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ARTICLE

Evaluate the Value of Houses around the Garbage Transfer Station Based on CVM

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ABSTRACT

In recent years, with the rapid development of China's economy, a large number of people have flocked to the cities, which also brings more residential waste. The increased waste overloads transfer stations located near residential areas, and the continuous noise and odour affect the daily lives of nearby residents. In addition, the neighbourhood avoidance facilities represented by the waste transfer stations also reduce the value of the surrounding residents' houses. Therefore, using the conditional value method and the Tobit and Double Hurder econometric models, this article investigates the implicit value of the Fuli Resort neighbourhood under the influence of the waste transfer station through a questionnaire survey on the willingness of the residents to accept the compensation, which can be regarded as the "aversion value" of the neighbourhood due to the aversion to the waste transfer station and analyses the impact of the aversion value of the neighbourhood. aversion value" and analyses the impact on residents' willingness to accept compensation. The study found that the residents' willingness to accept compensation near the waste transfer station is 511.94 RMB/person/month, and the implicit value of the Fuli Resort neighbourhood under the influence of the waste transfer station in Qinhuai District, Nanjing, Jiangsu Province, China, is 147,950 RMB. The study found that residents are most interested in having the government rectify the waste transfer station and set sanitary standards and work norms.

Keywords: Refuse transfer station; House price; Invisible price; Conditional value method; Willingness to be compensated

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1. Introduction

"The refuse transfer station works from 5am and the noise prevents us from sleeping..." "The rubbish trucks come in and out, making the narrow road very congested..." "When summer comes, the unpleasant odour starts to spread, and everyone living in the neighbourhood can't open their windows for ventilation..." Such complaints can always be heard in the mouths of the residents near the refuse transfer station.

Refuse transfer stations are always unwelcome in cities because of the environmental impacts it brings, such as bad odour, bacteria, mosquitoes and environmental pollution. However, for cities of a certain size (e.g., the study case Nanjing, China), where the gathering of a large number of people generates a huge amount of domestic waste, a waste transfer station in the city can divert the pressure of transporting the waste to suburban landfills. Therefore, despite all the negative externalities of waste transfer stations, their establishment is still necessary. Under the combined effect of urbanisation and industrialisation, the regional economy is growing rapidly. However, along with the rapid growth of economic production, the imbalance between ecological protection and regional economic development has led to a series of problems. Among them, the treatment of municipal solid waste has become a major problem. In China, the amount of MSW has been increasing year by year from 133.92 million tonnes in 2008 [1] to 226.84 million tonnes in 2018 [2].

In the case study location of Nanjing, China, where an average of 66,533 people share one waste transfer station, and the local government has stipulated that one waste transfer station should be constructed for every 30,000-50,000 people, the reality is that the number of people using waste transfer stations far exceeds the stipulated maximum. This means that many waste transfer stations are working beyond their capacity. The overloaded work has caused the waste transfer stations to bring more life problems to the nearby residents, such as the noise lasts for a long time, and the rubbish can't be cleaned up in time and leaves a smell. According to statistics, the amount of rubbish in Nanjing is around 6,000 tonnes per day, however, the residents' living rubbish is still rising, which means that the pressure on the waste transfer station will not be reduced in the future, but will become heavier and heavier.

In order to avoid affecting people's normal working life and cause pollution of the urban environment, landfills and incineration plants are generally built far from the city, and the face of the growing and the base of such a large number of residents living in the rubbish if they are transported by different rubbish trucks to the landfill and incineration plant for the traffic will bring enormous pressure, many round trips to the transport will also result in a waste of fuel. Refuse transfer stations (RTSs) play an important role between waste collection and waste disposal in the community [3]. Establishing a certain number of waste transfer stations in a certain area makes it easier to manage the waste separately, which reduces the amount of waste to be disposed of at one time and makes it easier to manage. The presence of waste transfer stations reduces mosquito and fly infestation during long transport times, and small rubbish trucks transporting waste to the stations can reduce energy consumption, which protects the environment and reduces secondary pollution.

