

Proximity to Kindergartens and Housing Price: The Case of Bratislava Hinterland

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The paper aims to explore the relationship between proximity to kindergartens and housing prices in the suburban hinterland of Bratislava and to identify the nature of this relationship in the context of current education policy. Using a log-linear regression, this analysis examines whether kindergarten accessibility – measured through distance and capacities – contributes to higher housing prices. Contrary to prevailing assumptions, the results reveal that the influence of kindergartens on housing prices is negative. Although statistically significant, the effect sizes are negligible, suggesting that kindergartens do not have a decisive impact on shaping residential property prices in the Bratislava hinterland. Additionally, the negative association may suggest that new development, characterised by higher housing prices, is located in areas with limited accessibility to kindergartens. The results challenge established paradigms of amenity capitalisation and emphasise the need for context-sensitive interpretations. They also underscore the importance of integrated urban planning that aligns housing development with timely public service provision. This study offers new empirical insights by extending amenity-based housing research to the underexplored context of post-socialist suburban regions. It contributes to more equitable and evidence-based planning strategies.

Keywords: housing prices, kindergartens, hedonic price model, suburbanisation, Bratislava hinterland

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Introduction

A complex interplay of direct and indirect factors shapes housing prices. While the size, condition, and amenities of a dwelling are significant, location remains the most decisive factor (Wittowsky, Hoekveld, Welsch, Steier, 2020). The notion of location encompasses multiple dimensions; however, in the context of housing prices, it primarily refers to relative proximity (i.e., spatial closeness, distance-related accessibility) to public services, amenities, and economic centres. The price of a property thus reflects a trade-off between its location's positive and negative aspects. Skaburskis (2004) argues that inter-regional variations in housing prices become negligible once economic factors such as income, migration, or household change are accounted for. On the other hand, Wen, Xiao and Hui (2019) suggest the inverse is also true: neglecting spatial dependency in property prices leads to an overestimation of the capitalisation effects of property characteristics, as demonstrated through spatial quantile regression models focusing on educational facilities.

The impact of school accessibility and quality on housing affordability has received considerable scholarly attention. It is widely accepted that educational facilities have a significant impact on housing markets (Wen, Zhang, Zhang, 2014; Huang, Hess, 2018). Beyond quality, factors such as transport accessibility and service density are also crucial (Zhang, Li, Lin, Zheng, Li, 2020). A study from Shanghai (Zhou, 2018) confirms these findings for urban and peri-urban contexts. However, research on preschool accessibility and its effect on housing prices remains scarce – particularly in rural, suburban, or post-socialist settings. Most empirical studies focused on Chinese cities or cities from North America/Western Europe, and analyses addressing these issues in other social and economic contexts are largely absent.

The global scholarly literature broadly supports the claim that the spatial distribution of kindergartens influences local housing prices, though findings vary. Numerous studies have confirmed a positive relationship between proximity to kindergartens and housing prices (e.g., Li, He, Xu, Wang, He, 2013; Theisen, Emblem, 2018; Wen, Xiao, Hui, Zhang, 2018; Heyman, Sommervoll, 2019). The results indicate that housing prices increase with decreasing distance to kindergartens, which implies reduced housing affordability and kindergarten accessibility. However, some scholars have suggested this relationship is non-linear (Wen et al., 2019). Wen et al. (Ibid.) found that the relationship is especially pronounced for properties in the lower half

of the housing price distribution, suggesting that access to early education is valued even by lower-income households. Residents of such areas are often willing to bear higher housing costs to secure better educational opportunities for their children (Qiu, Guo, Zhao, Zhang, 2020). Other research suggests a more universal pattern, indicating that proximity to kindergartens affects property values across the entire housing market (Wen, Xiao, Zhang, 2017; Theisen, Emblem, 2018).

