IS THERE A PREMIUM FOR PROXIMITY? ASSESSING THE IMPACT OF MRT ON RESIDENTIAL PROPERTY PRICES IN GREATER KUALA LUMPUR, MALAYSIA

Adakah Terdapat Premium untuk Proximiti? Menilai Kesan MRT terhadap Harga Hartanah Kediaman di Greater Kuala Lumpur, Malaysia

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ABSTRACT *Urban rail transit systems such as the Mass Rapid Transit (MRT) and Light Rail Transit (LRT) can produce a mix of beneficial and adverse effects on nearby communities, particularly for properties in close proximity to the infrastructure. This study focuses on the Sungai Buloh-Kajang (SBK) MRT Line in Greater Kuala Lumpur, Malaysia, and evaluates its influence on residential property values, taking into account both the favourable and unfavourable externalities associated with the transit system. To analyse these effects, a hedonic pricing model was applied to a dataset of residential transactions spanning from 2013 to 2019, encompassing properties situated within a 2-kilometer buffer of the SBK MRT corridor. The analysis accounts for comparable market conditions, income distribution, and housing types. The findings show that while properties near MRT stations generally experienced price increases, especially in middle- and lower-income areas, homes located extremely close to the MRT track in affluent neighbourhoods saw a decline in value. These results suggest that MRT systems can enhance residential property prices, but the benefits vary by location and socio-economic context. These findings underscore that while MRT systems can positively affect nearby residential property prices, these benefits are not uniform. The gains tend to be widespread, benefiting various neighbourhoods and housing types, whereas the downsides are more geographically limited. From a policy and urban planning perspective, the results highlight the value of integrating land value capture mechanisms and promoting transit-oriented development (TOD) strategies to harness these positive externalities more effectively.*

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Keywords**:** Mass Rapid Transit (MRT), residential property prices, hedonic pricing model (HPM), land value capture, Greater Kuala Lumpur

ABSTRAK *Sistem pengangkutan rel bandar seperti Transit Aliran Massa (MRT) dan Transit Aliran Ringan (LRT) boleh menghasilkan gabungan kesan positif dan negatif terhadap komuniti berhampiran, terutamanya bagi hartanah yang terletak sangat hampir dengan infrastruktur tersebut. Kajian ini memberi tumpuan kepada Laluan MRT Sungai Buloh-Kajang (SBK) di Greater Kuala Lumpur, Malaysia, dan menilai pengaruhnya terhadap nilai hartanah kediaman dengan mengambil kira kedua-dua kesan luaran yang menguntungkan dan yang merugikan yang dikaitkan dengan sistem transit ini. Untuk menganalisis kesan tersebut, model harga hedonik telah digunakan ke atas set data transaksi hartanah kediaman dari tahun 2013 hingga 2019, melibatkan hartanah yang terletak dalam lingkungan dua kilometer dari koridor MRT SBK. Analisis ini turut mengambil kira keadaan pasaran yang sepadan, taburan pendapatan, dan jenis perumahan. Penemuan kajian menunjukkan bahawa walaupun hartanah yang berhampiran dengan stesen MRT secara amnya mengalami peningkatan harga – terutamanya di kawasan berpendapatan sederhana dan rendah – rumah-rumah yang terletak terlalu dekat dengan landasan MRT di kawasan kejiranan mewah mencatatkan penurunan harga. Dapatan ini mencadangkan bahawa sistem MRT boleh meningkatkan harga hartanah kediaman, namun manfaatnya berbeza mengikut lokasi dan konteks sosioekonomi. Kajian ini menekankan bahawa walaupun sistem MRT boleh memberi kesan positif kepada harga hartanah berhampiran, kesan ini tidak seragam. Kenaikan harga cenderung berlaku secara meluas dan memberi manfaat kepada pelbagai kawasan kejiranan dan jenis perumahan, manakala kesan negatif pula lebih terhad dari segi geografi. Dari sudut dasar dan perancangan bandar, dapatan kajian ini menyerlahkan kepentingan untuk mengintegrasikan mekanisme cerapan nilai tanah (land value capture) serta menggalakkan strategi pembangunan berorientasikan transit (TOD) bagi memanfaatkan kesan positif ini dengan lebih berkesan.*

Kata kunci: *Transit Aliran Massa (MRT), harga hartanah kediaman, model harga hedonik (HPM), cerapan nilai tanah, Greater Kuala Lumpur.*

1. Introduction

Urban rail transit systems, including Mass Rapid Transit (MRT) and Light Rail Transit (LRT), serve as essential components of metropolitan transportation networks, particularly in highly populated and expansive urban regions. These systems facilitate efficient mobility, enabling residents to commute to key desired destinations such as workplaces, educational institutions, healthcare facilities, and various public services. Therefore, when examining the influence of urban rail transit systems on property values, researchers typically presume that households and businesses are inclined to spend more on properties situated near these transport facilities. This is based on the expectation that proximity to transit reduces both the financial and psychological stress associated with commuting. Previous research indicates that being close to transit stations typically leads to a positive and statistically significant influence on property values. However, this relationship is not straightforward or linear, as both the magnitude and direction of the impact can differ depending on various factors (Abidoye et al., 2022; Bohman & Nilsson, 2016; Dubé, et al., 2013; Dziauddin, 2019; Dziauddin et al., 2015; Forouhar & Hasankani, 2018; Hess & Almeida, 2007; Nelson, 1992; Rojas, 2024; Zhang & Shukla, 2023). Urban rail transit systems may also produce undesirable effects, including noise, visual disturbances, and increased congestion along the tracks and near station areas – particularly for properties situated in very close proximity to these infrastructures. The European Environment Agency (2025) highlights that prolonged exposure to noise pollution can have serious consequences on both physical and mental well-being, potentially leading to a range of health issues over time, most obviously in terms of irritability and sleeplessness. Indeed, the WHO ranks noise pollution as the second highest among environmental stressors in terms of public health impact.

As awareness of physical and mental well-being continues to grow, homebuyers are becoming more sensitive to environmental factors such as noise, vibrations, obstructed views, and congestion – common externalities associated with urban rail transit systems. These concerns are increasingly shaping residential decision-making. A number of studies have explored how close proximity to rail infrastructure can lead to a decline in property values due to these negative externalities. For example, studies by Debrezion et al. (2006), Hewitt and Hewitt (2012), Kilpatrick et al. (2007), and Nelson (1992) suggest that properties situated very close to urban rail transit systems may experience devaluation. Contributing factors include construction and operational noise, visual intrusions, and increased local traffic. Nelson’s (1992) analysis of Atlanta found that homes in higher-income neighbourhoods located near transit stations saw a reduction in value, suggesting a socioeconomic dimension to how transit proximity is perceived. Debrezion et al. (2006) found that properties within 250 meters of a railway line were priced about 5% lower than those located more than 500 meters away, attributing this decline primarily to noise disturbances. Similarly, Kilpatrick et al. (2007) observed that simply being near a transit corridor – without direct station access – could negatively affect property values. In Ottawa, Canada, Hewitt and Hewitt (2012) discovered a mixed pattern: while some areas saw price appreciation near O-Train stations, many neighbourhoods closest to the line experienced a drop in residential property values, with gains observed in areas set farther back. These findings underline the complex and often context-dependent nature of how rail transit proximity influences real estate values.

However, the majority of existing research has concentrated on developed Western countries, resulting in a significant gap in understanding how urban rail transit affects property values in developing nations. In particular, empirical studies focusing on Malaysia are notably limited. This study addresses that gap by examining the impact of the newly developed Mass Rapid Transit (MRT) system in Kuala Lumpur – a subject that, until now, has not been explored through comprehensive empirical analysis. Moreover, the nature of urban rail transit systems in other global cities often differs from that of Greater Kuala Lumpur, where the tracks are predominantly elevated.

