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Influence of the Mass Rapid Transit System on Plotted Residential Property Prices: A Case Study of Gurugram, India

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ABSTRACT

Mass Rapid Transit Systems (MRTS) are increasingly recognised as critical drivers of urban transformation, particularly in rapidly urbanising cities at the Global level. However, empirical research on their influence on plotted residential property markets in emerging urban contexts remains limited. This study investigates the socio-economic impact of the Delhi Metro Line extension in Gurugram, India, across the various phases of the metro project. Using a mixed-methods approach, it combines a hedonic price modelling of 300 residential properties from 2007 to 2024 with qualitative surveys and spatial analysis. The study measures "proximity premiums" and contextualises them through stakeholder perspectives. The results indicate that properties within 500 metres of a metro station experienced price growth of 20–25% after project announcement and around 30% post-operation, relative to earlier trends. These effects are highly localized, with premiums diminishing beyond 1km and disappearing beyond 1.5-2km. The hedonic model confirmed distance to the nearest station as a key determinant of price with an average 12% price decrease per kilometre ($p < 0.01$), along with other influential variables like plot size, proximity to the CBD, and highway access. The model showed strong explanatory power ($R^2 \approx 0.64$). The findings reveal that MRTS can substantially enhance residential property prices but also influence the spatial distribution of economic opportunities, potentially intensifying socio-economic disparities if unregulated. This paper advances the debate on land value capture in Indian cities, offering evidence-based recommendations for equitable urban development strategies in the context of contemporary urbanisation.

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Highlights:	**Contribution to the field statement:**
- The implementation of MRTS led to a 20 to 30% increase in the value of homes within 500 meters of stations, which supports the bid-rent theory in a growing city. -The price of the property is increasing significantly, with the most significant jumps occurring near metro stations and the smallest jumps more than 1.5 km away. -About half of the price premium showed up during the planning and building stages, and the other half showed up after metro operations started.	This study offers insights into how the Mass Rapid Transit System (MRTS) infrastructure shapes socio-economic patterns in a rapidly urbanizing Indian city. It shows the novel empirical examination of the relationship between plotted residential property prices and the context of an emerging economy, with a specific focus on Gurugram, India. It helps people understand how public transportation affects property prices in cities with extensive planned development. This paper contributes to transit value research by examining price fluctuations in the different phases of the metro project. It provides decision-makers with important information on how to maximize land value.

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1. Introduction

Urbanisation in the twenty-first century is marked by unexpected rates of spatial expansion, infrastructural investment, and socio-economic transformation (Iamtrakul et al., 2024; Begam et al., 2024). In many emerging cities, urban transport infrastructure—particularly the Mass Rapid Transit System (MRTS)—serves not only as a mobility solution but also as a catalyst in reshaping the urban land markets, investment patterns, and choices of residential location (Yu et al., 2024). Improvements in accessibility from major projects, like metro rail transit, usually lead to higher property prices, aligning with traditional urban economic theory (Tang et al., 2022; Barbosa, 2024).

According to Alonso's (1964) bid-rent theory, shorter travel times and better connectivity make people more willing to pay for well-located land. Empirical research across the world confirms this theory. Many studies have shown that being close to mass transit, such as rail or metro, is linked to higher property values (Zhang et al., 2024; Jiang et al., 2020). For instance, a meta-analysis by Rojas et al. (2024) found that in Southern Sweden, house prices increased by about 2.3% on average for every 250 metres reduction in distance to a railway station. However, commercial properties often experience greater value gains. One study reported a roughly 12% hike in commercial values within 0.25 miles of a transit station because businesses are willing to pay more for good accessibility. These capitalisation effects have been documented (Ko, 2021; Zhang, 2023; Guan et al., 2021).

Overall, across cities in North America, Europe, and Asia, transit accessibility adds value to nearby properties, although the impact of the premium varies. Not all research, however, highlights a uniform positive impact of transit investments. Local conditions can change or even reverse the effects of improved accessibility. For example, proximity to a new rail station in suburban Washington, DC—a car-oriented setting—negatively impacted the real estate market in the neighbouring area (Acuña, 2023). The adverse effects were caused by noise, traffic, crime, and parking issues. Likewise, a study in Manchester (UK) found no significant change in house prices before and after the opening of a new tram line, indicating that local factors and alternative transport options can alter the expected accessibility benefits (Rennert, 2022). Similarly, in Atlanta, where a high crime rate near some MARTA stations reduced the benefits of accessibility, mixed effects on nearby home values were observed (Acolin et al., 2022).

