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Modelling of property market: the structural and locational attributes towards Malaysian properties

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ABSTRACT

House acts as a basic shelter icon for all mankind. In recent years, property value has never stopped receiving attention in the market and has remained the topic of discussion and research on reputable property platforms and all around the world. Residential properties in Malaysia experienced significant appreciation in recent years and this creates anxiety among people. The real factors behind the tremendous rise of property prices in Malaysia however, are yet to be discovered. Structural and locational attributes are frequently discussed and have received uncountable attentions from the whole nation. This study intends to ascertain the factors affecting the property prices. The area of study comprised double storey terrace houses in Mukim Rawang, Selangor, Malaysia. Documentary analysis is conducted in this research with the real transaction data collected from JPPH. Using the regression analysis, various factors were included in the models to capture the particular effects on property values. In particular, built-up area is the most significant structural attribute; whereas shopping centre is the most significant locational attribute in determining the property prices. This paper serves as a guide for the developers and house buyers in decision-making for development and investments.

1. Introduction

Housing property is a multi-dimensional product. The property value is contributed by various factors and the ascertainment of these factors plays a significant role in property valuation (Ge & Du, 2007). Bello and Bello (2007) opined that the factors affecting property prices are normally classified into two broad categories which are the external and internal factors. These factors have either positive or negative effects on the property values.

The valuable characteristics that are grouped under internal factors are basically the structural attributes of the property. Numerous studies (Chiang, Peng, & Chang, 2015; Oloke, Simon, & Adesulu, 2013) have been carried out to examine the internal factors affecting property prices and they identified those as age of building, size, usable area, building materials, number of bedrooms/bathrooms, security services, parking space, building quality and appearance contribute to the property prices.

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Babawale and Adewunmi (2011) mentioned that the conception of externalities in real estate is that the external factors can either impose positive or negative effects on a property's value. External factors affecting property values can be grouped into; (1) economical attributes: such as housing loan and interest rate, inflation rate, real property gains tax, labour force, gross domestic product and household income (Khoiry, Tawil, Hamzah, Ani, & Sood, 2012; Ong, 2013); (2) locational attributes: accessibility and proximity to numerous (dis)amenities such as shopping centres, education institutions, public transportations, hospitals, forest, highways or treatment plants (Chiang et al., 2015; Luttik, 2000; Oloke et al., 2013); and/or (3) social attributes: such as population growth (Ong, 2013).

2. The Issue

The real factors causing the significant rise of property prices in Malaysia are still uncertain and they remain debatable (Moorthy & Jeronn, 2014). The National Property Information Centre (2014a) of Malaysia has reported that the local property market has been blooming in recent years. Moreover, the dramatic appreciation of property prices throughout the whole nation in recent years could also be seen from the house price index percentage change announced by the National Property Information Centre (2014b) as shown in Figure 1.

The reason behind the unreasonable hiking of property values in Malaysia is important as it has triggered the inaccessibility to housing (Aziz, Hanif, & Singaravello, 2011), resulting in an issue of concern as people fear that they cannot survive with such high property values (Moorthy & Jeronn, 2014). This scenario creates anxiety among people and the deficiency in affordable and passable housing has been identified as one of the most critical problems faced by Malaysia (Moorthy & Jeronn, 2014). Residential property market has been growing tremendously in the past 10 years and substantial price expansion can be seen throughout major cities and small towns in Malaysia (Moorthy & Jeronn, 2014). Many
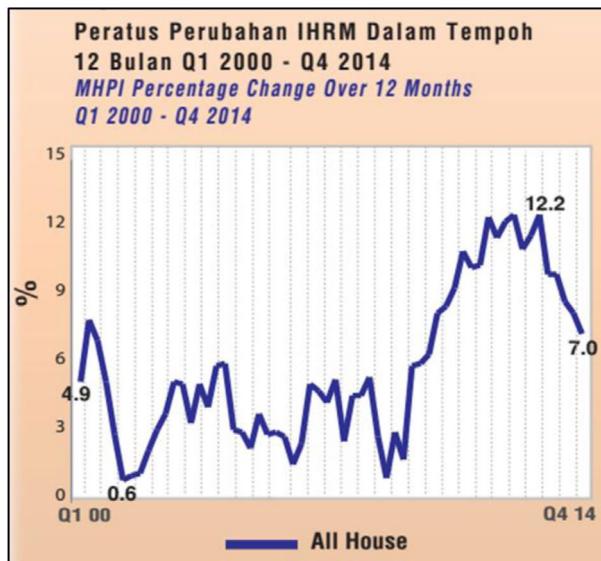
Figure 1. House Price Index percentage change from year 2000 to 2014 (National Property Information Centre, 2014b).