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This structural distinction highlights the need for localised research, as the physical design of transit infrastructure can influence its effects on surrounding property values. For example, the 46-kilometre SBK MRT Line, which begins in Sungai Buloh and ends in Kajang, runs underground for about 9.5 kilometres beneath Kuala Lumpur's city centre, while the rest of the route is elevated. This may cause drawbacks related to noise, vibration, light, and obstructed views that can have an adverse impact on property prices and rental incomes. Previous studies have not examined this issue in depth, since public transportation infrastructure in most other cities is primarily at grade or underground. Thus, what is missing from the empirical literature is research on local variations in the magnitude and direction of the effects of elevated or underground urban rail transit systems on residential property prices. In the present study of the SBK MRT Line, the value of properties within walking distance (0.5 kilometres) of the nearest station was estimated by the real estate valuers to appreciate by 15% to 25%, while some property owners in the affluent neighbourhoods on the north-west side of the city claimed their properties could depreciate by over 20% due to the construction of the MRT system in their neighbourhoods (Puspadevi, 2012; Yap, 2011). Property owners in the affected prosperous areas have asked for one of three options: (1) realignment of the line, (2) construction of the line underground, or (3) relocation of residents (MRT Corporation, 2012).

Given these considerations, the present study seeks to examine how the MRT system influences residential property values, taking into account both beneficial and adverse externalities associated with its presence. To generate robust insights, the analysis incorporates both spatial and temporal factors, enabling an assessment of how property prices evolve over time and across locations. By integrating longitudinal and cross-sectional elements within a unified modelling framework, the study can capture variations in price before and after the MRT line became operational. To reflect the phased opening of the MRT system – initially from Sungai Buloh to Semantan on December 16, 2016 (Segment C), and later from Semantan to Kajang on July 17, 2017 (Segment F) – the model includes variables measuring proximity to the nearest station and segment of the line at both key time points. The influence of these proximity measures is assessed using multiple distance-based catchment zones, allowing for a more nuanced understanding of how proximity to the MRT line correlates with residential property prices.

The paper is structured as follows. The second section presents the literature review of the impacts of urban rail transit systems on residential property prices, before moving on to present the research method. Following this, the paper presents the results in terms of residential property price impacts. The findings are then discussed against the background of the existing literature. Finally, concluding observations and policy recommendations are provided.

2. Literature review

2.1 The relationship between transport accessibility and land value: A theoretical basis

Alonso's (1964) monocentric urban model is grounded in the idea that both the monetary and time costs of travel increase as one moves farther from the central business district (CBD). In this framework, the CBD holds strategic significance – serving as a primary employment centre for households and a commercial nexus for firms, offering access to services, markets, and opportunities for face-to-face interaction. Consequently, the spatial separation between residences and employment centres, or between firms and their business contacts, leads to escalating travel burdens. When evaluating how new transport infrastructure such as highways or urban rail transit systems affects land values, especially in the absence of disamenities like traffic congestion, noise, or air pollution, it is commonly assumed that both households and firms place a premium on location. Specifically, they may be willing to pay higher prices for land situated near transit infrastructure to capitalise on the reduction in travel costs. This notion rests on two key premises. First, transportation enhances accessibility by improving the ease with which people and businesses reach key desired destinations. Second, travel-related costs are closely tied to the distance separating a household or business from the nearest transport facility (Ryan, 1999). In essence, improved accessibility through rail transit is expected to generate a locational advantage, prompting individuals and businesses to compete for limited space near stations. This competitive pressure can drive up land and property prices in well-connected areas (Mills & Hamilton, 1994). Consequently, locations adjacent to transit nodes are likely to experience elevated bid rents. Within this framework, accessibility functions as a proxy for quantifying the broader economic returns of transportation investments, particularly their indirect impact on real estate markets (Banister & Berechman, 2001). This approach supports a more comprehensive understanding of how strategic transit infrastructure shapes urban land use patterns and property dynamics. Thus, this study draws upon established urban economic theory to examine how urban rail transit influences residential property values, with a particular focus on potential price increases in areas located near transit infrastructure. However, as stated above, nuisance effects such as noise, vibration, lighting, and visual obstruction may have a negative impact on property prices and rents. Therefore, the present study hypothesises that (1) there will be no price increases for residential properties located within walking distance of the nearest MRT station and (2) there will be no price decreases for properties located near an MRT line but without easy access to an MRT station. The individual and combined effects of distance from the nearest MRT station and the line itself are shown in Figure 1. While this study primarily concentrates on capitalised land value in relation to accessibility, it is essential to acknowledge that land value is influenced by a range of additional factors.

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These include intrinsic value, private sector investments, modifications to land use policies, as well as broader trends in population growth and economic development (Suzuki et al., 2015).

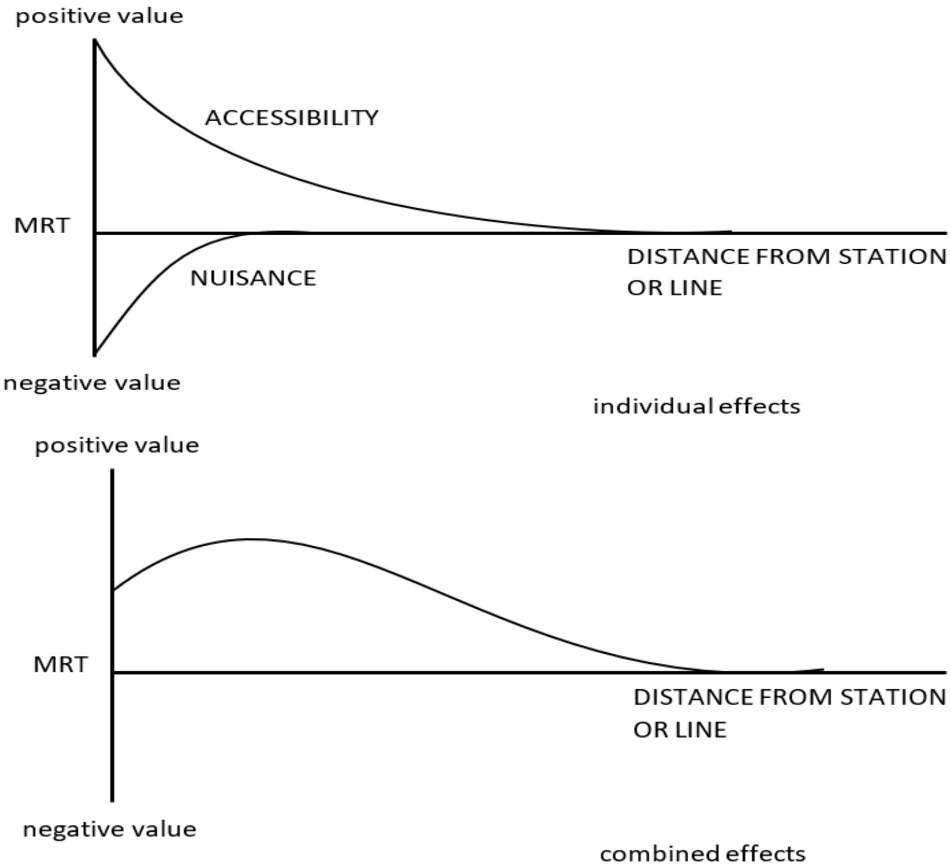

Figure 1. *Impacts of MRT on residential property prices: (A) individual effects; (B) combined effects*
Source: Adopted from Chen et al. (1998: 41)

2.2 The impact of urban rail transit on residential property prices

In the last 50 years, abundant studies have accumulated on the impact of urban rail on residential property prices. Based on these studies, some important observations are discussed below:

(i) Catchment area
To estimate the impact of urban rail transit on residential property prices, accessibility is determined by measuring the proximity of each residential property unit to the nearest urban rail transit station using a straight-line distance or road network. Although catchment areas of 0.4 through 4 kilometres from the nearest urban rail station are used, most empirical findings indicate that residential properties within 0.8

kilometres of the station exhibit a substantially greater increase in value (Chen et al., 1998; Devaux et al., 2017; Du & Mulley, 2006; Dubé et a., 2013; Dueker & Bianco, 1999; Dziauddin et al., 2015, 2019; Forouhar, 2016; Hess & Almieda, 2007; Li, 2018; Li et al., 2019; Martínez & Viegas, 2009; Mulley et al., 2018; Yang et al., 2020; Yen et al., 2019). This indicates that the influence on residential properties is generally concentrated within a limited geographic area. Regarding the threshold distance, certain research has applied a single Euclidean distance range (Bae et al., 2003; Camins-Esakov & Vandegrift, 2017; Du & Mulley, 2006; Duncan, 2008; Dziauddin, 2019; Dziauddin et al., 2015; Haider & Miller, 2000; He, 2020; Hess & Almeida, 2007; Hewitt & Hewitt, 2012; Li et al., 2019; Martínez & Viegas, 2009; Mulley et al., 2018), while some have used multiband distance (Bowes & Ihlanfeldt, 2001; Devaux et al., 2017; Dubé et al., 2013; Dueker & Bianco, 1999; Li, 2018; Nolan et al., 2012; Pan, 2013; Seo et al., 2014; Yang et al., 2020; Yen et al., 2019; Zhong & Li, 2016).

(ii) Treatment of time

Concerning the temporal aspect, most studies have analysed the effects of urban rail transit on residential property values from the onset of service and across the following decades (Bowes & Ihlanfeldt, 2001; Chen et al., 1998; Du & Mulley, 2006; Duncan, 2008; Dziauddin, 2019; Dziauddin et al., 2015; Haider & Miller, 2000; Hess & Almeida, 2007; Hewitt & Hewitt, 2012; Li, 2018; Li et al., 2019; Martínez & Viegas, 2009; Mulley et al., 2018; Nolan et al., 2012; Seo et al., 2014; Yang et al., 2020; Zhong & Li, 2016). In addition, there is research that considers how the initial announcement of rail development, coupled with rising expectations of future transport improvements among both developers and buyers, can affect residential property prices (Bae et al., 2003; Camins-Esakov & Vandegrift, 2017; Dueker & Bianco, 1999). On the contrary, Yen et al. (2019) examined how nuisances such as noise, pollution, and inconvenience during the construction of mass transit systems negatively impact buyers' purchasing intentions.

(iii) Method, study design, and data and data source

Most scholarly investigations in this field have predominantly employed the hedonic pricing framework, as introduced by Rosen (1974), to quantify the added value that proximity to transit stations confers upon residential properties. Nevertheless, this model falls short of establishing causality between urban rail infrastructure and property market dynamics (Mohammad et al., 2017). In response, a growing number of recent studies have adopted the difference-in-differences (DiD) approach (Devaux et al., 2017; Dubé et al., 2013; Forouhar, 2016; He, 2020), which, while robust, necessitates comprehensive longitudinal datasets to accurately capture pre- and post-intervention changes in residential property values. As emphasised by Mohammad et al. (2017), the robustness of findings is proportionate to the scale of the dataset employed.

Given the pronounced spatial heterogeneity and dependency resulting from localised property market influences, spatial econometric methods – such as Geographically Weighted Regression (GWR), spatial autoregressive models, spatial error models, and spatial Durbin models – have been increasingly utilised to more accurately estimate the spatial impacts of urban rail transit projects (Du & Mulley, 2006; Dziauddin, 2019; Haider & Miller, 2000; Zhong & Li, 2016).

Case study methodologies remain dominant, given the exploratory nature of much of the research in this domain. Secondary data sources are primarily relied upon due to accessibility, with dependent variables commonly encompassing actual sales transactions, effective rents, asking prices, and appraised values. In jurisdictions where transactional data is restricted, researchers have resorted to publicly available asking prices and rents (Du & Mulley, 2006; Yang et al., 2020). Sample sizes reported in the literature range widely, from 264 properties (Dziauddin, 2019) to over 36,000 (Pan, 2013).

Independent variables routinely comprise physical property attributes (e.g., number of bedrooms, floor area, building age, lot size, property type, and amenities such as fireplaces), and locational or neighbourhood indicators. Data acquisition has been diversified through online databases (Seo et al., 2014), field surveys (Xu et al., 2016), and direct homeowner interviews (Lin & Yang, 2019). Regarding housing typology, some analyses focus solely on single-family homes (Bowes & Ihlandfeldt, 2001; Seo et al., 2014), while others incorporate a mix of housing forms (Du & Mulley, 2006; Dziauddin et al., 2015). Locational variables typically include proximity to transit stations alongside accessibility to major highways, retail centres, employment hubs, schools, parks, healthcare facilities, and airports. Neighbourhood characteristics frequently examined include demographic composition, employment profiles, crime rates, and population density.

(iv) Empirical evidence

A substantial body of empirical research has enabled the systematic examination of the impacts of rail transit systems on residential property prices. The prevailing consensus indicates that proximity to transit stations exerts a positive and statistically significant influence on residential property values. Nonetheless, the magnitude of this influence demonstrates notable variability across contexts. In North America, for instance, Chen et al. (1998) assessed the effects of light rail transit (LRT) on the pricing of adjacent single-family residences, identifying both positive externalities (enhanced accessibility) and negative externalities (noise and disruptions). Their findings suggest that the benefits outweigh the detriments, with the optimum price effect observed at approximately 427.33 metres from the nearest station, reflecting a price premium of 10.5%.

Similarly, Bowes and Ihlanfeldt (2001) reported that properties situated within a quarter-mile radius were priced 19% lower compared to those located three miles or further away. Duncan (2008) identified price premiums of 6% for single-family homes and 17% for condominiums in proximity to urban rail transit stations.
Complementing these findings, subsequent research by Nolan et al. (2012), Dubé et al. (2013), and Pan (2013) has corroborated the significant positive association between rail transit access and residential property values.

Studies conducted beyond North America have yielded comparable outcomes, consistently revealing that rail transit positively affects residential pricing (Bae et al., 2003; Dziauddin, 2019; Forouhar, 2016; He, 2020; Li, 2018; Martínez & Viegas, 2009; Mulley et al., 2018; Yang et al., 2020; Yen et al., 2019). However, more modest positive impacts have been observed in Ottawa, Tyne and Wear, and Buffalo, as noted by Du and Mulley (2006), Hess and Almeida (2007), and Hewitt and Hewitt (2012).

Despite the general trend, certain studies have reported either negative outcomes (Bellinger, 2006; Seo et al., 2014; Zhong & Li, 2016) or statistically insignificant effects (Camins-Esakov & Vandegrift, 2019). Furthermore, while much of the existing literature has focused on residential property, several studies have explored the relationship between rail transit and commercial, office, and industrial property values, generally confirming positive associations (Golub et al., 2012; Ko & Cao, 2013; van der Krabben & Needham, 2008).

3. Methodology

3.1 Case study: The SBK MRT Line

The SBK MRT Line constitutes a heavy rail transit system designed to link the rapidly urbanising towns of Sungai Buloh in the northwest of Kuala Lumpur to Kajang in the southeast. The development of this line was intended not merely to expand the city's constrained rail infrastructure but also to integrate existing networks, thereby mitigating the severe traffic congestion affecting the Greater Kuala Lumpur area. A further strategic objective was to enhance regional accessibility by establishing a direct, high-capacity public transit connection between Sungai Buloh and Kajang via the Kuala Lumpur central business district (CBD), offering a service that prioritises affordability, reliability, speed, and safety.

The alignment of the SBK MRT Line suggests deliberate efforts by urban planners to stimulate the revitalisation of several key neighbourhoods along its route, including Sungai Buloh, Kota Damansara, Mutiara Damansara, Damansara Utama, Taman Tun Dr Ismail, and Cheras. Extending over a total length of 46 kilometres and featuring 31 stations, the line includes a 9.5-kilometre underground segment traversing the Kuala Lumpur CBD (see Figure 2).