A wide range of factors affect property prices, among which accessibility to public amenities – particularly to educational and preschool facilities – plays a crucial role. In its broadest sense, civic amenities encompass educational facilities, public services, transportation infrastructure, green spaces, grocery stores, and health, cultural, or religious institutions. The accessibility of these amenities has a significant impact on both the quality of life and housing prices (Cheshire, Sheppard, 1995). Preferences in housing location and type are not determined solely by the dwelling's physical characteristics but are also strongly shaped by household income. Higher-income households tend to purchase more expensive properties in premium locations, with greater pressure for high-quality amenities (Glaeser, Kolko, Saiz, 2000). These areas, in turn, attract more educated residents, whose presence tends to reinforce local income levels, job satisfaction, and employment opportunities (Hu, Lin, Liu, 2023). However, in the long term, the growth of well-paid employment opportunities in these neighbourhoods may lead to gentrification, reducing housing affordability, limiting access for lower-income groups, and potentially stalling further development.

Prior research indicates that within school catchment systems based on distance, higher-income households tend to relocate closer to higher-quality educational facilities, which drives up local housing prices (Kane, Riegg, Staiger, 2006). In systems where the quality of kindergartens is not systematically evaluated, as in the studied region of Slovakia, travelling and spatial accessibility become the primary factors shaping parental choices. This accessibility concept refers to proximity to a child's residence, a parent's workplace, or even a location along a commuting route. Evidence suggests that parents in Slovakia overwhelmingly prefer kindergartens located near their permanent residence rather than their workplace (Križan, Sládeková Madajová, Rišová, Švecová, Chorvát, 2025). Consequently, in the Slovak context, the influence of kindergarten quality on housing prices is expected to be minimal. It is, firstly, due to the lack of systematic and periodic quality assessment, and, secondly, that the differences between public and private providers were not significant. In such a setting, kindergarten accessibility may attract households from various socio-economic backgrounds and directly influence residential property values.

The ownership structure of service providers introduces an additional layer of complexity. Cortés and Iturra (2019), using geographically weighted regression on twenty-seven types of urban amenities, found significant differences between public and private providers. While private schools, clinics, and shopping malls tend to raise housing prices, public institutions such as state-run schools, kindergartens, and

hospitals often have a neutral or even negative effect. This discrepancy underscores how private amenities reinforce intra-urban inequality and reduce housing affordability. These processes reflect the broader neoliberal restructuring of urban space, in which capital plays a dominant role in shaping access to services and housing, ultimately contributing to the global housing crisis (Wetzstein, 2017). Therefore, kindergartens (particularly private ones) can function as gentrification catalysts, attracting middle-class in-movers and raising prices in suburban neighbourhoods, which were previously considered marginal. Conversely, affordable rental housing can enhance access to higher-quality schools for low-income families (Ellen, Horn, Schwartz, 2016), generating long-term social mobility benefits.

This study builds on existing research by addressing an underexplored spatial and institutional context. In post-socialist countries, the accessibility of civic amenities remains a critical factor in residential satisfaction, both in urban cores (Bursa, 2021) and suburban areas (Špačková, Dvořáková, Tobrmanová, 2016; Výboštok, Štefkovičová, 2023). Among such amenities, pre-primary education (kindergartens) is particularly relevant for families with young children, and its spatial accessibility plays a role in shaping housing demand. However, the studied Bratislava hinterland, influenced by post-socialist planning legacies, exhibits lower kindergarten accessibility in peripheral parts of municipalities that nonetheless command premium prices connected with newly built houses (Ondoš, Miláčková, Belušák, Rusnák, Kusendová, 2017).