In contrast, many U.S. studies have shown significant increases from transit. In Chicago, for instance, land values around planned metro stations began rising years before the service started (Acton et al., 2022). Similarly, in Wuhan, China, property prices within 1.6 km of new subway stations jumped by about 7–14% after the stations opened (Bardaka, 2024). These findings show that transit infrastructure generally has a significant impact on the real estate market, although the timing and magnitude of impacts depend on local urban conditions. Transit infrastructure often catalyses positive change in neighbourhoods by attracting more commercial activities and improving amenities, which in turn can boost property values of nearby areas. However, it is important to be mindful of the potential risk of gentrification, which can displace lower-income residents who are affected by the improved accessibility (Bardaka, 2024). These complex results emphasise the importance of integrating MRTS projects with broader urban planning strategies to ensure sustainable development (Begam et al., 2024).

1.1 Background and Context

Gurugram, previously known as Gurgaon, is part of India's National Capital Region and presents a relevant case study to examine how transit development impacts these dynamics, with implications for both real estate markets and socio-spatial equity. In the past two decades, the city has undergone significant urbanisation and infrastructural development, including the extension of the Delhi Metro and the establishment of a local metro system, which is developed and operated by private players. Consequently, real estate activity and land prices in Gurugram have seen a significant increase, particularly in the plotted residential sectors.

However, there has been a paucity of scholarly research regarding the reactions of these markets. The real estate sector in the study area encompasses a substantial portion of "plotted development," distinguishing it from literature focused on residences or commercial structures. In such settings, the development of infrastructure projects, especially the transit system, is directly linked with land/property prices as well as projections of future development. While this model is standard in Indian cities, few studies examine how transit investments affect these properties and the socio-economic dimensions of contemporary urbanisation (Parihar et al., 2025). It is crucial to understand how investments in mass rapid transit systems affect the prices of plotted residential properties and also increase the demand for residential, commercial, and industrial properties along metro corridors (Begam et al., 2024).

1.2 Problem Statement and Research Gap

In India, plotted developments form a substantial part of the urban land market, often in both regulated sectors and informal colonies. However, most of the empirical literature concentrates on market trends related to built developments such as offices and apartments, as well as commercial properties. In contrast, the dynamics of plotted properties remain comparatively less explored and understudied. Emerging research in India has now begun to record these effects. For instance, Singhal and Tyagi (2021) found that the price of commercial properties declines while the Delhi Metro is being planned and built, but increases after it opens.

There is still uncertainty about when this value uplift occurs, how much it varies, and its geographic impact, particularly for plotted properties. The study by Karthigeyan and Chander (2020) examined the impact of a Chennai Metro station on development in the influence zone (within a 10–12-minute walking distance) by assessing accessibility and other factors, including MRTS availability. Kashyap and Berry (2015) examined the value of land near Jaipur metro stations and suggested changing zoning regulations to maximise these benefits. Several studies analyse price changes across spatial and temporal dimensions (e.g., Malhotra & Rastogi, 2020), while global empirical studies highlight the heterogeneous capitalisation by type of properties and market segments.

For example, the impact of Seoul's Metro Line 9, utilising a spatial difference-in-differences approach, showed that office spaces and high-end apartment developments experienced the most significant value gains from the new line. In contrast, lower-priced residential areas saw comparatively minor benefits (Chun-Chang et al., 2020). This contribution highlights inequality concerns, as high-investment properties and affluent neighbourhoods might benefit disproportionately from transit-induced improvements, likely exacerbating the value gap between different areas (Schirripa Spagnolo et al., 2024).

Zhang et al. (2024) identified significant appreciation in residential property prices due to the introduction of light rail, compared to land-assessed values in regions that experienced slight declines. Suri and Cropper (2024) estimated a 7–8% increase in property sale prices within 1 km of the Metro in Mumbai, affecting both commercial and residential land values. Wang et al. (2021) found the most substantial impact of rail transit on housing prices within a 400 m radius along Fazhou Metro Line 1 during different phases of the project. The most significant impact occurred in the operation phase, with a 19.6% average increase compared to the construction phase.

Despite this progress, no prior research has systematically examined the impact of MRTS on plotted residential property prices through the different phases of development—announcement, construction, and operation. Nor have studies assessed how far the benefits extend spatially. Most international research focuses on built-up properties in developed nations. There is a lack of empirical evidence from Indian cities, particularly about changes in the value of plotted residential property over time. This study aims to address that gap by examining the relationship between Gurugram's plotted residential market and mass rapid transit development by estimating:

(a) the magnitude of price upliftment for plotted residential property due to MRTS,
(b) the distance over which these effects are felt, and
(c) the project phase during which value changes are most significant.