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Initially proposed in 2010 and formally approved by the government later that year, the project reached completion at an estimated cost of RM23 billion. Full operations commenced on 17 July 2017. Since its inauguration, ridership has expanded dramatically, from 22.35 million passengers in 2017 to 51.31 million in 2018, with numbers nearing 64 million in 2019 (A. Malek, 2020). Given its extensive coverage of major urban areas, the SBK MRT Line presents an instructive case for assessing the impact of urban rail investments on residential property markets.

3.2 Data acquisition

(i) Property data

The data underpinning this study were derived from residential property transaction records available through the Brickz database (https://www.brickz.my), which consolidates information from the Malaysian Department of Valuation and Property Services. The dataset encompasses variables such as transaction price, sale date, property address, dwelling type, ownership details, number of floors and rooms, land area, and built-up area. Notably, information regarding the age of properties was not accessible from this source. To address this, supplementary data collection was conducted via online property platforms, specifically Star Property (https://www.starproperty.my) and Property Guru (https://www.propertyguru.com.my), although age data were confined to condominium unit.

The dataset spans the years 2012 to 2020. However, recognising the distortions introduced by the COVID-19 pandemic on the property market in 2020, the analysis was confined to the period from 2012 to 2019. The initial segment of this timeframe (2012–2016) corresponds to the construction phase of the SBK MRT Line. Although transaction data covered the entirety of the Greater Kuala Lumpur region, this research focused exclusively on properties situated within a two-kilometre radius of the SBK MRT Line. While extant literature suggests that residential properties located within 0.8 kilometres of transit stations realise more pronounced value increases, this study deliberately examines impacts extending beyond that proximity.

For sample selection, the methodological recommendations of Tse and Love (2000) were followed, particularly their emphasis on controlling for homogeneity in physical attributes and income demographics to ensure consistency in the marginal effects of neighbourhood and physical attributes. Accordingly, property markets along the SBK MRT corridor were segmented, and two segments – designated as C and F – were selected. These segments incorporate both landed properties and high-rise residences and were chosen based on the abundance of housing estates and transaction records, ensuring data robustness for subsequent hedonic pricing model estimations.

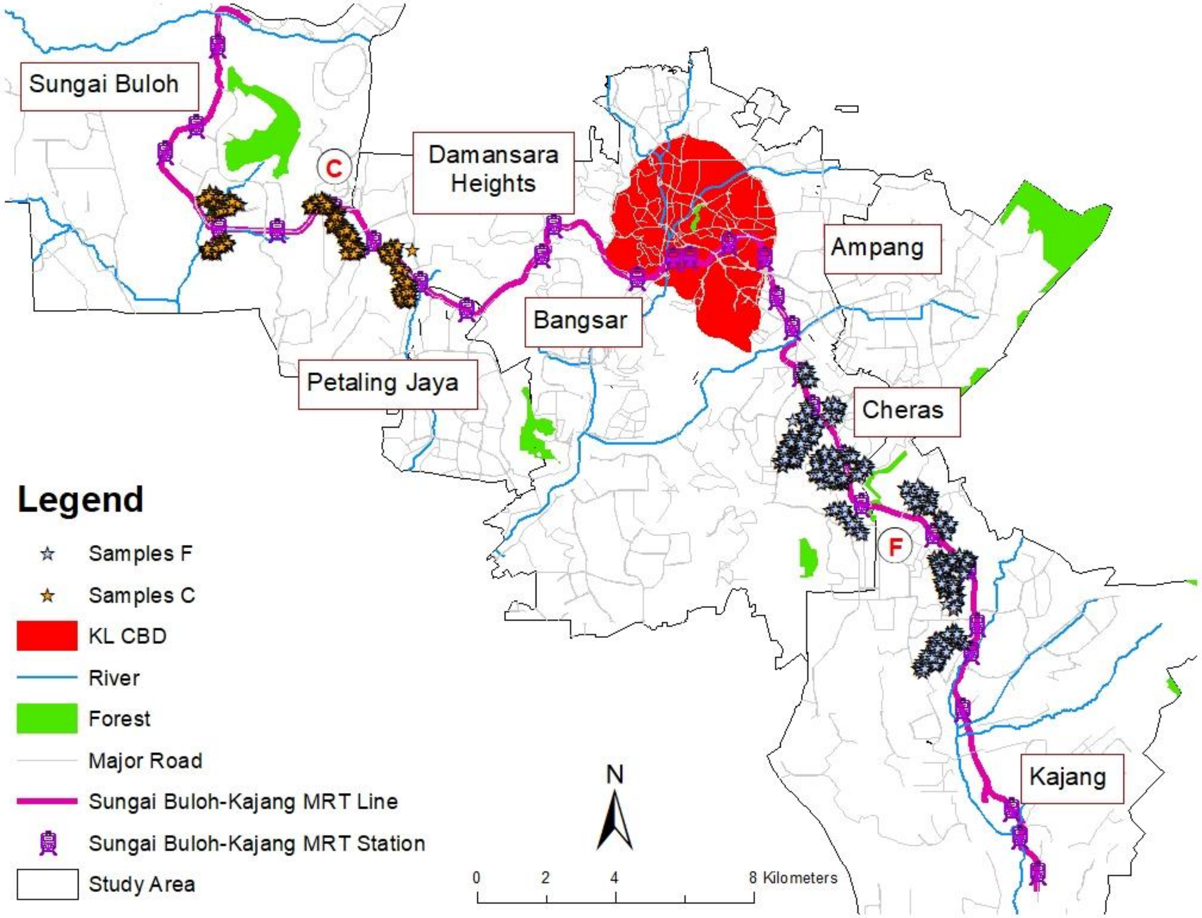

Figure 2. *The Sungai Buloh-Kajang (SBK) MRT Line;*
Source: The map and photos are the authors' own work

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(ii) Data cleaning and geocoding

As noted above, the present study seeks to estimate the impact of location – more specifically, the SBK MRT Line – on residential property prices. Two data elements are critical: transaction price and the full address of each property. Records with incomplete transaction prices and addresses were deleted from the data set. Based on the data collected, 26 transaction records from Segment C and 52 transaction records from Segment F had incomplete addresses and were therefore deleted from the data set. The remaining records were geocoded using the Awesome Table feature available on Google Drive. That feature assisted in determining an (x,y) coordinate pair based on the address so that each property unit could be precisely located on a local map. These records represent the data set used in this study. In the case of landed properties, terrace houses accounted for the majority of transactions in the study area. To control for the structural and physical characteristics of the property, only the terrace house was used for analysis in this study. Therefore, the sample used for this stage of the analysis consisted of 3,908 records.

(iii) Locational characteristics data

Once the datasets were accurately mapped using QGIS Desktop version 3.22.0, a two-kilometre buffer zone was generated along the SBK MRT Line by applying the software's Buffer tool. This spatial selection process resulted in a total of 2,485 transaction records identified for analysis. Within this sample, 1,416 records (56.98%) corresponded to properties located in Segment C, while 1,069 records (43.02%) pertained to Segment F. Building on the methodological recommendations by Tse and Love (2000), an effective strategy for implementing the hedonic pricing model involves not only choosing data from areas with comparable locational attributes and income levels but also ensuring the sample comprises properties with broadly similar physical traits. This includes factors such as housing type, floor space, and price range to enhance the consistency and reliability of the analysis. For the present study, two house types – condominium units and terrace houses with fairly similar floor areas and prices – were selected. Ultimately, 604 transaction records of condominium units and 572 transaction records of terrace houses in Segment C and 911 transaction records of terrace houses in Segment F were selected for the final analysis.

Once the records were geocoded on a local map, the distance from the property to the nearest MRT station, line, and other locational characteristics such as secondary schools, shopping centres, and commercial areas was measured using both straight-line and network distances using the Distance to Nearest Hub and Network Analysis functions in QGIS Desktop 3.22.0. The measurement of straight-line distances using the buffer analysis feature in QGIS Desktop 3.22.0 required only one layer of geospatial data (the SBK MRT Line), while the network distance measurement required three layers of geospatial data – origin and destination points and local road network data – which are also available in QGIS Desktop 3.22.0. The measured distances were automatically saved in a comma-delimited Excel file.