The establishment of waste transfer stations is one of the effective ways to solve the problem of large amounts of waste accumulation, but the selection of sites for waste transfer stations is still a difficult problem. The location of a refuse transfer station involves issues such as geographic location, the amount of waste produced, and traffic. In order to complete the transport of residential waste in a certain area within a short period of time, waste transfer stations are often built in residential areas [4]. Although there are relevant regulations that stipulate that nuisance behaviours should be avoided as much as possible during the process of waste collection and transportation, the presence of waste transfer stations still brings negative impacts to the surrounding residents. The most obvious perceptible impacts

are noise, odour and environmental pollution. It also means that waste transfer stations can have a negative impact on the value of adjacent land and above-ground buildings [5] Therefore, when planning and constructing a waste transfer station, residents tend to oppose the construction of a waste transfer station in order to protect the living environment and property values [6]. This resistance is often referred to as "neighbourhood avoidance syndrome" which is also interpreted as "not in my backyard". Neighbourhood avoidance syndrome increases the cost of urban planning and deepens the conflict between residents and local governments [7].

Apart from refuse transfer stations, public facilities such as wind power stations, landfills and even high-speed railway stations and highways are all known as neighbourhood facilities. According to studies by scholars, public facilities such as wind power stations, landfills, high-speed railways and highways, which involve air, water, soil, noise and visual scenery, affect the daily lives and property values of the neighbouring residents to a greater or lesser extent due to the threat of

pollution they may bring. This is also evidence that the presence of waste transfer stations does damage the property values of neighbouring residents.

Therefore, in order to minimise conflicts, the siting of neighbourhood facilities such as waste transfer stations needs to be more careful and social standards need to be set to regulate the working hours and workload of the facilities [8], in addition to financial compensation for residents affected by neighbourhood facilities is necessary, in addition to which some financial compensation for the surrounding residents affected by the neighbouring facilities is necessary.

This paper examines the impact of other public facilities with a neighbourhood effect, such as refuse transfer stations, on the surrounding property prices, as summarised by different scholars from 1990 to 2002. It is found that most scholars choose to use the characteristic price method to assess the real estate prices affected by the neighbourhood facilities, but the results of the characteristic price method only show the negative externality of the neighbourhood facilities and the inverse relationship between the distance and the range of the neighbourhood facilities and the value of the houses, which do not reflect the specific impact on the lives of the residents and the expression of the residents' willingness to be compensated. Therefore, this paper uses the conditional value method to measure the residents' willingness to be compensated, and calculates the "aversion value" of the residents to the waste transfer station by investigating the residents' willingness to be compensated for the impact of the waste transfer station. This "aversion value" will also be used as the discount value of the houses in the neighbourhood.

1.1 Objectives and Research Questions

Objective: What are the monetary compensation values that resident's are willing to accept as compensation for an urban refuse transfer station within their neighbourhood?

2. Literature Review

Firstly, I will study the public's attitude towards neighbourhood facilities from the definition of neighbourhood facilities, which will lead to the conclusion that waste transfer stations are a kind of neighbourhood facilities that have shown strong externalities in recent years with the construction of towns and cities. Then the negative externalities of waste transfer stations are reviewed, and the topic is directed to the fact that the negative externalities of waste transfer stations affect the daily life of the surrounding residents as well as the value of their properties. Finally, the conditional value approach is used to investigate residents' attitudes toward the waste transfer station and how much monetary compensation they would accept to accommodate the continued existence of the waste transfer station.

2.1 NIMBY facilities

The Oxford English Dictionary defines a NIMBY as an attitude of opposition in which people object to having something in their community that would harm their interests, even though it would benefit the community as a whole, while implying that they would not raise an objection if the situation occurred elsewhere [9]. Diekmann called people's opposition to NIMBY facilities the "volunteer dilemma" [10], that is, the majority of people can benefit from the collective good, but the interests of a small number of people will be harmed. Some scholars believe that NIMBY facilities refer to the facilities that are beneficial to most people but harmful to some people within a certain range (such as a community). Burningham argues that the concept of NIMBY is derogatory and devalues the actions of affected residents. Smith & Desvousges surveyed the residents of Boston and found that only a small proportion of people were willing to live near NIMBY facilities [11]. The data showed that 23%, 33% and 48% were willing to live near nuclear power plants, hazardous landfill sites or coal-fired power plants, respectively. Research has found that the amount of information the public knows will affect their cognition of NIMBY facilities. Better-informed residents are less likely to protest the construction of waste disposal facilities and more likely to participate in sustainable waste management [12]. The research on NIMBY is far more than that. Different scholars have conducted empirical case studies on hydropower stations [13], wind farms [14]and waste transfer stations.