1.3 Objectives and Hypotheses

The study examines the impact of MRTS on residential property prices in Gurugram across different stages of the project. The goal is to measure the price increase linked to metro access and to explore how prices change over time and space. Key questions include: Did property prices get influenced by the metro, and what was the impact of the metro during different phases of the project? These four hypotheses are proposed: (H1) Anticipation Effect: Pre-Operation Capitalization: Prices near planned metro stations rose before the system became operational. (H2) Operational Effect: Post-opening capitalization: property prices appreciated significantly near the metro station. (H3) Distance Decay: the price depreciates as one moves away from the metro station, reaching its maximum within 500m and becoming negligible beyond 1.5–2 km. (H4) Local Amenities: Other factors (e.g., plot size, proximity to CBD or highways) also influence prices, but metro proximity remains significant after controlling for these. These hypotheses, which draw from urban economic theory and previous studies, form the strong base of our research and require empirical testing in the Indian context.

1.4 Significance and Structure of the Paper

The study offers academic and policy relevance. It is among the first studies to evaluate MRTS impacts on plot-level residential property values in an Indian city. By analysing phase-wise value changes across the metro project lifecycle (announcement, construction, and operation) and distance decay, the study contributes depth to existing literature, which typically focuses on post-completion analysis. The findings support implementing more effective land value capture mechanisms within a policy framework (Development Control regulation, Floor Area Ratio). If property prices rise by ~30% near stations, a portion could be tapped for infrastructure funding. The Ministry of Housing and Urban Affairs (2017) also encourages such practices in national policy. Furthermore, insights into the spatial extent of price benefits can inform zoning changes, increased Floor Area Ratios (FAR), and affordable housing mandates near stations to avoid displacement and support inclusive growth. The methodology used in our research enhances the robustness of findings and overcomes common data limitations in developing urban settings. The paper is structured into four sections as shown in Figure 1 , with Section 2 focusing on the methods and materials, research procedure, and data analysis. Section 3 presents the results of applying Hedonic Price Modelling and Difference-in-differences, along with price trends by metro phase. Section 4 presents an interpretation of empirical results and key findings, concluding with a discussion on future research scope. It also discusses findings related to the hypotheses, offers policy implications, and examines limitations.

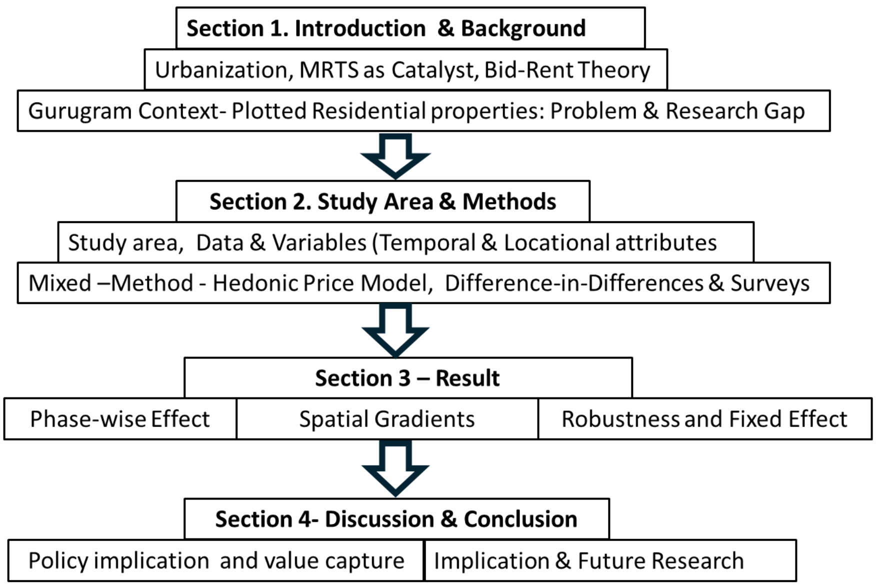

Figure 1: Structure of the paper.

2. Materials and Methods

2.1 Study Design and Setting

This study employed a mixed-methods research design to assess the impact of the Mass Rapid Transit System (MRTS) on plotted residential property prices in Gurugram, India. The use of both quantitative and qualitative methods was essential due to the complex relationship between determinants (e.g., metro proximity, plot size, market trends, etc.) of the property price. The methodology consists of two primary components:

1. Hedonic Pricing Model (HPM): This quantitative analysis (Erdoganras et al., 2023)(Muto et al., 2023) Assesses how proximity to metro stations and other factors affect residential property prices across three phases—pre-construction (2007), during construction (2008-2010), and post-operation (2011)—as well as prices in 2024. To verify the robustness zone, DID has also been applied by comparing the property prices in the treated zone and the control zone (Chen et al., 2022).
2. Qualitative and Spatial Analysis: Field surveys and stakeholder interviews complemented by Geographic Information System (GIS) mapping provided a spatial-temporal understanding and validation of the model's findings.