Since 1989, Slovakia has undergone a transformation from a centrally planned socialist system to a market-based economy. Children were assigned to the school catchment area based on their place of permanent residence, which changed due to education liberalisation after 1989 (Gurňák et al., 2019). Currently, the kindergarten network and its accessibility are influenced by demographic changes and lower fertility (Nestorová Dická, Lipták, 2024; Švecová, Tolmáči, 2025). These led to a decrease in kindergarten count and capacities. Moreover, many suburbanised localities have suffered from poor infrastructure problems in the past, and some of these problems persist, e.g., conflicts over private infrastructure and under-capacity of schools or kindergartens (e.g., Lokšová, Galčanová Batista, 2021; Sládeková Madajová, Šveda, Výboštok, 2021). This paper aims to empirically explore the relationship between proximity to kindergartens and housing prices in the suburban hinterland of Bratislava and to identify the nature of this relationship in the context of current education policy. Given this context, we ask: Does proximity to kindergarten affect housing prices in municipalities shaped by suburbanisation processes? Is the relationship positive (i.e., housing prices increase with proximity) or negative? What is the functional form of this relationship? Does it vary with distance? Are there observable differences between municipalities? To the best of our knowledge, no published study has yet been conducted in Slovakia or other Central and Eastern European countries on the relationship between the accessibility of kindergartens and housing prices. This creates a significant research gap, particularly in relation to

current legislation and demographics. In particular, although previous international research has typically found that proximity to amenities – such as kindergartens – results in higher housing prices, the case of Bratislava hinterland reveals a diverging narrative.

Current approaches in analysing the relationship between kindergarten accessibility and housing prices

A broad range of indicators and variables is utilised to examine the relationship between the location of educational facilities and housing prices. These include parameters that assess the accessibility of (pre)school facilities, such as proximity, travel time, capacity, and frequency (count). Other variables describe the quality of the educational institutions, which are generally categorised into two groups (Wen et al., 2014): input indicators – resources invested in education (e.g., institution expenditures, pedagogical staff wages, teacher count) and output indicators – observable performance outcomes (e.g., non-pedagogical staff wages, enrollment rate, acceptance rate, number of successful graduates, dropout rates, etc.). However, not all of these parameters are applicable across all levels of education (pre-primary, primary, secondary, tertiary). External factors often influence some input variables and may not directly correlate with the quality of an educational institution. Nevertheless, as shown in the existing literature cited above, all these variables are still related to property prices.

In the Slovak context, the spatial accessibility and capacity of kindergartens are the only relevant variables for examining this relationship. That is because there is no regular, comprehensive evaluation of kindergartens in Slovakia. The State School Inspection evaluates a predefined sample of kindergartens. The most recent inspection, conducted in 2024, revealed no systematic differences in the quality of education between public and private kindergartens. The differences identified were primarily related to staffing conditions.

Constructing a model that accurately captures the relationship between kindergarten proximity and housing prices remains a methodological challenge. Several studies across various countries have attempted to address this by developing hedonic price models based on the classical Alonso-Muth-Mills framework. This model interprets housing location as a result of the trade-off between income-earning opportunities in central locations and the costs of housing and commuting. However, its applicability has proven limited in polycentric urban contexts (Brueckner, 1987). A functional hedonic model should maximise kindergarten proximity's explanatory power while minimising the influence of other locational factors (Khoshnoud, Sirmans, Zietz, 2023). Therefore, to measure the impact of kindergarten accessibility on housing prices, we use a log-linear regression model, which has proven suitable for analysing property prices in proximity to kindergartens (Theisen, Emblem, 2018;

Heyman, Sommervoll, 2019). Several authors have attempted to use quantile regression and more complex models based on spatial weights, often yielding more precise results (e.g., Huang, Hess, 2018; Wen et al., 2019; Qiu et al., 2020). However, these models have also confirmed the robustness and reliability of log-linear models in this context.

Study Area, Data and Methodology

The study area is defined as the commute hinterland of Bratislava. This area is delineated based on the functional commuting regions (FRD) as defined by Halás and Klapka (2024), where we select the FRD-A type and exclude the capital city within its administrative boundaries. Therefore, we also exclude remote areas of Bratislava, which have a more suburban or rural character (see Figure 1). The choice of a functional region over the administrative boundaries of the Bratislava Region (NUTS 3) is due to its stronger internal cohesion, homogeneity, and centripetal pull towards the city of Bratislava. The location of Bratislava on the borders of Austria and Hungary, with borders currently more formal than functional, naturally facilitated suburban development beyond the state border. However, for consistency across datasets, we take a more conservative approach and exclude areas affected by cross-border suburbanisation. The study's time horizon spans 2020–2024. Temporal (20 quarters) and spatial (86 municipalities) variables are control variables in the model.