2.2 Refuse transfer stations

Refuse transfer stations are a part of urban waste collection. Waste transfer stations are often located within cities, in areas where residents congregate. The purpose of a transfer station is to be a transport hub [15] that is responsible for collecting waste collected by scattered rubbish trucks in the city and sorting, compressing, and packing it before loading it into large rubbish trucks to be sent to waste treatment plants such as landfills and waste incineration plants that are far away from the city for final recycling, composting, incineration, or landfilling. The establishment of waste transfer stations can reduce the number of times waste trucks send waste to recycling stations, thus reducing fuel consumption, and at the same time reduce traffic congestion, air pollution and virus breeding during the waste transport process to make the whole process more environmentally friendly [16]. Therefore, waste transfer stations in cities are an important part of the MSW management system. However, in consideration of environmental and economic issues, waste transfer stations are usually located near residential areas, and the odour generated by long-time waste stacking and the noise generated by the work of rubbish trucks have become a nuisance to nearby residents.

Table 1. Value Composition of Houses in the Vicinity of the Refuse Transfer Station.

project	value composition	embody	value embodiment
The total value of the houses near the garbage transfer station	Aversion value'	The aversion value caused by the aversion of nearby residents to the garbage transfer station due to the disturbance of smell, noise, bacteria and mosquitoes.	Negative externality implicit value
	commodity value	The value of a house as a commodity that can be sold with useful value.	Commercial economic value

2.3 Externalities associated with waste transfer stations

Externalities often refer to the social and economic activities of one group of people that affect another group of people, where the market fails to take into account the extra costs or benefits generated by their impacts.Preez argued that all activities related to waste disposal have externality impacts, with the problems of traffic and odour emerging as the top issues raised by residents .

Although the advent of waste transfer stations has alleviated the pressure of sending waste to landfills, the constant influx of sporadic rubbish trucks into waste transfer stations located in residential and commercial areas can add to traffic congestion for surrounding residents.

There is a large body of literature documenting the externality impacts of waste transfer stations. These impacts include air quality, soil, water, litter spreading, and mosquito breeding. As a result, all other things being equal, houses close to waste transfer stations are less expensive than houses in other areas, and numerous scholars have calculated that for every square metre of house price closer to a waste transfer station there is a corresponding reduction in house price [17].

2.4 House prices under the influence of refuse transfer stations/landfills

Since waste transfer stations and landfills have similar negative externalities and there are fewer international studies on waste transfer stations, some scholars' literature on the assessment of house prices near landfills is referenced here.

Due to the special location of the waste transfer station (located near residential areas), it will have a strong externality impact on the surrounding residents, which has attracted more and more scholars' attention. The earliest studies started in Fort Wayne, Indiana, where Havlicek found that house prices were strongly correlated with the distance to the landfill, and that house prices increased by $0.61 for every foot away from the landfill. This finding has also been confirmed by arguments in subsequent years [18]

However, not all studies illustrate a significant correlation between distance to the landfill and house prices.When Gamble conducted hedonic value regressions of prices and distance to houses near landfills in Pennsylvania by year, the coefficients on distance showed no statistical significance at the 5% water rating and the coefficients on distance to the landfill were negative, which implies that the closer the landfill, the higher the house price. landfill the higher the house price. However, such a study was soon found to be problematic, as Reichert found that if the study area was narrowed and more evenly distributed, house prices closer to the landfill would be steadily lower than those further away from the landfill.

In addition to the study on the distance from landfills to houses and house prices, Lim and missios estimated the effect of landfill size and area of influence on house prices, and suggested that the size of landfills is also one of the factors affecting house prices.Ready confirmed the negative correlation between landfills and neighbourhood house prices by using empirical data on house prices at and around three North American landfills [19]. Ready confirms the negative correlation between landfills and nearby house prices through empirical data from three landfills in North America and the surrounding house prices, and calculates that large-capacity landfills bring an average 13.7% discount to the surrounding house prices, whereas small-scale landfills bring an average 2.7% discount to the surrounding house prices.

Research in the last decade has focused on changes in house prices within a certain radius of the landfill [20].Mei demonstrated the percentage impact of waste transfer stations on surrounding house prices. Almost all measurements of distance and house prices use the hedonic value approach to build regression models, the difference is only in the choice of regression model. Hedonic value assumes that houses are made up of a variety of features for human use, and distance to the landfill is included in the regression equation as a feature that affects price and thus the calculation.

In previous studies, numerous scholars have focused on the effect of the distance between the house and the landfill on house prices, but with the increase in rubbish, waste transfer stations have begun to be built in cities, and waste transfer stations exhibit similar externalities to landfills.Eshet used the characteristic price method to calculate the negative effect of waste transfer stations on house prices in Israel, and stated that that waste transfer stations

have a more tangible impact on the neighbourhood.