The study focused on the urban corridor served by the Delhi Metro's Yellow Line extension in Gurugram. The prominent metro stations analyzed in the corridor included Guru Dronacharya, Sikenderpur Metro station, MG Road, Iffco Chowk, and Millennium City Centre. Plotted residential areas within a 2000 m radius of metro stations formed the primary treatment zone, aligning with typical influence zones developed by literature and National Transit-oriented Policy (2020). Properties beyond 2000m from the metro station were considered control zones, reflecting general market trends unaffected by MRTS, and were used for comparison. Key neighbourhoods studied were along the metro station, including planned and unplanned areas like Sushant Lok, DLF Phases (1–5), urban village, colonies, and South City. This double-checks approach aided a strong analysis of metro-induced price variations and supported triangulation, hence improved the reliability and depth of the study's findings.

2.2 Participants or Subjects

We conducted field surveys and interviews with primary stakeholders in Gurugram's real estate sector, including property dealers, property owners, developers, and urban planners. They shared insights on price trends and the perceived impact of the MRTS by providing sales details of the properties, such as price, plot size, and other property features. Many reported a rise in prices after the announcement or during metro construction, while some noted buyer hesitation during construction phases. Their perspectives helped us deepen our understanding of the context of the study. Simultaneously, we analyzed approximately 300 residential property transactions from 2007 to 2024 to create our empirical dataset for statistical analysis. Together, stakeholder perceptions and transaction data formed a solid basis for examining the metro's influence on property values.

2.3 Materials and Equipment

To develop a comprehensive and reliable dataset, the study adopted a triangulation approach, sourcing data from primary and secondary sources, which ensured reliability in both qualitative and quantitative parameters of property price trends near Gurugram's metro corridor. Primary data were collected through stakeholder interviews and surveys. In contrast, secondary data on property prices were sourced from online platforms such as MagicBrick and 99acres, as well as from reputable real estate consulting firms like JLL (2021) and other Consulting firms. As the survey helped us to understand the study area in detail, online sources provided additional strength to our database. GIS was used for referencing the properties and measuring other distance-based attributes, like distance from the metro station, city centre, major highway, etc. Distances were measured as straight lines from the metro station to the property, and statistical analysis was conducted using SPSS. The whole data set included details of 300 residential properties and their sale price from 2007 to 2024.

2.4 Procedures and Protocols

The whole data set consisted of the addresses of 300 plotted residential properties along the metro corridor, property features like age of the building, no. of floors, area, distance from the nearest metro station, distance from the CBD, and Distance from the nearest park/ green space, distance from the nearest hospital and school, width of access road. The data also consisted of property prices from 2007 to 2024, in per sq m. To study the impact of the metro on property pieces, a Hedonic Price model was formulated, which calculated the natural log of property sale price as the dependent variable and considered other attributes as independent variables and interaction terms of different phases of the metro project. The logarithmic transformation helped to standardize the price distributions and made it easier to understand he coefficients as percentage impacts. Along with this, GIS was used to map the price change and delineate the study area and distance bands, as shown in Figure 2. This visual representation helped to confirm the model and its results. Furthermore, the difference-in-differences (DID) was employed to study the causal effect of the property prices within 500m from the metro station as the treated group, with the properties more than 2000m away as the control group. Ultimately, integrating empirical results with spatial analysis enhanced the study's validity, thereby strengthening confidence in the conclusion.

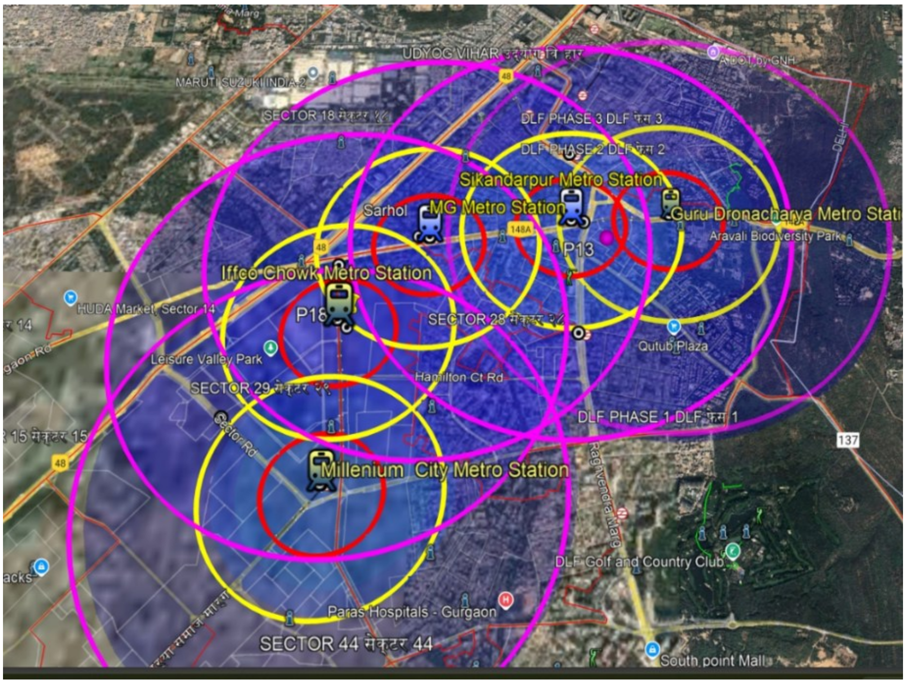

Figure 2. Spatial representation of the metro station and the influence zones.