(iv) Noise data

One source of noise pollution is the transportation system, specifically the rail system. Rail transportation is one of the most efficient modes of connecting areas within Greater Kuala Lumpur. Despite the transportation options available to Greater Kuala Lumpur residents, it was discovered that rail transportation impacts the environment through noise pollution. One of the vital modes of rail transportation in Greater Kuala Lumpur is the MRT. Currently, the MRT connects the routes of Sungai Buloh and Kajang. There are residential settlements along the SBK MRT Line, including village houses, residential areas, terrace houses, bungalows, and condominiums. Most of these residential areas were discovered to be too close to the MRT line, causing local noise to be affected or disturbed.

Noise measurements were taken along the MRT line with a sound level meter (EXTECH INSTRUMENTS Model 407722) that was already on hand in the Physical Geography Laboratory, Department of Geography & Environment, Faculty of Human Sciences, UPSI. This device measures noise levels as low as 35 dBA to 100 dBA and as high as 65 dBA to 130 dBA. To detect this noise, the field location was determined by first locating the monitoring station, which was in the closest residential area to the MRT line. Field surveys revealed the existence of 14 observation stations along the SBK MRT Line and nine observation stations along the Kajang–Sungai Buloh MRT line. The procedure for observing noise from rail transportation, specifically MRT, was based on Malaysian Department of Environment (DOE) guidelines, namely guidelines for Environmental Noise Limits and Control (3rd ed.) published in 2019. This noise observation was carried out during the day between 7.00 a.m. and 10.00 p.m., and at night between 10.00 p.m. and 7.00 a.m. the following day. In general, noise levels observed while the MRT was operating remained unchanged under normal circumstances, unless there was interference from the MRT's frequency of operation or motor vehicle traffic, as the MRT line was mostly parallel to the road.

For this study, the noise was observed during the day from 7.00 a.m. to 10.00 p.m. on working days (Monday–Friday) and non–working days (Saturday–Sunday). Meanwhile, night–time observations were restricted to the hours of 10.00 p.m. to 12.00 a.m. (as MRT operations ended around 1:00 a.m.) and included both working and non–working days. The observation procedure entailed positioning the sound monitor following the established guidelines, namely placing the microphone on a tripod 1.2 m above the ground and directing it toward the MRT rail. The highest noise level was then recorded while the MRT passed through that route.

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The obtained data was then compared to the Fifth Schedule of Maximum Allowable Sound Levels (LAeq and Lmax) From Railway and Transit Trains (For New Railway & Transit Lines and Re–Alignments) as set forth by DOE.

3.3 Property price estimation

The hedonic pricing model is a method for estimating the implicit prices of elements of a single commodity with many characteristics (Freeman, 1979; Rosen, 1974). For example, houses are differentiated by characteristics such as floor area and number of bedrooms. Conceptually, with an adequate range of models encompassing diverse configurations of floor area and bedroom numbers, one can estimate an implicit pricing structure that expresses the property's price as a function of its constituent attributes (Freeman, 1979, p. 193). Specifically, the price differential observed between two models that are identical except for floor area is interpreted as the implicit value attributed to the incremental floor space.

In the domain of housing market analysis, it is essential to understand that residential property prices are determined not solely by structural attributes but are also significantly shaped by neighbourhood characteristics, locational factors, and environmental conditions. The hedonic pricing model has been extensively adopted as the preferred methodological framework for isolating and evaluating the influence of these variables on housing prices (Mulley, 2014). The origins of this approach can be traced back to Court (1939), with subsequent theoretical advancements by Lancaster (1966) and Griliches (1971). Initially intended for appraising quality adjustments in consumer goods, the methodology achieved broader recognition following Rosen's (1974) application of the model to analyse differentiated goods markets under competitive conditions. Multiple regression techniques are most frequently employed to operationalise the hedonic pricing model in empirical research. While the method has been widely applied, the works of Malpezzi (2002), Chin and Chou (2003), and Sirmans et al. (2005) are particularly noteworthy for their comprehensive reviews of hedonic pricing applications within residential property markets.

Powe et al. (1997) identify two fundamental justifications for the widespread application of the hedonic pricing model in housing market studies. Firstly, the model provides a framework for explicitly modelling housing prices as functions of an array of property-specific characteristics. Secondly, it facilitates the estimation of coefficients that capture households' willingness to pay for discrete changes in these attributes. Such coefficients are instrumental in deriving the marginal willingness to pay for incremental improvements in a given characteristic. This is accomplished by computing the partial derivative of the hedonic price function with respect to the attribute under consideration, while holding all other explanatory variables constant at their mean values. The application of the hedonic pricing model is contingent upon the satisfaction of several underlying assumptions.

Firstly, the designated study area must constitute a singular, integrated market. Secondly, the market is presumed to be in a state of equilibrium. Thirdly, it is essential that the determinants of price are accurately identified and fully represented within the model. Fourth, continuous differentiation of the product along the chosen explanatory variables is required. Fifth, it is assumed that consumers possess homogenous utility functions, guiding their decision-making processes consistently. Lastly, the model presumes frictionless mobility within the market, meaning there are neither arbitrage opportunities nor transaction costs (Freeman, 1979; Weinberger, 2001).

(i) The hedonic pricing model specification

Traditionally, the general form of a hedonic pricing function is specified as follows:

$$Y_i = f\ (S, L) + \varepsilon_i \tag{1}$$

where,

Y_i = the price of property i;
P and L = the vectors of physical and locational characteristics, respectively;
ε_i = a vector of error terms.

Since the hedonic pricing model uses multiple regression analysis, it has to meet the following assumptions:

a. A linear relationship between dependent and explanatory variables;
b. No perfect multicollinearity among the explanatory variables;
c. The error terms (residual) are normally distributed with a mean of zero;
d. The error terms are independent (i.e., they are not autocorrelated); and
e. The error terms have a constant variance (i.e., they are homoscedastic).

Orford (1999) asserts that any breach of the core assumptions underlying the hedonic pricing model risks producing biased and unreliable estimates. He specifically notes that violations of the fourth and fifth assumptions are prevalent across numerous prior studies. Furthermore, model misspecification remains a frequent source of error. In this regard, Butler (1982) argues that accurately specifying the hedonic function for housing prices necessitates both the careful determination of the relevant set of explanatory variables and the appropriate selection of the functional form to capture the true nature of the relationships involved.

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3.4 Variable transformations

In order to derive robust insights into the positive and negative effects of the MRT system on residential property prices, the analysis incorporated both temporal and spatial dimensions, thereby enabling the estimation of longitudinal and cross-sectional impacts within an integrated modelling framework. Proximity variables – specifically, the distance to the nearest station and MRT line – were determined according to the network's operational status at two critical points: mid-December 2016 for Segment C and mid-July 2017 for Segment F, corresponding to the phased opening schedule of the SBK MRT Line.

Drawing on the methodology of Forouhar and Hasankhani (2018) in their study of Tehran's urban rail system, this research applied multi-band catchment areas to capture spatial price effects. Notably, the delineation of catchment zones varied by property type. For condominiums within Segment C, the treatment zone was defined as 0.0–0.4 kilometres from the nearest station, with the control zone extending from 0.85 to 1.5 kilometres. To isolate the accessibility benefits while avoiding distortion from potential disamenities related to close proximity to the railway infrastructure, catchments based on the distance to the MRT line were excluded from the analysis. Consequently, the results reflect only the positive externalities associated with enhanced transit accessibility.