2.5 Conditional Value Method

Conditional value method is also called willingness survey method, this method needs to obtain information through interviews and assess the value of non-market resources by describing the preferences of respondents. By constructing a suitable hypothetical market, randomly selecting an associated group as a sample unit, and setting up associated hypothetical questions by means of a questionnaire, people are surveyed and asked about their preferences for the value of a certain public good or service, such as a resource and environment, by obtaining the respondent's willingness to pay for the improvement of the quality of the resource and environment or its protection (WTP) or the willingness to be compensated for the deterioration of the resource and environment (WTA) and covering the sample to the overall study, the average willingness to pay or willingness to be compensated was used to derive the overall economic benefit or loss as a measure of the economic value of the resource environment.

CVM is based on the principle of utility maximisation, through the construction of hypothetical markets to get people's willingness to pay and willingness to be compensated for non-market goods, and then to get the full value of non-market goods, especially the non-use value.CVM is based on the welfare economics of constant consumer utility, and is developed on the basis of the theory of compensatory change and equivalent change of welfare measures proposed by Hicks comes. The conditional value method takes full account of the impact of the environment on the surrounding residents in terms of property, psychology and living environment, and is a valuation method based on environmental costs.

Ciriary-Wantrup first proposed the conditional value method in his study of the externalities of soil erosion, but it did not receive much attention from academics, and then Davis drew on the conditional value method in his study of the recreational value of seaside forests. The U.S. Department of the Interior in 1986 identified the conditional value method as the basic method for calculating the "Comprehensive Environmental Reflections, Compensation and Liability Act" and established it as the basic method for evaluating the value of environmental resources and heritage. Conditional valuation is often used to assess facilities that have no market value, such as parks, wetlands, agricultural land, and historic buildings that have economic value but are difficult to measure in the marketplace. Currently, there are numerous methods used by academics to quantify and assess non-use values, the most common being the conditional value method.

In this paper, the conditional value method can be used to understand the real willingness and psychology of the residents living around the waste transfer station through questionnaires, and to assess the "aversion value" of the waste transfer station to the residents through the investigation of the amount of monetary compensation that the government is willing to accept to continue the work of the waste transfer station in this area. Through the "aversion value", we can calculate the hidden impact of the waste transfer station on the value of nearby houses, and thus assess the impact of the waste transfer station on the value of nearby houses.

3. Methodology

Economists believe that a commodity is made up of its explicit and implicit prices, the market price of a commodity is its explicit price, while the implicit price is made up of unseen brands, services and feelings. For houses, the surrounding environment, traffic and greenery are affecting the implicit price of houses. In this paper, we choose a combination of qualitative and quantitative methods to explore the implicit price impact of waste transfer stations on nearby houses. The qualitative study focuses on what kind of negative externality the waste transfer station brings to the nearby residents. The quantitative research is achieved by collecting residents' perceptions of the refuse transfer station and then through the conditional value method.

3.1 Data Collection Method

Conditional Value Method (CVM) is a valuation method based on environmental costs, and the damage caused by the waste transfer station to the value of the surrounding residents' homes is in line with the impact of the environment on property. On the other hand, although CVM reveals preferences by establishing a hypothetical market, its appraisal value is built on the subjective preferences of respondents, making the appraisal results obtained by using CVM may be affected due to the bias of its intrinsic factors, which leads to questioning the validity of its appraisal value. However, from the research experience at home and abroad, the possible bias factors are not brought about by CVM itself, and the existence of these biases does not lead to the invalidity of the method. In addition, the CVM is based on the residents' point of view for valuation, which can be used to collect the residents' ideas and feedback them to the government and related management personnel, so as to put forward more reasonable suggestions. Therefore, the conditional value method is suitable for evaluating the house price around the waste transfer station.

The conditional value method uses questionnaires to obtain data. A total of 300 questionnaires were distributed, and all 300 questionnaires are true and valid because the author conducted short interviews with 300 respondents in the form of one-on-one interviews in the in-depth research community and all the respondents cooperated positively.

The questionnaire consisted of three main parts: the first part collected socio-economic information about the respondents, including gender, age, occupation, education level and monthly income level; the second part investigated the respondents' future use of the house, including selling and continuing to live in the house; the third part asked the respondents about their willingness to be compensated for the impacts of the refuse transfer station on their houses, which is expressed as: how much they are willing to accept as monthly compensation continue to live next to the waste transfer station and how much price they are willing to pay to leave the waste transfer station.