Figure 2 illustrates the five identified stations: Guru Dronacharya Metro Station, the initial station originating from Gurugram, extension of the Delhi Metro yellow line in Gurugram, Sikenderpur, MG Road, Iffco Chowk, and Millennium City Centre. The figure illustrates three distinct distance bands distinguished by colours: red indicating a radius of up to 500 meters from the metro station; yellow representing a distance of 501-1000 meters; and pink denoting a distance range of 1000-2000 meters.

2.5 Data Analysis

The study utilized Hedonic Price Modeling (HPM) to evaluate the results, decomposing property prices accordingly. The HPM decomposes a property's price into the implicit values of its attributes. Our dependent variable was the natural logarithm of the sale price per square meter of each plotted residential unit, which normalized the distribution and enabled percentage-based interpretation of coefficients.

The core regression model is structured as follows in Equation 1:

$$ln(P_i) = \beta_0 + \beta_1(DisMetro_i) + \beta_2(DisMetro_i \times PostAnnounc_i) + \beta_3(DisMetro_i \times PostOpen_i) + \sum_k \gamma k X_{ki} + \varepsilon_i$$

Where:

- P_i - Price per square meter of plot i
- $DisMetro_i$ - Distance of plot i to the nearest metro station (km)
- $PostAnnounc_i$- Dummy variable = 1 if a sale occurred after the metro announcement (2007)
- $PostOpen_i$-Dummy variable = 1 if sale occurred after metro operation began (2010–2024)
- $\sum \gamma k X_{ki}$ - Vector of other property and locational attributes
- ε_i - Error term

This result illustrates the impact of metro proximity on the three phases of the project, as shown below:

- β_1 (Pre-announcement slope)- examined the impact of the proximity to the metro station before the announcement of the metro project. Moreover, showed a negligible effect.
- β_2 (post-announcement change): Indicated a negative value, which means an increase in the property prices after the announcement of the metro, driven by the expectation of the buyers.
- β_3 (post-operation change): After the operation of the metro, an additional price premium was noticed. A prominent negative coefficient indicates a sharp price increase due to proximity to the metro.

The model also studied the control variables related to location, property features, and accessibility, which impact the property prices. The key variables are as explained below:

Distance to nearest highway (m) - This measures road accessibility to the closest highway, which in this case is NH48. Better connectivity to the road and proximity generally enhance the property prices. However, extreme nearness sometimes causes disadvantages, such as noise.

Distance to CBD (m) - This is the straight-line distance from the property to the city's commercial hubs, such as DLF Cyber City and MG Road. As proximity to the CBD increases desirability and price premiums, a negative coefficient was expected.

1. Distance to nearest park (m) - A negative coefficient was expected, as proximity to green spaces and parks is associated with fundamental amenities that directly relate to health and the environment.
2. The width of the access road (m) indicates the width of the road next to the property, which reflects better neighbourhood infrastructure and improves accessibility, thereby promising a positive coefficient.
3. Plot Area (sqm) - Plot size is the most critical factor of the property, and larger plots often have a lower price due to the effect of "bulk discounts" compared to smaller plots. So, expecting a slightly negative coefficient.
4. Year of the sale fixed effect- A variable affected by macroeconomic factors such as inflation, policies, and the tax structure, influencing the real estate market and property prices. Additionally, dummy variables were created for each transition year (2007-2024) to ensure that the results accurately reflect changes in property prices within the specific study area rather than across the entire city.

To address potential spatial autocorrelation, standard errors were clustered by neighbourhood. Residual diagnostics confirmed the model's reliability. Using statistical modelling, we assessed R^2 and the F-statistic to evaluate the model's fit. Aside from observational data, the study also introduced a quasi-experimental framework. Consequently, the study analyzed the difference between treated and control zones to capture metro-related impacts, employing interaction terms of distance and time in a difference-in-differences (DID) approach. It examined the causal effect of metro accessibility on property prices. The model specification is as follows in Equation 2:

$$Price_{2024} = Treated + Price_{2010} + DID$$

The variables of the model are explained below:

Price $_{2024}$ -Dependent variable as the current property price.

Treated -A binary variable (1=property within 500m of the metro, 0=otherwise), highlighting baseline spatial advantage even before the metro's impact.

Price $_{2010}$ -Control for starting property prices to measure the difference and time-invariant features.

DID -This is the interaction between treated properties and controlled properties.

It is observed that the impact of metro accessibility is slightly greater in privately developed areas due to better last-mile connectivity. It is also confirmed that property prices in the metro-influenced zones are not directly affected by the city's overall market trend, but rather by metro accessibility.

