and Cities.

1 Introduction

The existing literature on smog research focuses on the relationship between industrial agglomeration and energy structure and smog. Foreign scholars have rarely systematically studied the spillover effect among various provinces and cities in China, and regard manufacturing as a whole, Studying the intensity of the manufacturing smog haze, scholars rarely involved. Smog in big cities is both endogenous and exogenous. According to the Kuznets Curve, most of the exogenous smog comes from the heavy manufacturing industry. When the industrial structure transitions to the heavy chemical industry, the air pollution is the most serious.

At present, the domestic scholars' research on haze mainly focuses on the relationship between industrial agglomeration, industrial structure, economic growth and environmental pollution. In industrial agglomeration, scholars generally believe that the higher the level of agglomeration, the higher the level of pollution discharge, Li Weina Yang Yongfu and Wang Zhenzhen [1] empirically analyzed the relationship between manufacturing agglomeration and air pollution through panel data. The results show that there is a N-shaped curve between manufacturing agglomeration and air pollution. Yu Feng, Qi Jianguo, Tian Xiaolin [2] The panel data of provinces and cities other than Tibet, Shanxi and Guizhou during 2004 shows the impact of economic development on the environment, and concludes that the expansion of economy will accelerate the environmental pollution. Environmental technology innovation and promotion have reduced China's environmental pollution. Ma Limei and Zhang Xiao [3] explored the spatial effect of haze pollution and the impact of economy and energy structure. Using the panel data of 2001-2010PM2.5, the regression analysis of spatial econometrics was carried out. It was found that the haze increased with the increase of per capita GDP Relationship. This article attempts to pass provincial and municipal panel data to provinces as a sample to study the manufacturing sector share of the spatial relationship between smog formation. Due to the manufacturing industry has some lag and space emissions. The paper will use space measurement method to study the formation of haze smog / lag (time effect)/panel effect.

2 PM2.5 data source and processing instructions

3 China smog pollution spatial autocorrelation test

3.1 Global Spatial Autocorrelation

Spatial autocorrelation refers to the potential interdependence between observed data for some variables within the same distribution. The global spatial autocorrelation indicator is used to detect whether the regional distribution of the study has a clustering characteristic and reflects the degree of similarity of the spatial and spatial neighborhood attribute values. The Global Correlation Index uses a single value to reflect the overall degree of autocorrelation. There are a number of relevant indices that are known to be used, the most important being the Moran'I Index. In this paper, when calculating the Moran'I index, the spatial weight matrix selects the spatial adjacent binary matrix, and the principles are set as follows:

\[ W_{ij} = \begin{cases} 
1, & \text{when area } xi \text{ and } xj \text{ have adjacent boundaries and adjacent points} \\
0, & \text{other} 
\end{cases} \]

Table 2-1. The annual average concentration of PM2.5 in 31 provinces and cities in China during 2006-2015 is as follows.

<table>
<thead>
<tr>
<th>Year</th>
<th>Moran'I</th>
<th>E (I)</th>
<th>Mean</th>
<th>Sd</th>
<th>Z-value</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011</td>
<td>0.175615</td>
<td>-0.0333</td>
<td>-0.0285</td>
<td>0.1110</td>
<td>1.8386</td>
<td>0.0390</td>
</tr>
<tr>
<td>2012</td>
<td>0.200787</td>
<td>-0.0333</td>
<td>-0.0319</td>
<td>0.1111</td>
<td>2.0951</td>
<td>0.0240</td>
</tr>
<tr>
<td>2013</td>
<td>0.150328</td>
<td>-0.0333</td>
<td>-0.0256</td>
<td>0.1038</td>
<td>1.6946</td>
<td>0.0550</td>
</tr>
<tr>
<td>2014</td>
<td>0.422190</td>
<td>-0.0333</td>
<td>-0.0346</td>
<td>0.1061</td>
<td>4.3045</td>
<td>0.0010</td>
</tr>
<tr>
<td>2015</td>
<td>0.489304</td>
<td>-0.0333</td>
<td>-0.0273</td>
<td>0.1137</td>
<td>4.54500</td>
<td>0.0010</td>
</tr>
</tbody>
</table>

Table 2-1 shows that the Moran'I index of PM2.5 in 2011-2015 all passed the significance test and the Moran'I value is relatively stable. Therefore, there is also a significant spatial correlation between smoke concentrations in neighboring provinces. The characteristics of spatial agglomeration are obvious.

