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CONCERN OVER PROPERTY VALUE: WILL THE SITTING OF PETROCHEMICAL HUB INFLUENCING HOUSING PRICE?

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Abstract

Malaysia is a major exporter for petrochemical products. In line with this, the petrochemical industry is experiencing continuous growth and expansion. This study intends to examine the effect of the establishment of petrochemical hub on nearby housing price. Using residential transaction data of year 2016-2022 nearby Gebeng Industrial Area, we analyse the effect of the sitting of petrochemical hub via hedonic models. Our result indicates that the sitting of petrochemical hub will influence the housing price in which those located nearby will experience higher appreciation in property prices. This study is essential in clearing the doubt that housing price will be negatively influenced by petrochemical hub. Our findings further indicate that there is a need to educate local residents on the impact of the industry cluster on their house, in mitigating local opposition due to concern over declination of housing price due to the sitting of petrochemical hub.

Keywords: Chemical Industry; Housing Price; Hedonic Model; Residential Transaction

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INTRODUCTION

The petrochemical industry is an important and strategic sector for Malaysia economic development. Essentially, the availability of feedstock at competitive price has positioned Malaysia as an important petrochemical hub in the Southeast Asia region. In total, there are six important petrochemical industry zones in Malaysia that attracted almost RM33 billions of investments in year 2018 (MIDA, 2020). These petrochemical zones are Kertih (state of Terengganu), Gebeng (state of Pahang), Tanjung Langsat, Pasir Gudang (state of Johor), Pengerang Integrated Petrochemical Complex (state of Johor), Bintulu (wilayah of Sarawak) and Spitang Oil and Gas Industrial Park (wilayah of Sabah).

Nevertheless, petrochemical facilities can be regarded as a negative externality that will affecting housing price, predominantly due to its production nature which generating significant amount of wastewater, air pollutant, toxic and hazardous waste, as well as odour and noise pollution (eg. Axelsson et al., 2013; Jain et al., 2020; Jia et al., 2021; Boonhat et al., 2022). Such externalities not only having adverse environmental impacts on the neighbourhood, but concern over health issues has invited disputes on the siting of the petrochemical hub in which it is argued that these externalities have driven residents and potential migrants away from the vicinity, thus, contributing to the decline in property value. Despite the abovementioned externalities, it is worth mentioning that unpleasant scenic view that is potentially associated with the industry site is contributing to the decrease in property value (Damigos and Anyfantis, 2011). Ironically, contaminated industry site will negatively affect the selling price of nearby industrial properties (Tonin and Turvani, 2014).

In order to examining and quantifying the impact of negative externalities associated with the operation of industry facilities, previous studies had employed, predominantly, hedonic modelling in estimating the externalities of industry site and hazardous facilities on housing price. De Vor and De Groot (2011) employed hedonic pricing model in estimating the effect of industry site on housing value. They referred distance as a proxy to quantify the negative externalities associated with the siting of industry site. Their study found that housing price rise with increasing distance from industry site located at the Randstad region and the Province of North-Brabant, Netherlands. An approximately 14.9% less in housing price being noticed for residential units located within 250 meters close to industrial site compared those located beyond 2,250 meters away.

In capitalizing pollution cost, Goodwin et al. (2021) reported a 1.3% decrease in housing value in Mexico City for every 10% increment in air pollution. Similarly, for every 10% increase in PM_{2.5} concentration, there will be 2.4% decrease in housing price observed in Chinese cities (Chen and Jin, 2019). While interpreted in numerical figure, Chen and Chen (2017) reported a loss of CN¥46 per square meter, which will eventually contribute to a total of CN¥520

billion loss. This figure is estimated to be equivalent to 1% of China's gross domestic product. A more recent study by Tsai (2022) also reported similar findings. He found that there is a 25% drop in value for houses located within 15km from thermal power plant at Central Taiwan. The impact was greater for houses with high housing cost.