The post-socialist suburban landscape of Bratislava offers a unique context for studying amenity capitalisation. Rapid urban expansion and legacy planning practices have led to a spatial distribution of public services that departs from classical urban models. The Bratislava hinterland can be characterised as a suburban zone that has experienced rapid, unregulated development under liberalisation and market expansion. Over the past 30 years, the area has undergone dramatic demographic and spatial changes, driven by elevated levels of internal migration and extensive residential and commercial construction (Šveda, Sládeková Madajová, Podolák, 2016; Šuška, Šveda, Krivý, 2018; Šveda, Výboštok, Gurňák, 2021). Recent studies highlight that the region has, over the last 15 years, recorded one of the highest fertility rates in the country (Šprocha, Bleha, Nováková, 2022; Nestorová Dická, Lipták, 2024), resulting in a growing number of preschool-aged children (Novotný, Pregi, 2019; Križan, Šveda, Tarčáková, Bilková, Hencelová, 2020). This demographic shift has led to a temporary shortage of kindergarten capacity (Sládeková Madajová et al., 2021). Slovakia remains marked by pronounced regional disparities, including preschool access – around one-third of Slovak municipalities lack any kindergarten. In contrast, in the study area, only two municipalities – Bellova Ves and Oľdza – lack a kindergarten, reflecting a relatively dense spatial coverage, albeit with inadequate capacity (Švecová, Tolmáči, 2025).

Housing price data used here were provided by United Classifieds (2025). The database collects information from nehnutelnosti.sk, Slovakia's largest property listing portal. Before model creation, data were cleansed of duplicates and outliers (Table 1), with only residential properties (houses and apartments) retained. The dependent variable – property price (logarithmically transformed) – was selected from the cleaned database.

Table 1: Data preparation of property listing prices. Data source: authors.

	Observations
The property is located within the study area	164,320
Duplicate removal (note: a single listing may appear across multiple quarters but not within the same quarter)	71,858
Residential floor area in the range of [10, 200] sqm	68,025
Outlier removal (1% of the most expensive and 1% of the cheapest listings by LAU 2 unit)	64,443

Variables reflecting the accessibility of kindergartens include the distance to the nearest kindergarten, accessibility of kindergartens within 1 km radius, and the total capacity of all kindergartens within a 1 km road access distance. Control variables include various housing characteristics (e.g., a liveable area in square meters, land area in square meters, property type – house or apartment, number of bedrooms, property condition – new construction, original state, etc.), and location characteristics. These include variables for the accessibility of civic amenities (e.g., primary schools, grocery stores, transportation infrastructure – bus and train stops, highway access, parking lots, green spaces such as parks, forests, vineyards, cultural facilities and monuments, religious institutions, cemeteries, healthcare facilities, and dumps) as well as accessibility to regional commuting centres (district cities and the capital). Finally, the model includes time-related (quarter and year) and spatial control variables (municipality – LAU 2 unit). The choice of indicators was supported and guided by already published research on proximity to kindergartens and their impact on property prices (e.g., Theisen, Emblem, 2018; Zhou, 2018; Cellmer, Belej, Trojanek, 2024). While some authors used grouped variables (due to a large number of variables, e.g. Heyman, Sommervoll, 2019; Wen et al., 2019), we opted for an individual approach and analysed all amenities separately. However, an aggregated approach was also applied when analysing the models' robustness.

Unlike traditional hedonic models, neighbourhood characteristics are not included. The reasons for this exclusion are: (1) the preference for location characteristics over neighbourhood characteristics in our model, given their high interdependence; (2) the unavailability of address-level data; (3) using aggregated territorial units would lead to variable autocorrelation. Descriptive statistics for the analysed variables and their data sources are presented in Table 2.