3.2 Methodology

3.2.1 Conditional Value Method

The open-ended questionnaire method used in the preliminary pre-survey to obtain the amount of residents' willingness to compensate for the impact of the waste transfer station on the price of the house can not only get a reasonable price range with a small number of samples, but also understand what the residents really think and the reasons for refusing to compensate.

The conditional value method requires the following steps: designing a questionnaire, constructing a hypothetical market, obtaining the compensated amount, and calculating the average willingness to pay. And the WTP formula is used to calculate the final price of the study neighbourhood after being affected by the waste transfer station.

(1) Questionnaire design

The data acquisition of CVM comes from the questionnaire survey, and the key to the accuracy and effectiveness of the acquired data lies in the design of the questionnaire. In the preliminary design of the CVM questionnaire, firstly, we should determine the way to guide the willingness to pay, as well as the content and form of related questions; secondly, we should consider the comprehension and acceptance level of the respondents, and the expression of the content of the questionnaire should be simple and concise, so as to facilitate the understanding of the respondents, and the length of the questionnaire should be reasonable and appropriate, in order to prevent the boredom of respondents due to the content of the overloaded psychology.

(2) Constructing a hypothetical market

It is assumed that the government will compensate the residents of the waste transfer station.

(3) Obtaining the maximum payment amount and calculating the average willingness to be compensated

Analyse the questionnaire to obtain the different compensation amounts chosen by different residents, and calculate the average willingness to be

compensated.

3.2.2 Reasons for model selection

This paper uses stata software to select Tobit model and Double Hurder model to analyse the willingness to be compensated of the residents near the waste transfer station.The meaning of Tobit is to filter the critical value in the data, which can be used to filter the residents who are unwilling to accept compensation, i.e., the willingness to be compensated is zero in the data in the present study. Whereas the Probit model and Truncated combined with the Probit model is responsible for addressing why this sample was selected, the Truncated model addresses the fact that the occurrence of Y in the data is influenced by additional variables in addition to X.

3.2.3 Model Interpretation

Tobit model is used to analyse the factors affecting the willingness to be compensated of the residents near the refuse transfer station as a whole, considering the psychological activities of the residents near the refuse transfer station in terms of whether they are willing to accept the compensation and how much amount they are willing to accept the compensation. Since the factors influencing the willingness to pay may not be the same for different residents, the two problems are further analysed separately by using the Double Hurder model, which consists of a probit sub-model and a truncated sub-model, and the two sub-models correspond to two phases, respectively. The first stage is whether the residents near the waste transfer station are willing to accept the compensation (or whether they are willing to pay more to stay away from the waste transfer station), and this stage screens whether the residents are involved in the decision. The second stage is how much residents near the refuse transfer station are willing to accept compensation (or how much they are willing to pay to stay away from the refuse transfer station), which measures the residents' payment decision.

The specific calculation model is shown below:

$$E_i = \alpha \times F_i + \mu_i \quad \mu_i \in N(0,1)$$

$$y_i^* = \beta \times \chi_i + \varepsilon_i \quad \varepsilon_i \in (0, \delta^2)$$

$$y_i = \begin{cases} y_i^*, & y_i^* > 0 \\ 0 & \text{else} \end{cases}$$

$$y_i = \begin{cases} y_i^*, & y_i^* > 0 \text{ and } E_i > 0 \\ 0 & \text{else} \end{cases}$$

E_i is the observed value of the first-stage participation decision, indicating whether the ith interviewed resident near the refuse transfer station would like to be compensated for to continue living near the refuse transfer station; F_i is the factor influencing the participation decision of residents near the refuse transfer station; α is the parameter to be estimated; μ_i is the random error term. y_i^* is the observed value of the second-stage payment decision, which indicates the price of the compensation that the ith interviewed resident living near the refuse transfer station is willing to accept for continuing to live around the refuse transfer station; x_i is the factor influencing the acceptance of the compensation by the resident living near the refuse transfer station; β is the parameter to be estimated; ε_i is the random error terms. y_i is the value of compensation that residents living near the waste transfer station are actually willing to accept.