believe that residential property prices will never stop to swell, resulting in unaffordability particularly during the period prior to financial crisis (Hashim, 2010). Khoiry et al. (2012) claimed that the significant upsurge in terraced house pricing in urban areas in Malaysia recently is an apprehension.

Among the factors discussed earlier, structural and locational attributes are commonly related to property prices and frequently discussed in previous researches in different countries (Chau & Chin, 2002; Colwell, Gujral, & Coley, 1985; Owusu-ansah, 2012; Williams, 1990). These attributes are considered as the main determinants of housing prices as they exerted significant impact on property price variations (Khoiry et al., 2012; Tyrväinen & Miettinen, 2000). Hence, the relationship between the value of residential properties and the structural and locational attributes is critical to be established (Owusu-ansah, 2012).

While numerous researchers have studied various structural and locational attributes affecting the property prices, unfortunately the actual factors affecting the property prices in Malaysia are rarely discussed. Since the impact of the structural and locational attributes on property prices may vary at different geographical districts (Sirmans, Macpherson, & Zietz, 2005), there is a pressing need to conduct this research to discover the impact of these attributes on property prices in Malaysia as local publication on this issue was limited.

Hence, the paper aims to fill in the gaps by ascertaining the structural and locational factors affecting property prices in Mukim Rawang, Selangor, Malaysia. Rawang is chosen as the area of focus as properties in the particular area has been receiving non-stop attention from the property market in recent years due to the dramatic increase of property prices (Chee, 2013). The subject of study comprised all the double-storey terrace houses in Mukim Rawang as prices of residential properties especially terrace houses have experienced tremendous upsurge in the past few years and this has caused anxiety among people (Khoiry et al., 2012; Moorthy & Jeronn, 2014).

3. Literature review

Over the past decades, a significant number of theoretical and experimental studies have been focused on the factors affecting property values (Oloke et al., 2013; Pashardes & Savva, 2009). Particularly, the evaluation and measurement of the effects of numerous structural and locational attributes on housing prices have received extensive attentions from various parties (Iman, Hamidi, & Liew, 2009; Lansford & Jones, 1995; Reibel, Chernobai, & Carney, 2008).

3.1. Structural attributes

The structural attributes of the property are often discussed in literatures. As one would expect, the researches showed that the size of the house and number of bedrooms have positive impact on the property value (Owusu-ansah, 2012; Pashardes & Savva, 2009). The total area of house and of the land are expected to positively affect the property prices (Chiang et al., 2015; Iman et al., 2009; Reibel et al., 2008). Research undertaken by Babawale and Adewunmi (2011) showed that the number of bedrooms, followed by the number of bathrooms contributed the most to the house prices, whilst the analysis carried out by Oloke et al. (2013) had the same notion that the number and size of bedrooms and number of bathrooms are the dominant contribution to the property prices.

On the contrary, the building age, which implies the depreciation of the property structure, is expected to be a negative factor influencing house prices (Goodman & Thibodeau, 1995; Pashardes & Savva, 2009). Apart from that, research undertaken by Iman et al. (2009) has proved that the holding type of the properties is essential in determining the property prices. According to Ooi, Le, and Lee (2014), freehold properties which have a lease tenure of 999 years tend to command a higher premium compared to leasehold properties which have only a tenure of 99 years. Moreover, the condition of building is considered as one of the factors affecting property prices as well but the results were inconsistent. Research conducted by Lansford and Jones (1995) showed a reduction in value for houses in poorer condition. In opposition, Babawale and Adewunmi (2011) and Matthews (2006) found that building condition is not a significant factor in determining property values.

Besides, the literatures also showed other minor structural features affecting the property prices such as the availability of swimming pool and fire place, garage and parking space (Chiang et al., 2015; Forrest, Glen, & Ward, 1996; Oloke et al., 2013). Nonetheless, intangible characteristics such as designs, view and builders' reputations are often difficult to quantify and include in the estimation.