In Malaysia context, Azmi et al. (2012) revealed a potential negative correlation between the Malaysia Housing Index and Air Quality Index. Ling et al. (2020) had attributed negative relationship between the concentration of industrial land use and air quality. Their result further confirms the negative externalities needed to be capitalised into housing cost. Extended to the specific effect of industry site on housing price discussion, Azmee and Osmadi (2018) found that while there is an increase in house price recorded after the opening of Lynas plat at Gebeng Industry Area, the increment potential maybe limited as those housing estates located far away is experiencing higher increment in housing value. Similar findings were observed by Karunzaman et al. (2019) in Pasir Gudang, Johor. As a consequence, this may further lead to a drop in demand towards housing nearby industrial site (Yassin et al., 2021). Nevertheless, industry site located within urban area may have a positive effect on the property value (Jie and Burhan, 2020).

This study is expected to contribute to the discussion on the impact of industry site on housing market, from the perspective of petrochemical hub. It aims to examine the negative externalities of petrochemical hub on nearby residential units via the application of hedonic pricing model. In line with previous studies, distance between the residential unit and petrochemical hub will be referred as the proxy that capture the negative externalities with the assumption that residential units that are closer to the petrochemical hub will likely to experience the negative externalities than those located far away. On top of that, this study is unique as it is among the first that will capture the effect of distance between residential unit and city central in controlling for the trade-off effect of decay housing price (i.e., between distance and petrochemical hub) and increment of housing price due to closer to city central while located away from the petrochemical hub.

The subsequent will be arranged in sections. The study context and methodology employed in this study will be explained in research method section, followed by the findings presentation and discussion before it reaches to the conclusion.

RESEARCH METHOD

Study Area

Located at Gebeng, Pahang, Gebeng Industry Area was clustered as a petrochemical hub and had been established since 23 April 1997. It is covering an area of 7,357 acres which were developed via four phases. Among others,

Descriptive Statistic

This study utilising residential units’ transaction data of the year 2016-2022 located nearby Gebeng Industry Area in estimating the impact of the petrochemical hub on housing price. It has been summarised in Table 1.

Table 1: Descriptive Statistic of Selected Residential Units

Variable	N	Mean	Max	Min	Std
Price_In	524	12.252	13.998	10.7144178	0.427
L_Area_In	524	7.381	8.554	6.55058021	0.409
N_Storey	524	1.147	2.000	1	0.354
Semi-D*	524	0.107	1.000	0	0.309
Semi-D_Low*	524	0.095	1.000	0	0.294
Terrace_H*	524	0.594	1.000	0	0.492
Y_2017**	524	0.103	1.000	0	0.304
Y_2018**	524	0.153	1.000	0	0.360
Y_2019**	524	0.267	1.000	0	0.443
Y_2020**	524	0.225	1.000	0	0.418
Y_2021**	524	0.233	1.000	0	0.423
D_Gebeng	524	7.700	35.100	4.47	5.762
D_Kuantan	524	14.912	18.460	1.6	2.422

*Note: Price_In=House price in logarithm form; L_Area_In = Land area of a residential uni in logarithm form; N_Storey =Number of storeys for a residential unit; Semi-D = Typical Semi-Detached House; Semi-D_Low = Low Cost Semi-Detached House; Terrace H= Typical Terrace House; Y_2017-Y_2021 = Transacted residential units for year 2017, 2018, 2019, 2020, and 2021;D_Gebeng= Distance between residential units and Gebeng Industry Area in Kilometres (km) ; D_Kuantan= Distance between residential units and Kuantan City Centre in Kilometres (km); *Low cost terrace house and ** Year 2016 act as base dummy for its group respectively.*

Table 1 depicts the descriptive statistic of selected residential units. Generally, these are the variables that used to assess the impact of petrochemical hub on the surrounding residential units. The composition of residential units consists of low cost terrace, semi-detached house, low cost semi-detached house which ranged from one floor to 2 floors. The transacted period is ranged from year 2016 until 2021. Most of the transactions were contributed in year 2019, 2020 and 2021. There are two areas have been identified in this study namely Gebeng Industrial area and Kuantan City Centre. Both areas play significant role in supporting the economic activities in Pahang state. The distance for the residential units to access Gebeng Industrial area and Kuantan City Centre is ranged from 4.47km – 35.10km and 1.6km-18.46 km respectively.