In the Tobit model, when it is $y_i^* > 0$, the variable in the model is also the price of compensation that residents are willing to accept ($y_i = y_i^*$) ; and when it is $y_i^* \leq 0$, $y_i^* = 0$, implying that the price of compensation makes sense when the price of compensation is greater than zero. In the Probit sub-model of the Double Hurder model, when residents are willing to accept the compensation $E_i = 1$; when residents are not willing to accept the compensation $E_i = 0$. After screening whether they are willing to accept the compensation or not, the Truncated sub-model can analyse the amount of willingness to accept the compensation. When $E_i > 0$, $y_i = y_i^*$; $E_i < 0$ the situation is not accepted, that is, there is only the question of how much the compensation is if the residents are willing to accept the compensation.

3.3 Analytical framework

I will analyse the selected case from the following

perspectives:

Firstly an introduction to the research case is carried out to analyse the case selection criteria.

Secondly, the questionnaire statistics are carried out.

Then the conditional value method is used to sort out the data from the questionnaire to calculate the WTP of the residents, and according to the WTP formula to measure the price of the study area.

Then we use stata software to carry out the regression analysis of Tobit model and Double Hurdle model to study the influence of gender, age, education level, family income, occupation and so on on the willingness to pay.

Finally, the conditional value method was used to calculate the compensation price as the invisible price of the houses affected by the waste transfer station, that is, the discounted price of the houses receiving the impact of the waste transfer station.

4. Introduction to the case studies

4.1 Case selection criteria

Since a study on house prices needs a specific object, I will select a representative house affected by the waste transfer station as my research object.

In this study, the Fuli Shanzhuang neighbourhood in Qinhuai District, Nanjing, China, which is close to the waste transfer station, is selected to assess the implicit price of the neighbourhood as affected by the waste transfer station.

4.2 Possible Bias and Handling Strategy

CVM is an assessment method based on hypothetical markets, and there will be more or less bias in the assessment process. Therefore, relevant measures should be taken in the design of the questionnaire and the implementation of the survey to avoid or reduce the impact of CVM bias on the results. The possible biases in this CVM study and the strategies for dealing with the biases are shown in **Table 2**.

5. Results

5.1 Contingent value method calculations

According to the results of statistical processing, interviewing 300 people around the waste transfer station, tobit model screening is not willing to accept the compensation of a total of 11 people, the willingness to be compensated is 147,950 yuan, the average value is 511.94 yuan, see it in **table 4**.

Table 2. possible deviations and solution strategy.

Deviation Type	Treatment Strategy
Compensated value deviation	Explain to interviewees how much they would be compensated each month for continuing to live near the garbage transfer station or how much they would be willing to pay each month not to live near the garbage transfer station.
Sample deviation	The survey samples were randomly selected. The survey dates included working days, the end of weeks and holidays, and the time periods were selected as morning, morning, noon, afternoon and evening respectively.
Survey method deviation	Conduct research in the form of one-to-one interview.

Table 3. Table of gender, education, occupation, income of respondents.

Table of gender, education, occupation, income of respondents							
serial number	**1**	**2**	**3**	**4**	**5**	**6**	**7**
sex	male	female					
education	Junior high school and below	Senior High School	three-year college	undergraduate	Postgraduate and above		
occupation	student	Jobless (unemployed, laid off, retired)	profession	Business units (state-owned enterprises, private enterprises)	Institutions (education, science, culture, health)	a private firm (PRC)	Government servants, military personnel
year_income	Under 5w	5-10w	10-15w	15-20w	20w or more		

Table 4. Statistical table of the results of the survey on the wishes of the population.

Statistical table of the results of the survey on the wishes of the population				
	sex	**education**	**occupation**	**year_income**
	WTP	**WTP**	**WTP**	**WTP**
0	69350			
1	78600	29700	900	49300
2		40150	56250	23650
3		32500	8700	43300
4		39000	36800	27700
5		6600	28400	4000
6			12100	
7			4800	

The results of the above willingness to accept compensation were converted into the implicit price of the Fuli Hills neighbourhood as follows:

The total willingness to accept compensation is 147,950 yuan, the number of people surveyed is 300, of which the number of people who do not accept compensation is 11, the plot was built in August 2000, according to the national regulations of the civil residential tenure of 70 years, according to the current year (2023) has been 23 years, the plot has a total of 1,675 families living in the plot, the plot's total land area is 100,000 square metres. The average household willingness to be compensated for the whole district is converted into square metres of 4836.29718 yuan/square metre.