3.2. Locational attributes

Williams (1990) defined the three most significant features of a property as location, location and location. In other words, locational factor is found to be the prime determinant of property prices (Colwell et al., 1985). The impact of various locational attributes such as public transportation, highway, shopping centre, school, hospital and forest are discussed next.

First of all, the impact of public transportation on property values has always been documented in various studies. The public transportation is said to have both positive and negative proximity effects towards the housing price (Moorthy & Jeronn, 2014). In addition, Moorthy and Jeronn (2014) claimed that an increment of 3% to 40% in housing prices at different distances from the nearest station can be expected as public transportation eased traffic congestion and introduced more sidewalks. People are willing to pay the premium for houses in the vicinity of the stations as travelling time is saved, which this particular cost is often transferred to the extra cost in renting or buying a house (Kilpatrick, Throupe, Carruthers, & Krause, 2007). On the other side, negative effect may be exhibited as well due to problems such as noise pollution and privacy concerns. These negative externalities have exerted negative pressure on the values of the adjacent houses (Diaz, 1999).

The impact of the highway routes on residential properties is commonly asked and explored (Mark, 2013). Research finding by Reibel et al. (2008) showed that houses in Claremont, La Verne, San Dimas and Pomona which were located 0.4 miles from the local highway experienced faster price appreciation and were more expensive by $38,252 than houses located beside the highway as negative externalities such as air and noise pollutions (Nelson, 1982) will dominate the positive externalities for houses in very close vicinity of highway extension and led to a decline in housing prices; while the houses which were located 0.8 miles away from the highway experienced slower appreciation in value and were sold at approximately $18,811 cheaper than houses lying 0.4 miles away from the highway, this showed that the proximity effect was expected to decrease and eventually become zero for the houses which were at a further distance (Reibel et al., 2008). Research conducted by Waddell, Berry, and Hoch (1993) has supported the previous statement, where the authors

found that negative effects have been attributed to houses which are very close to the local amenities due to terrible traffic congestion, air (Chay & Greenstone, 1998), visual and noise pollutions, while the amenities located at the next range of distance are claimed to be beneficial, which indirectly diminishes the negative impacts and imposes a positive proximity effect to the housing prices.

Shopping centres being one of the locational attributes claimed to be one of the determinants of housing value (Basu & Thibodeau, 1998). There are, however, not many researches which have been undertaken to investigate this issue. Similar with other amenities, the shopping centre simultaneously generated repulsion as well as attraction effects (Rosiers, Lagana, Thériault, & Beaudoin, 1996): while the former stems from negative factors such as noise and air pollutions, and traffic congestion, the latter depends on good accessibility and improved convenience. Researches undertaken by Rosiers et al. (1996) in Quebec Urban Community have reached the conclusion that 5% premium is commanded by the properties surrounding shopping centres. This is agreed by Sale (2015) who postulated that the potential disamenities such as pollutions and traffic congestion are outweighed by the enhanced convenience and accessibility of being located adjacent to the shopping centre. On the contrary, positive distance–price relationship was found by Tse and Love (2000) between the distance from shopping centres and housing prices in Hong Kong. This study showed that accessibility and proximity to the shopping centre was not favourable and, therefore, housing prices grew when distance from shopping centre arose.

Besides, school claimed to have positive effects towards surrounding property prices (Black, 1999). Similar findings were observed by Chiang et al. (2015) where school exerted positive impact on proximate property values. Research undertaken by Mense and Kholodilin (2014) found that school was not a significant factor in the research possibly because school is a source of noise pollution. Conversely, Jud and Watts (1981) opined that school quality is a vital factor of residential housing values; the study showed that the increase in achievement level of the school tends to associate with a rise in the value of proximate houses.

In addition, research conducted by Chiang et al. (2015) showed that hospital was one of the locational factors which affects the property prices. It is found to exert positive impact to the surrounding properties where the properties adjacent to a hospital command higher premium. In addition, Yang and Sue (2011) have reached the same conclusion that hospital imposed positive impact on the housing prices.

Lastly, Tyrväinen and Miettinen (2000) have confirmed that the urban forest has value-increasing results on the proximate housing values. The findings by Irwin (2002) and Thorsnes (2002) were consistent with the previous studies in which positive impact was found on the suburban properties value surrounding the forested land.