3.2 Space measurement model and empirical analysis

Model Estimation

<table>
<thead>
<tr>
<th></th>
<th>Basic panel model</th>
<th>Space Lag Panel</th>
<th>Spatial error model</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>OLS Fixed</td>
<td>Random Fixed</td>
<td>Random Fixed</td>
</tr>
<tr>
<td>( \rho )</td>
<td></td>
<td>0.352*** (0.0000)</td>
<td>0.344*** (0.0000)</td>
</tr>
<tr>
<td>( \lambda )</td>
<td></td>
<td>0.347*** (0.000)</td>
<td>0.347*** (0.000)</td>
</tr>
<tr>
<td>( C )</td>
<td>53.66** (0.044)</td>
<td>66.324* (0.051)</td>
<td>112.76*** (0.002)</td>
</tr>
<tr>
<td>lnMN_t</td>
<td>13.40** (0.03)</td>
<td>-3.688** (0.685)</td>
<td>-1.467 (0.862)</td>
</tr>
<tr>
<td>ln(MN_t)^2</td>
<td>-0.66* (0.702)</td>
<td>0.2001 (0.983)</td>
<td>0.109 (0.823)</td>
</tr>
</tbody>
</table>
Then by the Hausdorff space test, the Hausman test matlab program is set to reject the random effect when $P > 0.05$, select the fixed effect model. The result shows that the $P$ value of Hausman test is 0.9858, rejecting the null hypothesis and choosing the fixed effect model, so the optimal model is model 4. From the regression results of Model 4, it can be seen that the coefficient of private car ownership is positive and passes the 10% significance level test, indicating that private cars do have a positive impact on pollution. At present, the rapid increase in the number of cars in China has brought greater pressure on pollution prevention and control. The average annual rainfall coefficient of -0.0078 is negative but did not pass the significance test, indicating that the rainfall is not very obvious for alleviating the urban pollution. The coefficient of waste incineration is -0.0481, which shows that the incineration of waste can be Reduce the pollution of the atmosphere. The value of trash was 0.3440. The spatial spillover effect was particularly evident at 1% significance level, indicating that the spatial and temporal externalities of the pollutants in the region were transferred. The concentration of PM2.5 in the study subject Neighboring provinces and cities, the impact of PM2.5 concentration in the surrounding area for every 1% increase will cause the PM2.5 concentration in the region increased by 0.3440%. The main business income coefficient failed to pass the significant test. Indicating that the manufacturing industry as a whole will not have a significant impact on PM2.5 concentration, but also shows that the environmental Kuznets curve does not exist in the relationship between China's economic development and the environment, from the empirical results show that the concentration of PM2.5 smog haze The impact of industry development is small.

4 Summary

The spillover effect of haze pollution in China is particularly obvious. The spatial spillover effects of the three pollutant concentrations in the regression based on the geo-spatial distance weight matrix all pass the significance level test of 1%. In order to effectively control the concentration of pollutants and improve the quality of the environment, the most fundamental thing is to govern from the source, transform the mode of economic development, and change from extensive economic growth to intensive growth and from normal growth to comprehensive coordination. Therefore, the government should vigorously support the environment-friendly industries with high technological content and low energy consumption, abandon the industries that consume high energy and pollute the environment, encourage the technological innovation activities of enterprises, formulate relevant laws and regulations, Protection of taxes and subsidies to achieve the best use of resources, reduce pollution damage to the environment. Due to the existence of space agglomeration and spillover effect, local governments should strengthen inter-regional coalition defense and joint consensus on the benefits between regions. Environmental governance in a single region may not be able to obtain the full benefits of regulation due to spillover effects. May become futile. Therefore, inter-regional cooperation should be strengthened to achieve common governance,
information sharing and joint warning mechanism. Local correlation test, to the regional overall planning, there is emphasis on regional governance haze. For the heavily polluted areas, regard them as the key areas under management and the eastern coastal areas with high pollution tendency as the sub-key areas and the relatively serious ones as warning zones, and give different emphasis to different levels of polluted areas. At the same time, the government should increase the proportion of clean energy and increase the development and utilization of nuclear energy, wind energy and solar energy.

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References