The calculation formula is:

$$\text{Hidden price}=\frac{\text{Summarize the willingness to be compensated}}{\text{(Total number of people investigated} - \text{Number of people not willing to accept compensation)}}\times \text{Remaining life of house} \times 12 \text{ months a year} \times \text{Number of residential units}=\frac{147950}{(300-11)}\times(70-23)\times 12\times 1675=483629718 \text{ 元。}$$

$$\text{Implicit price per unit}=\frac{\text{Hidden price}}{\textit{Total floor area of the house}}=\frac{483629718}{100000}=4836.29718 \text{ 元}/m^2\text{。}$$

In this paper, the non-market value of the house around the waste transfer station (i.e., the hidden value of the house) is investigated using the conditional value method in the Fuli Resort neighbourhood of Qinhuai District, Nanjing as an example. By analysing 300 valid questionnaires, the aversion value of the house was measured using the willingness of the residents near the waste transfer station to accept compensation. The results of the measurement were the willingness of residents near the waste transfer station to accept compensation: 511.94 per person, the total aversion value of the waste transfer station for the nearby residents interviewed was 147,950, and the non-market value of the house per unit of area was 4,836.29718 per m^2.

This paper proposes for the first time that residents' willingness to accept government compensation for living in the vicinity of a waste transfer station is used as the hidden value of a house to calculate the discounted value of a house by taking the "aversion value" of a waste transfer station as the implicit value of a house.

5.2 Stata regression results

The Tobit model was set to take the limit of 0 on the left hand side, and 11 out of 300 respondents were screened who chose to accept the compensation price of 0 yuan. Eight of them did not accept the compensation because they were not willing to live around the waste transfer station for any amount of compensation. two of them did not accept the compensation because they demanded the government to introduce the operating standards and hygiene standards of the waste transfer station and act according to the standards, and they did not accept the compensation in the form of compensation. Finally only 1 person understands the important role of the waste transfer station in the city and believes that there is always someone who has to live around the waste transfer station and that he/she can sacrifice his/her standard of living to live around the waste transfer station.

Table 5. Tobit regression.

compensation	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
gender	29.434	48.164	0.61	.542	-65.354	124.222	
age	-4.252	1.916	-2.22	.027	-8.022	-.482	**
education	-29.629	31.655	-0.94	.35	-91.928	32.67	
occupation	-43.9	24.303	-1.81	.072	-91.73	3.93	*
yearly_income	84.116	36.175	2.33	.021	12.922	155.31	**
Constant	728.877	206.093	3.54	0	323.279	1134.476	***
var(e.compensation)	165289.7	13495.847	.b	.b	140753.49	194103.07	

Mean dependent var	493.167	SD dependent var	417.584
Pseudo r-squared	0.003	Number of obs	300.000
Chi-square	15.053	Prob > chi2	0.010
Akaike crit. (AIC)	4470.000	Bayesian crit. (BIC)	4495.926

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

Limits: Lower=0 Left-censored = 11

Upper = +inf Right-censored = 0

As can be seen through Table 2, the results based on the Tobit model (which includes both participation and payment decisions) show age and annual income to be significant at the 5 per cent level, and occupation to be significant at the 10 per cent level. The coefficients of age, education and occupation are negative, indicating a significant negative correlation between the willingness to be compensated for age and occupation of the residents near the waste transfer station. The coefficient of annual income is positive, showing a positive relationship with willingness to be compensated. Gender and education show insignificant relationship with willingness to be compensated. In summary, the younger the age and the higher the annual income the higher the amount of money residents want to be compensated.

As can be seen through Table 3, the results based on the Probit model show that age and annual income are significant at the 5 per cent level, and occupation is significant at the 10 per cent level. The coefficients of age, education and occupation are negative, indicating that the willingness to be compensated for age and occupation of the people living near the waste transfer station shows a significant negative correlation. The coefficient of annual income is positive, showing a positive relationship with willingness to be compensated. Gender and education show insignificant relationship with willingness to be compensated. In summary, the younger the age and the higher the annual income, the higher the amount of compensation the residents want to receive.The estimation results of the Probit model and the results of the Tobit model show a high degree of consistency.

As can be seen through Table 7, according to the results of the Truncated model shows that gender, age, education, and occupational yearly income all exhibit a non-significant correlation with the willingness to be compensated conclusion.

In summary, the results of the Tobit model regression and the Probit model regression show a high degree of agreement, while the results of the Truncated model show a large deviation, so the results of the former two prevail. It is concluded that the younger the age and the higher the annual income, the higher the amount of compensation residents wish to receive.