4. Methodology

Housing prices are generally determined by the buyers' evaluation on a parcel of attributes. Each attribute is anticipated to be priced implicitly. Since the nature of influences on the property prices are heterogeneous and huge, the structural characteristics of the property themselves cannot solely determine the housing prices, and therefore, both structural and locational attributes are to be included in the regression analysis to ascertain their particular impacts exerted on property prices.

Table 1. List of independent variables employed in regression analysis.

Variables	Description
Structural Attributes	
Built-up area	Total built-up area of the house (in square metres)
Age of building	Age of the building (in years)
Holding type	Freehold = 1, leasehold = 0
Condition of building	Good = 1, otherwise = 0
Number of bedrooms	Number of bedrooms available in the building
Locational Attributes	
KTM	Distance to nearest KTM station (in metres)
Highway	Distance to nearest toll (in metres)
Shopping centre	Distance to nearest shopping centre (in metres)
School	Distance to nearest school (in metres)
Hospital	Distance to nearest hospital (in metres)
Forest	Distance to nearest forest (in metres)

Tse and Love (2000) have included various structural and locational attributes such as building area, age, shopping centre and sports centre in the study. These attributes are included in the regression analysis as independent variables to capture the particular impact of each attribute on housing prices. Apart from that, both structural and locational attributes were included in Matthews (2006)'s research as well where structural attributes such as area, age, number of bedrooms, structural condition and locational attributes such as hotel, hospital and school are included in the regression analysis as independent variables.

With references of previous researches, structural and locational attributes are selected to be included in this research as they are believed to be the main determinants of the housing prices. An aggregate of 11 relevant structural and locational attributes have made up the list of independent variables. Table 1 below depicts the variables employed in the regression analysis with their corresponding descriptions:

Documentary analysis was carried out in this study where real property transaction data were collected from Jabatan Penilaian Dan Perkhidmatan Harta (JPPH) in Malaysia. JPPH is a government agency which advises the Federal Government, State Government, Statutory Body and Local Authority in Malaysia on matters relating to the valuation of real estate and property services. The study area focuses on Mukim Rawang, which is located in the northern part of Selangor, Malaysia. Mukim Rawang is chosen as the property prices have experienced tremendous growth in recent years (Chee, 2013), yet the real factors behind the growth are uncertain. On top of that, the significant upsurge of double-storey terrace house price in Malaysia is an apprehension in recent years (Khoiry et al., 2012; Moorthy & Jeronn, 2014), therefore, all the double-storey terrace houses in Mukim Rawang comprised in the sample. Only the transaction data of 2014 are selected for this study in order to preclude the time effects of the transaction value. JPPH Gombak was selected among the other JPPHs considering that it is accountable for the housing transaction data in Mukim Rawang. Visitation to JPPH Gombak is carried out upon the confirmation of study area and period for approval of data collection. After the collection and collation of data, the variables to be included in the analysis are identified and operationalized. Structural attributes are identified accordingly by reviewing valuation report from JPPH, while locational attributes are drawn from Google Earth.

In this study, the exact location of the subject buildings are determined by Google Earth for the measurement of distance from the local amenities. On the contrary, for the subject

buildings whose locations couldn't be identified on map, visitation to the subject building is required. Once the location of all the subject buildings are recognized, the straight-line distance of the subject building from the outer boundary of each particular amenities are measured using the "ruler" function in Google Earth (Sirpal, 1994). All the data collected including the secondary data obtained from valuation report from JPPH and primary data obtained using Google Earth and visitation are included in the regression analysis which will be further discussed.

The structural attributes identified from the valuation report and the distance of each amenities from the subject properties are captured to be included as independent variables in the regression analysis to establish the relationship between these attributes and housing prices.

Quantitative data analysis is employed by this research, where frequency analysis and regression analysis are the most suitable approaches to analyse the data for this research. Stepwise multiple regression analysis is conducted using SPSS, which allows the system to automatically select the particular variable and the order to be included in the model from the independent variables list based on the descending importance level of each variable in predicting the property prices (Pallant, 2005).