In Segment C, the multi-band catchment zones for terrace houses were delineated as 0.0–0.85 kilometres for the treatment area and 1.4–2.0 kilometres for the control area. Segment F adopted slightly adjusted ranges, with the treatment zone spanning 0.0–0.8 kilometres and the control zone similarly set at 1.4–2.0 kilometres from the nearest MRT station. These thresholds were established due to the insufficient number of observations within 0.4 kilometres of a station, particularly in Segment C, where no terrace houses were located within this immediate proximity. This spatial pattern in Segment C can be attributed to the socio-economic profile of the area. As a high-income enclave, the community actively opposed the MRT development, filing multiple legal actions that ultimately influenced planners to position the line away from residential precincts. In contrast, Segment F contains terrace houses within 0.4 kilometres of the line, but these are predominantly single-storey dwellings. Given that the dataset for Segment F encompasses both single- and double-storey terrace houses, reliance solely on properties closest to the station would risk misrepresenting the area's housing diversity.

The MRT noise variable was treated as the daily average of noise in the area with an interval of 5 dBA, starting at 65 dBA. For properties not located in an area with measured noise (10 metres through 80 metres), 0 dBA was specified. The purpose was to distinguish between noisy and quiet areas. In addition to the MRT variables, other variables were created: (i) transaction data were transformed into a set of annual indicator variables in order to capture the effects of the economic cycle and the existence and non-existence of the SBK MRT Line; (ii) indicator variables for structural characteristics such as floor area, lot area, number of bedrooms, tenure (ownership), age (condominium units only), corner lot (terrace houses only), and number of storeys; (iii) a set of variables for the residential neighbourhood to estimate location-specific effects on residential property prices; and (iv) locational characteristics such as distance to the nearest secondary school, shopping centre, commercial area, and park. For the shopping centre in Segment C, a further designation was made for the main shopping centre, based on its size and reputation. The two shopping centres are One Utama and IKEA. For a park in each of both Segment C and Segment was designated the main park, based on size.

3.5 Model specification

To derive a global model capable of effectively capturing the relationship between residential property prices and their determinants, precise specification of the hedonic function is imperative. Nevertheless, as Mulley (2014) and Tu (2000) observe, economic theory offers limited guidance on the selection of an appropriate functional form. Hussin (1990) and Watkins (1988) further argue that the choice of functional form in prior studies has often been shaped by considerations of analytical convenience rather than grounded theoretical rationale. Consequently, this study adopted an exploratory approach, estimating several alternative specifications, including linear, semi-logarithmic, and double-logarithmic forms. The process of model selection was iterative, involving repeated evaluations to compare performance across different forms. Ultimately, the semi-logarithmic specification was chosen, as it produced more desirable residual distributions and demonstrated superior explanatory capability.

(i) Terrace properties in Segment C (Model 1)

The final form of semi–logarithmic for terrace houses in Segment C can be expressed as follows:

$$\log(PRICE)_i = \beta_0 + \beta_1(AREA) + \beta_2(LOT) + \beta_3(CNR) + \beta_4(FREE) + \beta_5(BED) + \beta_6(Y2019) + \beta_7(Y2018) + \beta_8(Y2017) + \beta_9(Y2016) + \beta_{10}(Y2015) + B_{11}(Y2014) + \beta_{12}(BU) + \beta_{13}(MUTIARA) + \beta_{14}(TTDI) + \beta_{15}(DU) + \beta_{16}(TROPIC) + \beta_{17}(TREAT1) + \beta_{18}(TREAT2) + \beta_{19}(CTRL1) + \beta_{20}(CTRL2) + \beta_{21}(NOISE) + \beta_{22}(LINE400) + \beta_{23}(PARK) + \varepsilon \quad (2)$$

where $\log(PRICE_i)$ is the price of property i in Malaysian Ringgit (MYR); log is the natural logarithm; AREA is the floor area in square feet; LOT is the lot size in square feet; CNR is a dummy variable for a corner lot property, coded with a 1 (yes) or 0 (otherwise); FREE is a dummy variable for a property with the

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freehold ownership, coded with a 1 (yes) or 0 (otherwise); BED is a dummy variable for a property with number of bedrooms five and more, coded with a 1 (yes) or 0 (otherwise); Y2019, Y2018, Y2017, Y2016, Y2015 and Y2014 are dummy variables for a property sold in 2019, 2018, 2017, 2016, 2015 or 2014, coded with a 1 (yes) or 0 (otherwise); BU, MUTIARA, TTDI, DU and TROPIC are dummy variables for a property located in Bandar Utama, Mutiara Damansara, Taman Tun Dr. Ismail, Damansara Utama, and Tropicana, respectively, coded with a 1 (yes) or 0 (otherwise); TREAT1 is a dummy variable for a property within a radius of 0–0.85 km from the nearest MRT station before its operations, coded with a 1 (yes) or 0 (otherwise); TREAT2 is a dummy variable for a property within a radius of 0–0.85 km from the nearest MRT station after its operations, coded with a 1 (yes) 0 (otherwise); CTRL1 is a dummy variable for a property within a radius of 1.4–2 km from the nearest MRT station before its operations, coded with a 1 (yes) or 0 (otherwise); CTRL2 is a dummy variable for a property within a radius of 1.4–2 km from the nearest MRT station before its operations, coded with a 1 (yes) or 0 (otherwise); NOISE is a dummy variable for a property within noise measured area, coded with a 1 (yes) or 0 (otherwise); LINE400 is a dummy variable for a property within a radius of 0.1–0.4 km from MRT line, coded with a 1 (yes) or 0 (otherwise); and PARK is a dummy variable for a property with the park view, coded with a 1 (yes) or 0 (otherwise). Finally, β_0 is the constant, while $\beta_1 ..., \beta_{23}$ represents a set of parameter estimates associated with independent variables, and ε_i represents the standard error of the estimate, which is usually assumed to be independent and identically distributed.

(ii) Terrace properties in Segment F (Model 2)

The final form of estimation using a semi-logarithmic form for terrace properties in Segment F is shown in Eq. (3):

$$\log(\text{PRICE})_i = \beta_0 + \beta_1(\text{AREA}) + \beta_2(\text{LOT}) + \beta_3(\text{DBL}) + \beta_4(\text{FREE}) + \beta_5(\text{NOISE}) + \beta_6(\text{LINE400}) + \beta_7(\text{TREAT1}) + \beta_8(\text{TREAT2}) + \beta_9(\text{CTRL1}) + \beta_{10}(\text{CTRL2}) + B_{11}(\text{NORTH}) + \beta_{12}(\text{SCH}) + \beta_{13}(\text{PARK}) + \beta_{14}(\text{MALL}) + \varepsilon \quad (3)$$

where $\log(\text{PRICE}_i)$ is the price of property i in Malaysian Ringgit (MYR); log is the natural logarithm; AREA is the floor area in square feet; LOT is the lot size in square feet; DBL is a dummy variable for a double storey property, coded with a 1 (yes) or 0 (otherwise); FREE is a dummy variable for a property with the freehold ownership, coded with a 1 (yes) or 0 (otherwise); NOISE is a dummy variable for a property within noise measured area, coded with a 1 (yes) or 0 (otherwise); LINE400 is a dummy variable for a property within a radius of 0.1–0.4 km from MRT line, coded with a 1 (yes) or 0 (otherwise); TREAT1 is a dummy variable for a property within a radius of 0–0.8 km from the nearest MRT station before its operations, coded with a 1 (yes) or 0 (otherwise); TREAT2 is a dummy variable for a property within a radius of 0–0.8 km from the nearest MRT station after its operations, coded with a 1 (yes) 0 (otherwise); CTRL1 is a dummy variable for a property within a radius of 1.4–2 km from the nearest MRT station before its operations, coded with a 1 (yes) or 0 (otherwise); CTRL2 is a dummy variable for a property within a radius of 1.4–2 km from the nearest MRT station before its operations, coded with a 1 (yes) or 0 (otherwise); and NORTH is a dummy variable for a property located in the north side of Cheras, coded with a 1 (yes) or 0 (otherwise); SCH is the distance to the nearest secondary school, measured in metre; PARK is a dummy variable for a property with the park view, coded with a 1 (yes) or 0 (otherwise); and MALL is the distance to the nearest mall, measured in metre. Finally, β_0 is the constant, while β_1..., β_{14} represents a set of parameter estimates associated with independent variables, and ε_i represents the standard error of the estimate, which is usually assumed to be independent and identically distributed.