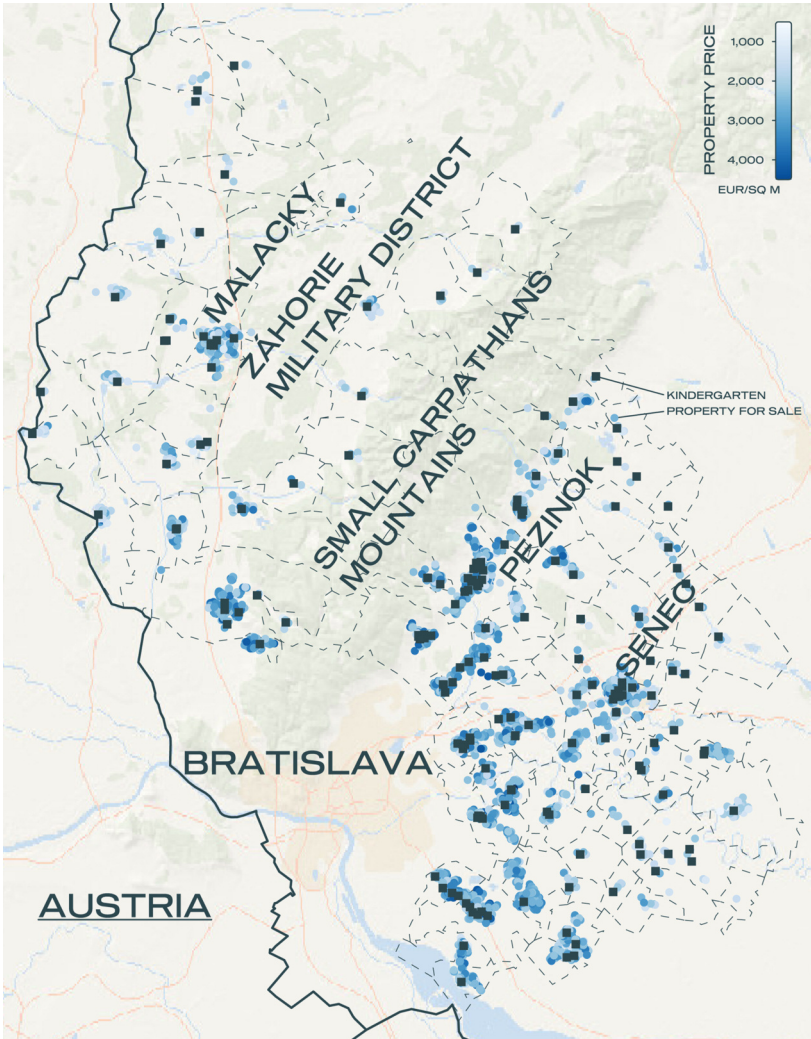


Figure 1: Study area with visualisation of kindergartens and property price values. Data source: Ministry of Education, Research, Development and Youth of the Slovak Republic (2024); United Classifieds (2025); edited by authors.

The large number of accessibility-related amenities and categorical variables may lead to multicollinearity. Some studies have attempted to address this by combining related variables (e.g., Heyman, Sommervoll, 2019). Additionally, some authors suggest that the cumulative accessibility and diversity of amenities may be more important than mere distance (Wen et al., 2017).

The impact of local amenities, focusing on the accessibility of kindergartens, was examined using three log-linear regression models (with the logarithm of property price as the dependent variable). Each of the three models was estimated in two variants, differentiated by the strictness of multicollinearity control.