We examined the data from the field surveys to identify common statements regarding the metro's impact. We compared these findings with the timeline and magnitude of effects indicated by the regression analysis. For example, many local realtors and residents remembered that "prices in Sector 54 started creeping up as soon as news of the Rapid Metro surfaced," highlighting an anticipation effect that occurred well before the line began operations. Some respondents also noted that during construction, confusion and noise from ongoing works led to some buyers being unsettled, indicating a lesser impact on property prices in that period. These direct observations provided qualitative support for the phase-wise findings, as per the model, including increased values following announcements and the potential for a period during construction. They also emphasized that attributing price changes to the metro was a visible and transparent process, especially compared to other infrastructure development. For example, if a specific sector saw a spike in 2010 because of a significant development launch unrelated to the sector, our interviews and local insights helped identify this. This confirmed our analysis, which was described in detail, including the incorporation of year effects and regional factor controls. The phased analysis is beneficial here – by demonstrating that the distance to the station became important only after the metro initiative and not before, we strengthen the argument that the change began openly by the metro (assuming other factors would not systematically produce the same pattern). Additionally, we compared our findings with established empirical patterns from the literature. It is observed that property prices and the distance decay in the study area are significant, which supports the theoretical assumptions and previous studies. The following section presents the analysis results and highlights the extent and timeframe of property price changes due to MRTS.

3. Results

3.1 Presentation of Key Findings

It is evident from the analysis that the metro availability and accessibility in the study area have a significant impact on the residential property prices. (Jiang et al., 2020) (Rey-Blanco et al., 2024). The results of the Hedonic Pricing Model (HPM) and Difference-in-Differences (DID) are summarized in Table 1 and Table 2, which also prove the same. The introduction of metro accessibility created a price premium, particularly after the metro's official announcement and subsequent opening. Specifically, the post-announcement period saw a distance premium of approximately 4.7%. In comparison, the post-operation phase resulted in an increased premium of around 9.1% for every kilometre closer to a metro station. The findings indicate that the metro plays a significant role in defining the land and property market.

Table 1: Hedonic Regression Results – Determinants of Log Land Price (₹/sq m).

Variable	Coefficient (β)	Std. Error	Significance
Distance to Metro (km)	–0.008	0.012	(n.s.)
Distance × post-announcement	–0.047	0.011	*** ($p < 0.001$)
Distance × post-operation	–0.091	0.014	*** ($p < 0.001$)
Plot Size (100 sq m)	–0.026	0.005	*** ($p < 0.001$)
Distance to CBD (km)	–0.059	0.008	*** ($p < 0.001$)
Distance to Major Highway (km)	–0.022	0.007	** ($p < 0.01$)
Distance to Nearest Park (km)	–0.015	0.006	** ($p < 0.01$)
Access Road Width (m)	+0.0035	0.0012	** ($p < 0.01$)
Constant	9.631	0.078	***
Year Fixed Effects	Included	–	–
Adjusted R^2	0.632	–	–
F-statistic (model p-value)	57.97 ($p < 1e-59$)	–	–

*Note: *(n.s. = not significant; **p<0.01; **p<0.001)*

Table 1 presents the findings of the Hedonic Price Modelling, which quantifies the relationship between metro accessibility property attributes and locational attributes on residential property prices in the study area, highlighting a significant price uplift during the post-announcement and post-operation phases. The model shows 64.3% of the variation in the property prices, which indicates a strong explanatory power.

Table 2: Result of DID Regression analysis.

Variable	Coefficient (₹)	Std. Error	t-Statistic	p-Value
Intercept	5000	1200	4.17	< 0.01
Treated (Within 500m)	22000	3200	6.88	< 0.001
Price_2010	0.65	0.05	13	< 0.001
DID Interaction Term	28330	3100	9.13	< 0.001
Model Summary				$R^2 = 0.835$

Table 2 summarizes the Difference-in-Differences (DID) regression results, showing a substantial positive causal impact of metro access on property prices. The DID interaction terms (Rs. 28330/-) are highly significant, which proves that the proximity to the metro enhances the property prices.

3.2 Statistical Analysis

This section presents the results of the Hedonic Price Modelling (HPM) and Difference-in-Differences (DID) analysis, which shows the quantification of the influence of metro accessibility on the property prices of the plotted residential area in Gurugram. The Key findings, which include:

- Distance to Metro: The pre-announcement coefficient ($\beta = -0.008$) was not significant, confirming that, before the metro's announcement, proximity to the metro did not affect land prices. After the announcement, however, proximity to the metro became a significant factor, with a 4.7% price premium per kilometre closer to the metro station during the announcement-to-construction phase.
- Post-Operational Impact- Following the metro's operation, property prices increased by 9.1%, indicating a significant rise in property values.
- Other factors- Each factor behaved differently, for example, plot size, which showed a negative relationship with property prices, as demonstrated by the HPM. Similarly, proximity to the CBD and major highways was associated with higher property prices.