The regression model shall be specified as follow:

$$Y_i = \beta_0 + \sum \beta_i X_i + \varepsilon_i (i = 1 \sim 8) \tag{1}$$

where Y_i represents the predicted property price for observation i and X_i represents the value of factor for observation i; β_0 is regression intercept or constant, β_1 is regression slope and ε_i is random error term (Iman et al., 2009; Makinde & Tokunboh, 2013).

The common statistics such as R^2, unstandardized coefficients (B) and Sig. associated with the analysis are generated through multiple regression analysis. R^2 generally evaluates the closeness of relationship and signifies the contribution of independent variables towards the variation in dependent variable, where $0 \leq R^2 \leq 1$. A low R^2 value indicates that the particular model is not significant in contributing to the dependent variable variations. In this research, R^2 is used instead of adjusted R^2 as the sample size has exceeded the minimum requirement. B indicates the impact of one unit change in the particular independent variable on the dependent variable, whereas Sig. represents the significance level of the variable (Pallant, 2005).

5. Findings

There were a total of 333 viable house sales transactions available in Mukim Rawang during year 2014. However, only 75% of the data are usable and can be included in the analysis. A total number of 83 housing data were removed from the sample due to certain incomplete data and the failure of identification of the exact location of subject building either through Google Earth or site visitation. After eliminating the unusable transaction data, 250 house sales transactions remained for the analysis.

Table 2 below shows the regression model summary generated from the stepwise multiple regression.

There were a total of eight models generated from the stepwise multiple regression, the model of interest in Table 2 is model 8, which comprised built-up area, shopping centre,

Table 2. Stepwise Regression Model Summary.

Model	R^2	Sig.	Durbin Watson
1	.401	.000	
2	.565	.000	
3	.613	.000	
4	.638	.000	
5	.645	.000	
6	.651	.000	
7	.659	.000	
8	.668	.000	
			1.510

Notes: 1. Predictors: (Constant), Built-up area; 2. Predictors: (Constant), Built-up area, Shopping centre; 3. Predictors: (Constant), Built-up area, Shopping centre, School; 4. Predictors: (Constant), Built-up area, Shopping centre, School, Age of building; 5. Predictors: (Constant), Built-up area, Shopping centre, School, Age of building, Holding type; 6. Predictors: (Constant), Built-up area, Shopping centre, School, Age of building, Holding type, Condition of building; 7. Predictors: (Constant), Built-up area, Shopping centre, School, Age of building, Holding type, Condition of building, Forest; 8. Predictors: (Constant), Built-up area, Shopping centre, School, Age of building, Holding type, Condition of building, Forest, Highway Dependent Variable: Price.

Table 3. Coefficients generated in model 8.

Model		B	t	Sig.
8	(Constant)	22536.070	.550	.583
	Built-up area	2392.764	10.204	.000
	Shopping centre	−23.941	−8.080	.000
	School	22.270	2.731	.007
	Age of building	−3038.717	−3.357	.001
	Holding type	23859.819	2.651	.009
	Condition of building	60792.654	2.382	.018
	Forest	−56.578	−3.163	.002
	Highway	11.446	2.630	.009

school, age of building, holding type, condition of building, and forest and highway. The R^2 of model 8 is 0.668, which is the highest value among all the models. This shows that 66.8% of the variance in property prices are explained by model 8; whereas the remaining 33.2% are explained by other unknown factors. The Sig. for all the 8 models are 0.000, and Durbin Watson for all the models is 1.510.

The coefficients of each variable in model 8 have been tabulated in Table 3 below, which includes the unstandardized coefficients (B), t and Sig.

Model 8 was selected among the other models as it produced the highest R^2 which is 0.668. The t test value specifies the intercept and slope in the multiple regression model. Sig. portrays the significant level of each variable, where a Sig. of greater than 0.05 indicates that the variable is insignificant in determining the property prices. The information of concern in this table is the B and Sig. value. Overall, as stepwise regression is conducted in this research, it was assured that all the variables included in the model generated are significant with all the Sig. values lower than 0.05. Insignificant variables such as number of bedrooms, distance from KTM (Keretapi Tanah Melayu Berhad) station and hospital are excluded from the model.