Table 6. Probit regression.

compensation	Coef.	St.Err.	t-value	p-value	[95% Conf	Interval]	Sig
gender	29.434	48.652	0.60	.546	-66.317	125.185	
age	-4.252	1.93	-2.20	.029	-8.060	-.444	**
education	-29.629	31.976	-0.93	.355	-92.561	32.30	
occupation	-43.9	24.550	-1.79	.075	-92.216	4.41	*
yearly_income	84.116	36.642	2.30	.022	12.198	156.03	**
Constant	728.877	206.185	3.50	0.001	319.155	1138.599	
Number of obs	0.010		F(5,294)	3.03			
Prob > chi2	0.0111		R-squared	0.0489			
Adj R-squared	0.0328		Root MSE	410.69			
*** p<.01, ** p<.05, * p<.1							

Table 7. Truncated regression.

compensation	Coef.	St.Err.	z-value	p-value	[95% Conf	Interval]	Sig
gender	0.6150	0.2963	0.21	0.836	-0.5193	0.6422	
age	0.0127	0.010	1.19	0.235	-0.0083	0.0338	
education	0.1329	0.1865	0.71	0.476	-0.4944	0.4986	
occupation	-0.2412	0.1291	-1.87	0.062	-0.2133	0.1195	
yearly_income	0.2076	0.2148	0.97	0.334	-0.2133	0.6287	
Constant	1.1229	1.1267	1.00	0.319	-1.0855	3.3313	
Number of obs	300.000		LR chi2(5)	6.84			
Prob > chi2	0.2325		Pseudo R2	0.2325			
*** p<.01, ** p<.05, * p<.1							

The research in this paper not only helps to enhance the understanding and affirmation of the hidden price of housing, but also provides a reference for the Nanjing Municipal Government in Jiangsu Province, China, to provide a mechanism for compensating residents whose housing value has been damaged by neighbourhood avoidance facilities. Therefore, the Nanjing Municipal Government in Jiangsu Province, China, should regulate the daily operation of neighbourhood facilities based on the impact of neighbourhood facilities on residents' assets, such as setting up daily work norms for waste transfer stations, limiting working hours, setting up strict hygiene standards, and establishing a relevant monitoring mechanism to safeguard the quality of residents' daily lives and property values.

6. Discussion

6.1 Discussion of existing literature

I have shown that the Conditional Value Method can achieve the price discount value of a waste transfer station to the surrounding houses by calculating the willingness of the neighbourhood residents to accept the compensation. Using the conditional value method, I have shown that the depreciated value of the houses affected by the waste transfer station can be more clearly demonstrated by the "aversion" of the residents. Comparing the results of this paper with the transaction prices of the same house types in the neighbourhoods near the refuse transfer station and the neighbourhoods not near the refuse transfer station on the second-hand trading website, the price difference is around

5,000 yuan, which is similar to the 4,836.29718 yuan derived from this study, which is in line with the real situation, and the study is valid.

In the past studies, scholars focus on landfills, only Eshet and others focus on the negative externalities of the waste transfer station and its impact radius. This study enriches the relevant literature studies on waste transfer stations, while using the conditional value approach to assess the discounted value of houses affected by waste transfer stations by analysing the willingness of nearby residents to accept compensation. While many scholars use the hedonic value method to assess the house prices around the landfill, the more innovative conditional value method is chosen, which is introduced for the first time into the research of valuing commodities with commodity value, and the concept of hidden value is proposed, which connects well with the non-market value of commodities with commodity value. The study provides a reference for the conditional value method to assess the non-market value of commodities with market value.

7. Conclusion

7.1 Conclusion

The study found that the residents' willingness to accept compensation near the waste transfer station is 511.94 RMB/person/month, and the implicit value of the Fuli Resort neighbourhood under the influence of the waste transfer station in Qinhuai District, Nanjing, Jiangsu Province, China, is 147,950 RMB. The study found that residents are most interested in having the government rectify the waste transfer station and set sanitary standards and work norms.

7.2 Limitations of the Study

The limitation of this study is that the sample size of the quantitative study is small, only 300, and the interviews were only conducted with residents of one neighbourhood in Nanjing, China. In the future, the scope of the study should be expanded by interviewing residents of multiple neighbourhoods affected by the waste transfer station and expanding the sample data to interview at least 1/3 of the residents of the neighbourhood so that the residents' opinions are representative.

In addition to this, the conditional value method only assesses the non-market value, whereas real estate has a market value. It would be more convincing to include some assessment of the market value on the basis of the conditional value method.

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