4. Empirical results

4.1 Terrace properties in Segment C

Table 1 shows the summary statistics and model results for Model 1, including a series of measures of fit such as the adjusted R^2, predictors, coefficients, standard errors, *t*-values, and indicators for the collinearity statistics tolerance and VIF. The model has fairly high explanatory power (0.754). Of the 23 variables affecting property prices included, 17 were significant at a minimum 0.10 level and had the expected positive and negative signs, which largely reflects the findings of previous studies, while six variables were not significant. Of those six variables, four were used to estimate the direct impact of the MRT system on terrace houses in the study area. The only significant MRT indicator variables were for properties located within 0.85 kilometres of the MRT station after its operation (TREAT2) and properties located within noise measured area (NOISE). Thus, *ceteris paribus*, properties located within 0.85 kilometres of the nearest MRT station and sold after the system began operating (TREAT2) experienced a statistically significant price increase of 7.4% which, at the mean, equals RM81,325. The most striking information from the model results is that the parameter estimates of the binary variable NOISE, which represents properties located within 0.08 kilometres along the MRT track, were negative and statistically significant. So, *ceteris paribus*, properties located within 0.08 kilometres along the MRT track were about 16.6% (RM182,432 of the mean) less expensive than those located beyond that distance.

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This essentially supports the previous argument that negative externalities of the MRT such as noise and visual disturbance can depress property prices, especially for those located very close to MRT infrastructure.

Table 1.
Estimated model for terrace properties in Segment C (n=562)

Variable	Unstandardized Coefficients		Standardized Coefficients		Collinearity Statistics	
	B	Std. Error	Beta	t	Tolerance	VIF
(Constant)	12.517	0.056		222.452***		
AREA	0.000	0.000	0.576	17.525***	0.406	2.464
LOT	0.000	0.000	0.228	8.633***	0.629	1.591
CNR	0.009	0.029	0.011	0.305n/s	0.353	2.832
FREE	0.105	0.033	0.172	3.192***	0.150	6.653
BED	0.009	0.015	0.014	0.607n/s	0.784	1.275
Y2019	0.079	0.041	0.094	1.935*	0.185	5.413
Y2018	0.078	0.042	0.077	1.835*	0.250	3.999
Y2017	0.100	0.040	0.158	2.468***	0.107	9.364
Y2016	0.112	0.040	0.107	2.805***	0.301	3.317
Y2015	0.106	0.037	0.139	2.872***	0.187	5.342
Y2014	0.092	0.040	0.084	2.287**	0.326	3.066
BU	0.267	0.033	0.351	8.033***	0.230	4.355
MUTIARA	0.288	0.054	0.270	5.358***	0.173	5.774
TTDI	0.287	0.047	0.227	6.093***	0.316	3.165
DU	0.138	0.033	0.177	4.221***	0.249	4.013
TROPIC	0.212	0.028	0.319	7.556***	0.246	4.066
TREAT1	0.024	0.026	0.026	0.930n/s	0.542	1.843
TREAT2	0.074	0.022	0.113	3.381***	0.395	2.531
CTRL1	0.029	0.028	0.030	1.037n/s	0.540	1.850
CTRL2	0.002	0.032	0.002	0.059n/s	0.532	1.879
NOISE	–0.166	0.058	–0.069	–2.844***	0.748	1.337
LINE400	0.027	0.036	0.035	0.745n/s	0.201	4.976
PARK	0.079	0.034	0.051	2.342**	0.915	1.093

Notes: Goodness of fit: Adjusted $R^2 = 0.754$; The symbols of *, ** and *** indicate significance at the 0.1, 0.05 and 0.01 levels respectively.

It is useful, however, to examine further how the property market in the study area responded to the arrival of the MRT system by looking at the year indicator variables which were intended to capture the impact of the existence and non-existence of the MRT system in the area. As shown in Table 2, all year indicator variables were significant with the expected signs. The model results suggest that properties sold after the MRT began operating (2017–2019) were less valued by homebuyers. Thus, *ceteris paribus*, properties sold after the MRT began operating were at 5.3% less (0.079 + 0.078 + 0.100 – 0.112 + 0.106 + 0.092 = -0.053). The 5.3% decline in residential property values after the MRT began operating may be due to a market correction following earlier overestimation of benefits. Before the MRT opened, buyers and developers may have speculated that property prices would rise significantly due to improved accessibility, leading to inflated values. However, once the system became operational, the actual benefits – such as travel convenience, service frequency, or first-mile/last-mile connectivity – may not have met expectations. Additionally, concerns such as noise, congestion, or increased competition from a surge in nearby developments could have reduced buyer interest. As a result, property prices adjusted downward to reflect the true market value.

4.3 Terrace properties in Segment F

Table 2 shows the summary statistics for Model 2, including a series of measures of fit such as the adjusted R^2, predictors, coefficients, standard errors, *t*-values, and indicators for the collinearity statistics tolerance and VIF. These results show that the explanatory variables accounted for 0.648 of the variation in the dependent variable. Table 2 shows the model results with expected positive and negative signs which are largely consistent with the findings of previous studies, except for NOISE, TREAT1, SCH, and MALL. In terms of significant values, of the 14 explanatory variables included, only eight were statistically significant at a minimum 0.10 level. The coefficient associated with lot size of dwelling (LOT) was highly significant, indicating that lot size had a strong and positive influence on property prices. Thus, *ceteris paribus*, every square foot increase in lot size led to a 0.017% increase in price. Another coefficient that showed a strong positive impact on property prices is the north side (NORTH). So, *ceteris paribus*, properties located in the north side of Cheras experienced a significant price increase of 24.1%. Among the MRT indicator variables, two variables – TREAT2 and CTRL2 – are statistically significant, and both positively influence property prices.

Table 2.
Estimated model for terrace properties in Segment F (n=701)

Variable	Unstandardized Coefficients		Standardized Coefficients		Collinearity Statistics	
	B	Std. Error	B	t	Tolerance	VIF
(Constant)	12.185	0.048		253.952***		
AREA	0.000	0.000	0.332	8.405***	0.251	3.991
LOT	0.000	0.000	0.271	11.015***	0.647	1.546
DBL	0.149	0.026	0.162	5.710***	0.485	2.063
FREE	0.105	0.027	0.100	3.942***	0.606	1.649
NOISE	0.047	0.065	0.016	0.706n/s	0.726	1.378
LINE400	0.041	0.028	0.038	1.422n/s	0.539	1.855

continued

TREAT1	–0.038	0.030	–0.032	–1.297n/s	0.647	1.545
TREAT2	0.088	0.035	0.063	2.553***	0.648	1.543
CTRL1	0.020	0.031	0.015	0.657n/s	0.745	1.343
CTRL2	0.060	0.034	0.039	1.787*	0.820	1.219
NORTH	0.241	0.027	0.258	8.876***	0.462	2.164
SCH	2.604E–5	0.000	0.031	1.208n/s	0.602	1.662
PARK	–5.843E–5	0.000	–0.113	–4.050***	0.499	2.005
MALL	2.251E–5	0.000	–0.019	–0.736n/s	0.589	1.697

Notes: Goodness of fit: Adjusted R^2 = 0.648; The symbols of * and *** indicate significance at the 0.1 and 0.01 levels.

The model results indicate that property prices increased by about 8.8% (RM45,475 of the mean price) and 6.0% (RM31,005 of the mean price), *ceteris paribus*, when a property was located within 0.8 kilometres and 1.4 to 2 kilometres from the nearest MRT station, respectively. This striking result suggests that there is a significant price premium associated with distance to an MRT station and that this premium decreases as distance increases. Another notable feature of the results is that the sign of the coefficient was positive for properties located within 0.08 kilometres of the MRT track (NOISE). Based on this result, further investigation was conducted to observe the distribution of the samples for this variable. It was found that some of the samples in the Taman Sri Raya area were located very close to both the MRT track and the station.