Model specifications by kindergarten accessibility:

- Models 1 (A1, B1) use road-network distance to the nearest kindergarten, calculated via the OSRM tool (R package: `osrm`, function: `osrmTable`, parameter: `osrm.profile = "car"`). The objective was to test for a distance-decay effect, i.e., whether property prices decline with increasing distance from the nearest kindergarten. Hypothesis 1: Property price decreases as the distance to the nearest kindergarten increases.
- Models 2 (A2, B2) use a binary indicator to determine whether a kindergarten is within 1,000 meters. Hypothesis 2: Properties within 1 kilometre of a kindergarten have higher asking prices.
- Models 3 (A3, B3) incorporate the aggregate capacity of all kindergartens within a 1,000-meter radius of each property. Hypothesis 3: Property prices increase with the total nearby kindergarten capacity within 1 kilometre.

Model variants:

- Variant A (A1, A2, A3) adopts a stricter multicollinearity threshold ($\text{GVIF} < 5$; pairwise correlation < 0.70) and includes 133 predictors.
- Variant B (B1, B2, B3) allows for more leniency ($\text{GVIF} < 10$; pairwise correlation < 0.85) and comprises 137 predictors in total.

Analysis and results

Regression results, presented in Table 3, yielded somewhat unexpected findings. The relationship between kindergarten accessibility and property price is negative, while it appears negligible. The standardised beta coefficients are below 0.01, suggesting that the proximity or accessibility of kindergartens is not a key determinant of property prices in the Bratislava hinterland.

Despite the minimal effect size, the results are statistically significant, though somewhat counterintuitive. Before delving into interpretation, we consider potential model-related issues: (1) Although the diagnostic tests confirm that model assumptions were met, some residual multicollinearity remains. However, when variables capturing accessibility to similar categories of amenities (e.g., natural areas, cultural and sports facilities, disamenities) were grouped or collapsed, the regression results remained virtually unchanged, indicating robustness of the model. (2) The low p-values might result from the large sample size rather than the strength of the underlying relationships. To test this, the model was re-estimated on a smaller subsample, where the relationship remained significant, and the R-squared even increased. (3) The results across both model variants demonstrate high robustness and internal consistency. Various manipulations of control variables did not materially affect the outcome. Based on these results, we cautiously accept the

negative relationship between distance to kindergarten and property price. In other words, proximity to a kindergarten is associated with lower property prices, and this relationship is statistically significant at the 95% confidence level. (4) Interestingly, however, in some areas of the Bratislava hinterland, a kindergarten within 1 km is associated with lower property prices.

We propose several potential explanations for our results: (1) The relationship may vary by municipality size. Kindergarten proximity may have little negative influence in smaller municipalities, whereas the effect may be reversed in larger towns (over 10,000 residents). This hypothesis requires further investigation. (2) Kindergarten accessibility in the Bratislava hinterland is already high, possibly reducing its influence on price formation. Alternative accessibility indicators or more nuanced model parametrisation might better capture this effect. (3) Proximity to kindergartens may not be a primary decision factor for buyers, and the observed statistical significance may be spurious, as suggested by the weak effect size. (4) New residential development is situated mostly on the outskirts of municipalities, resulting in lower accessibility to kindergartens, which are usually localised in central parts of municipalities. These new houses cost substantially more compared to the second-hand housing market. This aligns with the findings of Ondoš et al. (2017), who noted that residential development in the Bratislava hinterland tends to be located away from amenities.

We then investigated whether the assumptions necessary for valid statistical inference were met. The first assumption assessed was multicollinearity. We examined it using pairwise correlation coefficients, aiming to exclude variables with correlations exceeding 0.85 (Spearman's ρ or Pearson's r) in the more relaxed version of the model (model variants B) and above 0.70 in the stricter specification (model variants A). No pair of independent variables exhibited correlations above 0.85. However, two pairs – DCulture \times DCBD and LandArea \times LivableArea – exceeded the 0.70 threshold. In these cases, the variable with the lower correlation to the dependent variable (property price) was excluded. Accordingly, DCulture and LandArea were removed from the stricter model.

Next, we evaluated Variance Inflation Factors (VIF). Using categorical predictors, VIFs were adjusted using $\text{GVIF}^{1/(2 \times \text{DF})}$, where DF represents the degrees of freedom. A common threshold of 10 was adopted for both model variants. None of the variables exceeded this threshold. In the stricter model, only GVIF values below 5 entered the analysis; therefore, we excluded DBA and DPubTrans to reduce multicollinearity.