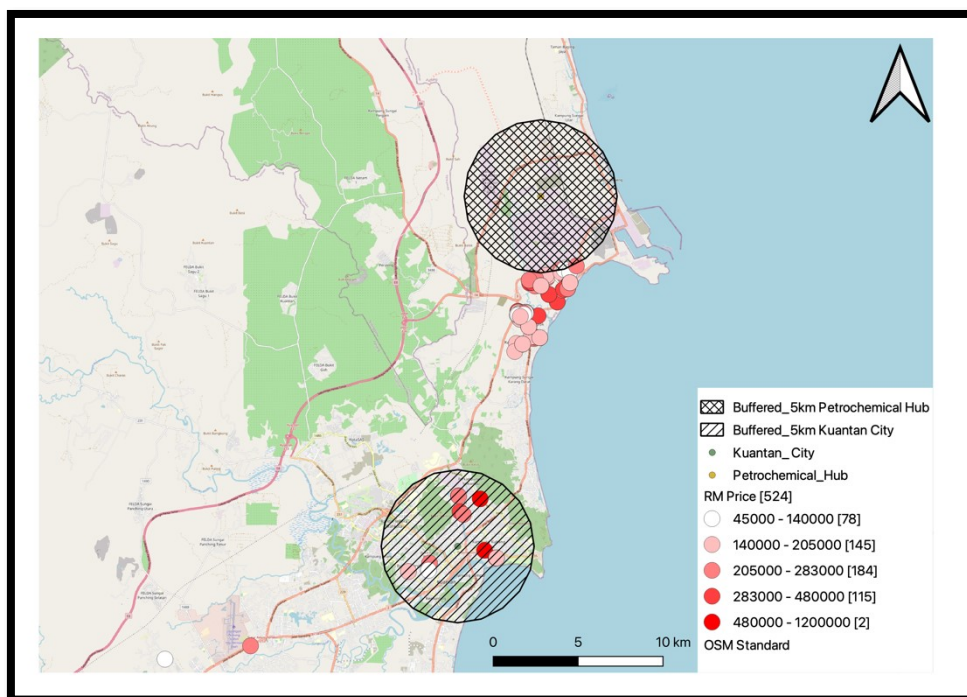


Figure 2: Distribution of Residential Units for Year 2016 - 2022

As indicated in Figure 2, beside the proximity distance between residential unit and the petrochemical hub, this study is unique as it is among the first that will capture the effect of distance between residential unit and city central in controlling for the trade-off effect of decay housing price (i.e., between distance and petrochemical hub) and increment of housing price due to closer to city central while located away from the petrochemical hub.

Ordinary Least Square Model

Additionally, this section will reveal the research methodology that used to assess the impact of petrochemical hub on residential property price. This study has adopted Ordinary Least Square (OLS) Model to compute the marginal contribution of each variable on property price. As claimed by Rosen (2019), a hedonic model can be utilised to examine the implicit value of the variables. Thus, a hedonic model is formed to achieve to the objective of this study as follows:

$$\text{Price_ln}_{it} = \alpha + \beta_1 L_Area_ln_{it} + \beta_2 N_Storey_{it} + \beta_3 \text{Semi-D}_{it} + \beta_4 \text{Semi-D_Low}_{it} + \beta_5 \text{Terrace_H}_{it} + \beta_6 Y_2017_{it} + \beta_7 Y_2018_{it} + \beta_8 Y_2019_{it} + \beta_9 Y_2020_{it} + \beta_{10} Y_2021_{it} + \beta_{11} D_Gebeng_{it} + \beta_{12} D_Kuantan_{it} + \varepsilon_{it} \text{---Equation (1)}$$

The dependent variable of the model is represented by residential price in logarithm form. It is regressed on the independent variables such as L_Area_ln, N_Storey, Semi-D, Semi-D_Low, Terrace_H, Y_2017, Y_2018, Y_2019, Y_2020, Y_2021, D_Gebeng and D_Kuantan. The coefficient of each variable is indicated by $\beta_1 - \beta_{13}$. The positive sign of coefficient shows a positive relationship between residential price and the variables or vice versa. Both α and ε_{it} are constant and error term of the model.