This result implies that in middle- and lower middle-income areas such as Cheras, the presence of the MRT line is always associated with better accessibility, which is highly valued by homebuyers. It is also interesting to note that the sign of the coefficient was negative, with insignificant impact for properties located within 0.8 kilometres of the nearest MRT station and sold during the construction of the MRT line. Thus, *ceteris paribus*, properties located within 0.8 kilometres of the nearest MRT station and sold during the construction of the MRT line were likely to decrease by about 3.8% (RM16,637 of the mean price).

Finally, among other locational characteristics, the distance to the nearest park (PARK) was significant and had the expected sign. The model results indicate that every metre of distance away from the nearest park, *ceteris paribus*, reduced property prices by approximately 0.006%.

The empirical findings for terrace properties in Segments C and F reveal both commonalities and differences in how the MRT system influences residential property values. In Segment C, the model exhibits a higher explanatory power (adjusted R^2 = 0.754) compared to Segment F (adjusted R^2 = 0.648), suggesting a better fit in explaining price variations in the former. Both segments identify a statistically significant price premium for properties located within close proximity (around 0.8–0.85 km) to MRT stations post-operation (TREAT2).

However, the magnitude of this premium is slightly higher in Segment F (8.8%, RM45,475) than in Segment C (7.4%, RM81,325), relative to their respective mean prices, indicating a stronger appreciation in the more suburban, middle- to lower-income area of Cheras. Notably, the impact of noise (NOISE) diverges significantly between the two segments: in Segment C, close proximity (within 0.08 km) to the MRT track yields a significant price discount of 16.6%, reflecting negative externalities such as noise or visual pollution. In contrast, Segment F shows a positive, though statistically insignificant, coefficient for NOISE, which may be attributed to specific neighbourhood characteristics where accessibility benefits outweigh disamenities. Additionally, Segment C indicates a post-MRT operation price correction of 5.3% over time, suggesting that earlier speculative gains were not sustained once the system became operational. Meanwhile, in Segment F, the presence of the MRT line aligns more clearly with long-term accessibility gains, evidenced by positive and significant effects even at distances up to 2 km (CTRL2). These differences underscore the importance of local context, income level, and spatial configuration in determining how the MRT system shapes housing market dynamics across urban segments.

5. Conclusions, policy implications, limitations and future works

This study adds to the growing scholarly discourse on the influence of urban rail systems, such as the SBK MRT Line, on residential property prices. Of particular relevance, it provides empirical evidence on the relationship between accessibility to urban rail transit – encompassing both station proximity and rail alignment – and property prices within the rapidly urbanising context of Greater Kuala Lumpur, Malaysia. Leveraging a comprehensive dataset of more than 1,000 residential transactions across two distinct submarkets and covering the period from 2013 to 2019, this study employed a series of hedonic pricing models to explore market responses to major transportation investments. The longitudinal nature of the data facilitates an evaluation of the MRT system's impacts over time, while the cross-sectional component enables comparative analysis across different geographic segments. After accounting for locational homogeneity, income brackets, and housing typologies, the model estimations yield several critical insights: (a) Properties located within 0.85 kilometres of the nearest MRT station and sold after the system began operating experienced a statistically significant price increase of 7.4% which, at the mean, equates to RM81,325. Although this finding might be good news for some property owners, properties located within 0.08 kilometres of the MRT track in the affluent neighbourhoods on the north-western side of the city were about 16.6% (RM182,432 of mean) *less* expensive than those located outside this distance. The results in this study are of a similar magnitude and direction as in research conducted by Forouhar and Hasankani (2018), Forouhar (2016), Kilpatrick et al.

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(2007) Bellinger (2006), Debrezion et al. (2006), Chen et al. (1998), and Nelson (1992). For instance, a study carried out by Debrezion et al. (2006) showed a negative effect of distance to railways, with properties located within 0.25 kilometres of a railway line priced about 5% lower that locations farther away than that distance, while Nelson (1992) found that properties located in high-income neighbourhoods were negatively affected by mass transit stations in Atlanta, Georgia. Moreover, the results suggest an insignificant increase of 0.2% for properties within 1.4 to 2 kilometres from the nearest MRT station; (b) Properties located within 0.8 and 1.4–2 kilometres from the nearest MRT station were valued positively by homebuyers from middle- and lower middle-income groups on the south-eastern side of the city. The results show that property prices increased by about 8.8% (RM45,475 of mean) and 6.0% (RM31,005 of mean) for those located within 0.8 and 1.4 to 2 kilometres of the nearest MRT station, respectively. These results are of a similar magnitude and direction as those reported in other studies (for example, Dziauddin, 2019; Li, 2018). An interesting accounting conclusion based on these results is that proximity to the nearest MRT station tends to have a positive but non-linear effect on properties located within two kilometres of an MRT station.

The stronger negative impact observed in high-income areas can likely be attributed to heightened sensitivity to externalities such as noise, visual intrusion, and loss of privacy – factors which may override accessibility benefits. Conversely, in the more modest-income areas of Cheras, improved accessibility appears to be a more dominant concern, with proximity to the MRT viewed as a critical enabler of mobility, economic opportunity, and time savings. Moreover, market responses may also be influenced by supply constraints, with limited affordable housing stock near stations intensifying demand, and by public perception, particularly where trust in the reliability and convenience of MRT services is uneven across the city.

Moving beyond the statistical results, the findings of this study have two important implications for the planning and policy-making communities; namely, the powerful need for potential implementation of land value capture and strategic transit-oriented development planning.

The study highlights the potential of land value capture (LVC) as a viable financing strategy for urban rail transit in Malaysia, especially as traditional funding sources like fare revenues and government subsidies become increasingly inadequate. Drawing on global examples from cities such as Hong Kong, Singapore, and Tokyo, LVC instruments – ranging from tax increment financing to air rights sales – have been used successfully to recover public investment in transit infrastructure. However, implementing LVC must be approached with caution to avoid regressive impacts, particularly on individuals with high asset value but limited cash liquidity. Policymakers need to consider both the positive and negative externalities of rail systems, ensuring that LVC mechanisms distribute financial responsibilities equitably and do not worsen social inequality. Another promising strategy is transit-oriented development (TOD) through joint public-private ventures. This approach, effective in cities like Hong Kong and Singapore, integrates compact, mixed-use developments near transit stations to generate value and support rail financing. However, Greater Kuala Lumpur faces challenges due to limited undeveloped land near MRT stations, as seen along the Putrajaya Line. The study suggests recalibrating TOD zones – for instance, narrowing commercial zones to a 0.15 km radius and residential to 0.5 km—to reflect land constraints and market responses. While TOD can enhance accessibility and urban density, careful planning is essential to prevent gentrification and ensure inclusivity, as high-end developments near stations risk marginalising middle- and lower-income residents. Despite the robustness of this study's findings, certain limitations merit acknowledgment, along with recommendations for future research directions. Subsequent investigations would benefit from utilising extended longitudinal datasets that commence at least five years prior to the public announcement of new MRT developments. This extended temporal scope would enhance the ability to detect baseline trends and assess the long-term evolution of property values in response to transit investment. Further, future studies should consider broadening the analysis to encompass both residential and commercial property markets, given the potential for differential responses to transport infrastructure improvements. Additionally, where data availability permits, property price estimations should be disaggregated at the individual station level to capture spatial heterogeneity in transit impacts.

In summary, the evidence presented confirms that MRT systems induce both beneficial and adverse externalities affecting residential property values. Crucially, while the positive effects tend to have a widespread influence across multiple housing estates, negative impacts appear to be spatially limited, primarily affecting properties in close proximity to the rail alignment.

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