Among the five structural attributes included in the analysis, the significant structural attributes are built-up area, age of building, holding type and condition of building. For built-up area, every increase in m^2 of area has caused an increase in terrace properties prices by RM 2,392.76. This is similar to the research findings by Chau and Chin (2002) and

Iman et al. (2009) in Malaysia, where the built-up area of buildings have positive impact on the housing prices. This finding supports the research findings by Chau and Chin (2002), where properties with bigger area are more favourable for big families and by buyers who desired a better quality of living standard. Therefore, buyers are generally willing to pay more for more functional space in a building. As a result, built-up area is found to be the prime determinant of terrace property prices.

Age of the building has led to a decline in property price by RM 3,038.72 for every year increase in age. Age of building is often found to be negatively related to property price as building age implies the depreciation of the property structure (Chiang et al., 2015). Older buildings tend to cost less due to the decrease in usefulness of building systems and more maintenance costs are incurred, as agreed by Clapp and Giaccotto (1998). Similar findings have been observed in Dallas (Goodman & Thibodeau, 1995), Michigan (White & Leefers, 2007) and Hong Kong (Tse & Love, 2000). A building undergoes a lot of wear and tear during the usage period. As the age increases, the building tends to deteriorate and it is inevitable as an ageing process. This has caused the property prices to drop as people are likely to pay less for inferior products.

The holding type of properties is one of the significant structural attributes in this research. Freehold properties are found to command a higher premium of RM 23,859.82 compared to leasehold properties. This finding supports the research undertaken by Iman et al. (2009), where holding type has proved to be essential in determining the property prices. Freehold properties tend to cost more compared to leasehold properties as freehold properties have a lease tenure of 999 years instead of a tenure of 99 years for leasehold properties, as agreed by Ooi et al. (2014). In Malaysia, a premium is to be paid for the renewal of leasehold agreement, making leasehold properties less favourable by the house buyers, thus most of the house buyers are willing to pay more for a freehold property.

The condition of the building is significant in determining the property prices. A good condition building imposed positive impact on property prices and caused the price to escalate by RM 60,792.65 as shown in Table 3. Researches undertaken by Lansford and Jones (1995) and Kilpatrick et al. (2007) have acquired similar findings where properties with poorer condition experienced a reduction in value. As mentioned earlier, people tend to pay less for inferior products. The same concept applies here where building with a poorer condition will be priced lower compared to a good condition building.

Under structural attributes, the number of bedrooms is the only variable which is insignificant and has been excluded from the stepwise regression model. Married couples these days tend to have lesser kids compared to the previous generation in Malaysia. Moreover, the supply of residential properties in Malaysia is relatively high in the past few years. As a result, owning a house with more bedrooms is no longer a need and consequently the number of bedrooms doesn't affect the buyers' decision in purchasing a house in Malaysia.

The significant locational attributes in this study are shopping centre, school, forest and highway. As shown in Table 3, every m increase in distance to the nearest shopping centre has led to a reduction in property price by RM 23.94, which means that properties in a shorter distance from shopping centre command a higher premium. Shopping centre was one of the determinants of property value, as agreed by Basu and Thibodeau (1998). The finding of this research is consistent with the findings by Rosiers et al. (1996) in Quebec Urban Community, where shopping centre is said to have value-enhancing effects as good accessibility and improved convenience lead to the appreciation of surrounding properties.

Similar phenomena has been observed in other countries as well, for instance, United States (Sirpal, 1994) and South Africa (Sale, 2015).

School is significant in determining the property prices and has caused a rise of RM 22.27 for every m increase in distance. Mense and Kholodilin (2014) have obtained similar findings where the authors stated that properties with a short distance from school were not favourable. Proximity to school associates a lower property price, this is because schools are often a source of noise pollution during daytime, as agreed by Mense and Kholodilin (2014).

Forest has caused the property price to drop by RM 56.58 for every m increase in distance to the nearest forest. Similar findings are acquired by Tyrväinen and Miettinen (2000) which confirmed that the urban forest has value-increasing results on the proximate property values. This research finding supports the findings of Irwin (2002) in Central Maryland and Thorsnes (2002) in Michigan, where the finding is consistent with the previous studies where positive impact is imposed in the property value surrounding the nearest forest.

Highway has caused an increase of RM 11.45 in property price for every m increase in distance, which means that highway is not favourable and has imposed negative impact on proximate housing prices. This might be due to the existence of negative externalities such as air and noise pollutions as mentioned by Nelson (1982), which tend to dominate the positive externalities for properties in very close vicinity of highway, leading to a reduction in property price, as agreed by Reibel et al. (2008). This research has reached the same conclusion as the research conducted by Waddell et al. (1993), where the negative effects caused by traffic congestion, air, visual and noise pollutions have been exhibited to the surrounding properties, causing the price to drop.