FINDINGS

The quality of neighbour is one of major factors to be considered for home purchased. The disposal of hazardous chemical products without proper process from petrochemical hub could affect the public health. Generally, the concern over the health will hinder people from buying residential properties in the vicinity of petrochemical hub. Subsequently, these properties might be sold at discounted price. To conclude the general assumptions, the output of regression model based on equation 1 has been computed as follows:

Table 2: Output of Regression Model

Variables	Coefficient	Std Error	t-value	p-value	Expected Sign
L_Area_ln	0.4734	0.035	13.414	0.000	+
N_Storey	0.3298	0.033	9.907	0.000	+
Semi-D*	0.3853	0.053	7.238	0.000	+
Semi-D_Low*	-0.3423	0.043	-8.029	0.000	+
Terrace_H*	0.2457	0.030	8.221	0.000	-/+
Y_2017**	0.5391	0.079	6.853	0.000	-/+
Y_2018**	0.5328	0.076	7.035	0.000	-/+
Y_2019**	0.6094	0.074	8.285	0.000	-/+
Y_2020**	0.6268	0.074	8.467	0.000	-/+
Y_2021**	0.6612	0.074	8.887	0.000	-/+
D_Gebeng	-0.0155	0.002	-6.927	0.000	+
D_Kuantan	-0.0192	0.005	-4.248	0.000	-

Dependent Variable: Price_ln

Adjusted R-squared: 0.725

N=524

AIC: -68.21

BIC: -12.81

Note: Price_ln=House price in logarithm form; L_Area_ln = Land area of a residential uni in logarithm form; N_Storey =Number of storeys for a residential unit; Semi-D = Typical Semi-Detached House; Semi-D_Low = Low Cost Semi-Detached House; Terrace_H= Typical Terrace House; Y_2017-Y_2021 = Transacted residential units for year 2017, 2018, 2019, 2020, and 2021;D_Gebeng= Distance between residential units and Gebeng Industry Area in Kilometres (km) ; D_Kuantan= Distance between residential units and Kuantan City Centre in Kilometres (km); *Low cost terrace house and ** Year 2016 act as base dummy for its group respectively.

Table 2 had shown the output of regression model. The model is constructed based on 524 transacted data covering 2016 – 2022. Most of the variables are contributed significantly (p-value <0.05) to the residential prices. The influence on property prices for each variable is evaluated based on the sign of coefficient. In overall, there are two variables namely Semi-D_Low and D_Gebeng conflict with its expected coefficient sign. The base variable that used for property type is low cost terrace house. According to the normal scenario, low cost Semi-Detached house is more expensive than low cost terrace house. This is because Semi-Detached house occupied larger space and it has more privacy as compared to low cost house. However, the limitation in terms of sample size and information has hampered further investigation on this scenario.

Apart from that, D_Gebeng shows a negative coefficient or -0.0155. In other words, the residential price will be dropped 1.54% for every kilometre away from the petrochemical hub. In contrast to the previous studies by Tsai (2022) where he claimed that there is a 25% drop in value for houses located within 15km from thermal power plant at Central Taiwan. Nevertheless, this study supported by Jie and Burhan (2020), the industry site located within urban area may have a positive effect on the property value. Besides, the residential units which near to Kuantan City Centre exerted a higher price in accordance with Table 2 and the coefficient value for D_Kuantan is -0.0192. Therefore, the residential prices will be dropped -1.90% for every kilometre away from the Kuantan city. The result is reasonable because Kuantan city as a Central Business District (CBD) tends to give more impact on the residential prices. Gebeng industry area and Kuantan city played the important role in providing job opportunities to the public. Therefore, a proper management on petrochemical hub will not create worry among homebuyers when buying residential properties in the surrounding of Gebeng industry area

CONCLUSIONS

Our result indicates that the sitting of petrochemical hub will influence the housing price in which those located nearby will experience higher appreciation in property prices. This study is essential in clearing the doubt that housing price will be negatively influenced by petrochemical hub. Our findings further indicate that there is a need to educate local residents on the impact of the industry cluster on their house, in mitigating local opposition due to concern over declination of housing price due to the sitting of petrochemical hub.

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