The results were aligned with a multicollinearity check, confirming that the high correlation did not skew the relationships between variables.

The DID coefficient is ₹28,330 per sqm ($p < 0.001$), indicating that, after accounting for baseline differences and price trends, properties near metro stations gained ₹28,330/sqm more than others due to the metro becoming functional.

4. Discussion

The results of this study highlight a strong connection between proximity to the metro and the price of residential properties in Gurugram. We observe that the metro's announcement and subsequent operation significantly increased the price, confirming that both anticipatory effects (before construction) and realized benefits (after metro operation) contributed to raising property values.

This reinforces the idea that MRTS infrastructure serves as a key driver of urban property price appreciation. The temporal effect of the metro (pre- and post-opening) demonstrates the broader economic principles of value capture and accessibility, where early stages of a transportation project (announcements and planning) can already influence market behaviour, and the operational phase amplifies these effects as accessibility becomes a tangible benefit.

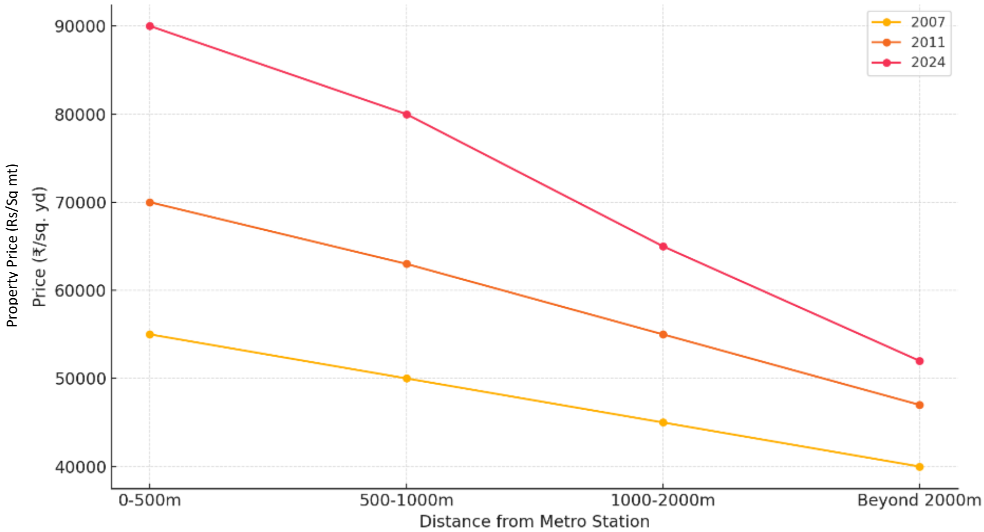

Figure 3. Property Prices Vs Distance from the Metro.

The line chart, as shown in Figure 3, shows how property prices change over time across four distance ranges from metro stations—0–500m, 500–1000m, 1000–2000m, and beyond 2000m—during the years 2007, 2011, and 2024. It reveals a steady trend that property prices decrease as the distance from the metro increases.

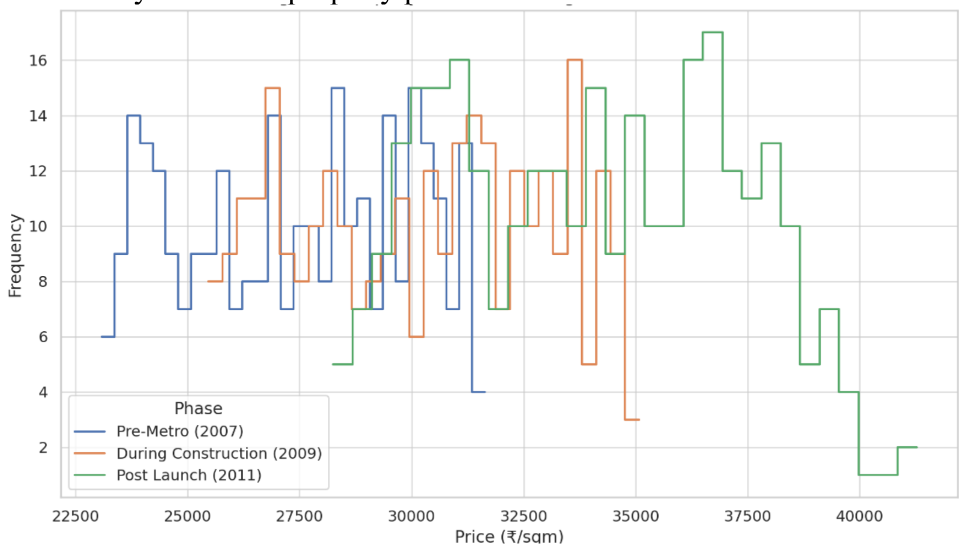

Figure 4. Histogram showing the frequency distribution of property prices during the project phases.