KTM station and hospital are excluded from the stepwise regression model as they are both insignificant in determining the property prices. Mukim Rawang is a relatively big city and yet only one KTM station was built within the area, hence it is not considered as an efficient public transportation within the city. In addition, the subject properties are not located within walking distance from the KTM station and thus it is to believed that the said station doesn't exert significant impact on the property price variations of the subject properties. Similarly, hospital is not a significant factor in affecting the property prices as it is not a popular amenity since it is only beneficial for a small range of people especially the elderly and patients. Unlike shopping centre, hospital is less frequently visited by most of the residents and therefore, it is unlikely to be included in the consideration of house buyers during their purchasing.

6. Conclusion

This research is carried out to ascertain the factors affecting property prices in Mukim Rawang, particularly structural and locational attributes as these attributes are essential in determining the property values. Stepwise regression was carried out and it is interesting to perceive that model 8 which comprised built-up area, shopping centre, school, age of building, holding type, condition of building, forest and highway is the most significant model in affecting and predicting the property value. A R^2 of 0.668 achieved by model 8 has indicated that this model has explained 66.8% of the variance in property prices.

The regression model is specified as follow:

$$Y = 22536.070 + 2392.764\,X_1 + (-23.941)\,X_2 + 22.270\,X_3 + (-3038.717)\,X_4$$
$$+ 23859.819\,X_5 + 60792.654\,X_6 + (-56.578)\,X_7 + 11.446\,X_8 \tag{2}$$

where Y represents the predicted property price; X_1 represents the value of built-up area; X_2 represents the distance to nearest shopping centre; X_3 represents the distance to nearest school; X_4 represents the age of building; X_5 represents the holding type; X_6 represents the condition of building; X_7 represents the distance to nearest forest and X_8 represents the distance to nearest highway.

Based on model 8, one of the foremost findings which has emerged from this research is that built-up area is the most important structural attribute in affecting the property prices where every increase in m^2 of area led to an increase in terrace houses prices by RM 2,392.76; whereas shopping centre is the most vital locational attribute which has caused the property price to reduce by RM 23.94 for every metre increase in distance to the nearest shopping centre. In general, it can be noted that people are willing to pay higher for a bigger house in order to obtain a larger functional space. Likewise, house buyers pay more to acquire a house which is in close vicinity of shopping centre as the proximity to the particular amenity brings benefits for instance, enhanced accessibility and improved convenience.

The research findings in this study are subjected to two limitations. Firstly, the most significant limitation in this study is unavailability of data due to incomplete transaction data and geographical constraint. Some transaction data collected from JPPH were incomplete so they were eliminated from the sample; while some primary data may not be available as the exact location of the subject properties are unable to be identified due to limited access for visitation. Missing data and information may cause bias in the predictions. Secondly, the limitation encountered in the study was the insufficient data due to limited property transactions within the study area and time period of study.

This research threw up questions in the course of study which are in need for future exploration. This study has confined the area of study to be limited in Mukim Rawang, Malaysia. Hence, it is recommended that further research could be carried out in other areas of Malaysia so that other locational attributes could be included in the study. Besides, future works are recommended to explore on the impact of economical and social attributes towards property prices.

The objective of this study have been achieved with the determinants of property values identified by providing an overview of the relationship between different factors and the property prices. Essentially, the research findings aim to impose impact on the property platform and contribute by providing relevant parties the latest property findings and information. Based on the evidence of findings, it gives a clearer picture for the developers and house buyers to shift their development or investments to areas where the properties are more profitable. The findings may be important to valuers as well because with the relationship between the factors and property prices established, they can be aided correspondingly during the assigning of premium to the various structural and locational attributes. This research is able to serve as a guide for the interested parties in decision-making for developments, investments and valuations. This research has successfully established the impact of the structural and locational attributes on the housing prices and part of the reasons behind the hiking of property prices in recent years are identified. Overall, this paper has provided some evidence that structural and locational attributes could have been considered by house buyers as a vital factor in property transactions.

Disclosure statement

No potential conflict of interest was reported by the authors.

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