The histogram compares the frequency distribution of property prices across different phases of the metro project, representing the metro's positive impact on prices. The chart indicates an upward shift in the price distribution, with the maximum hike in prices occurring near metro stations.

The results of the study align with international studies (Choi & Hyun, 2022), which proves that the infrastructure facility, especially transit systems, promotes property prices. However, in our study area, the introduction of the Mass Rapid Transit System (MRTS) has shown the same effect on the residential property prices. However, along with this development, the challenges related to socio-economic equity, affordability, and urban policy are also examined by other studies. The study shows that in Gurugram, the infrastructure-related growth and transit-oriented development may produce inequality without proactive policy intervention, as proven by many other studies (Erdoganras et al., 2023). The results of the research align with other global studies (Cárdenas et al., 2023; Diao et al., 2021) related to the impact of MRTS on property prices. Gurugram's findings are consistent with these international benchmarks, which typically report a 10–20% price increase for residential properties near new transit stations. Zhu et al. (2022) demonstrate that the role of accessibility of transit infrastructure is highly context-dependent, with other local factors like proximity to parks, schools, and hospitals in enhancing property prices, while shopping centres have limited impacts, highlighting how existing amenities moderate transit benefits. However, what distinguishes this study is the phase-wise analysis, which shows that property prices in Gurugram started to rise even before the metro became operational (during the announcement-to-construction phase). These insights underscore how expectations of improved accessibility can shape market dynamics well in advance of project completion, providing valuable lessons for policymakers and urban planners for sustainable development.

The mixed-method approach is the strength of our research, combining both qualitative and quantitative analysis. This approach helps us to understand both the local market trend and statistical trends. The observational aspects of the research require cautious inference about causality. While the DID method was used to assess the metro's impact on property prices in isolation, other unobserved factors also influence property prices, which can be added in further research. Additionally, the dataset of 300 properties is not comprehensive, so additional research could examine more properties. Another limitation of the study is the quality of geospatial data, as the study used GIS to measure proximity to metro stations and other variables. Future research could incorporate ridership data and other more accurate measurement metrics.

The research revealed an uplift in the plotted residential properties in Gurugram, presenting an opportunity for policymakers and regulatory authorities to capture land values through betterment levies and similar mechanisms. That additional fund can be used for infrastructure improvement. For future research, it would be valuable to examine the socio-economic impact of property enhancements on prices, both for residential and other land uses like commercial and retail properties in Gurugram itself.

5. Conclusion

This study examined the influence of the Mass Rapid Transit System (MRTS) on plotted residential property prices in Gurugram, India, across the phases of metro development. By integrating hedonic price modelling with qualitative surveys and spatial analysis, it demonstrated that metro accessibility is a decisive factor in shaping property markets. Properties located within 500 metres of metro stations experienced a significant 20–30% increase in value, with premiums tapering beyond 1.5–2 km. Importantly, nearly half of the price appreciation occurred during the announcement and construction stages, reflecting strong anticipatory effects, while the operational phase further consolidated these gains.

The findings confirm the central hypothesis that distance to the metro station exerts a strong and measurable effect on property values, consistent with urban economic theories such as bid-rent and accessibility capitalisation. They also highlight other locational determinants—plot size, proximity to highways, and central business districts—that interact with transit accessibility in determining price outcomes. Beyond their economic significance, these results underscore broader socio-spatial implications. While MRTS development creates opportunities for value capture and urban growth, it also risks exacerbating affordability challenges and socio-economic inequality if not coupled with inclusive planning mechanisms. Like many empirical studies, this research faced limitations in terms of data scope and spatial resolution, and unobserved variables may still influence property price dynamics. Future research could expand the dataset, adopt spatial econometric techniques, and investigate the impacts on rental markets, land-use conversion, and affordability outcomes. Comparative analyses between planned and unplanned neighbourhoods would also provide valuable insights into the differential capacity of localities to capitalise on transit investments.

In conclusion, the evidence from Gurugram demonstrates that MRTS infrastructure not only enhances residential property values but also reshapes the urban economic landscape. Policymakers and planners must seize this opportunity by implementing robust land value capture instruments, zoning reforms, and affordable housing mandates. Doing so will help ensure that the benefits of transit-led development are reinvested equitably, advancing both sustainable urban growth and socio-spatial justice in rapidly urbanising Indian cities.

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Conflicts of Interest
The authors declare no conflicts of interest.

Data availability statement
The original contributions presented in this study are included in the supplementary material. Further inquiries can be directed to the corresponding author. Data supporting the findings of this study are available from the corresponding author upon reasonable request. Sources of publicly available data (e.g., circle rates, online listings) are cited within the paper.

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