We visualised the linearity and homoscedasticity tests using five graphs (Fig. 2). Figure 2(a) displays the residuals versus fitted values plot used to assess the linearity assumption. The assumption holds well across all six models. The residuals cluster around the zero line (dark green dashed line), with no noticeable curvatures, waves, or systematic deviations. That indicates that the linearity assumption is reasonably satisfied. The spread of residuals remains fairly constant across the fitted values, though there is a slight increase in variance at higher fitted values, suggesting mild heteroscedasticity. However, this effect appears limited and not problematic.

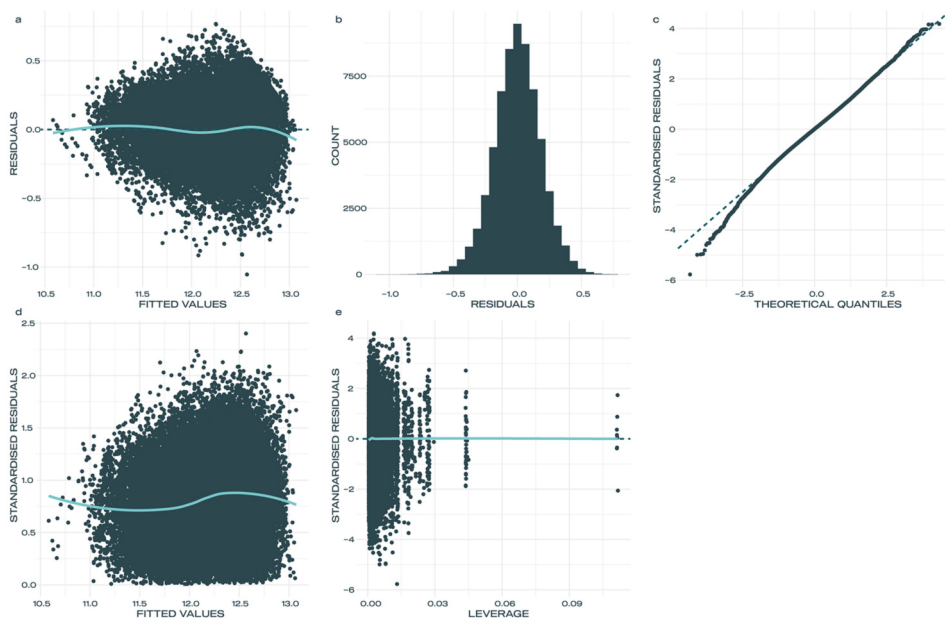


Figure 2: Linearity and homoscedasticity test results. (a) Residuals vs Fitted plot; (b) Distribution of residuals. (c) QQ plot of standardised residuals. (d) Scale–Location plot. (e) Residuals vs. Leverage plot. Note: All images show only Model A1. Other models produced nearly identical residual patterns (correlations > 0.99), suggesting similar model adequacy. Data source: authors.

The histogram of residuals in Figure 2(b) shows an approximately normal distribution centred around zero. That supports the normality assumption for residuals in regression and suggests that statistical inference remains valid. However, the QQ plot in Figure 2(c) reveals moderate deviation from normality in the left tail, possibly indicating negative outliers or mild left skewness, which may hint at minor heteroscedasticity or model misspecification.

To explicitly test for homoscedasticity, we constructed a Scale–Location plot, shown in Figure 2(d). The cyan LOESS smoothing curve illustrates the spread of standardised residuals across the fitted values. The curve suggests a modest increase in variance at both extremes of the fitted values, again indicating mild heteroscedasticity.

Figure 2(e) presents the analysis of outliers and influential data points. The plot does not indicate systematic errors within any specific variable. The cyan smooth line remains near zero across the leverage range, with no observable trend. That implies no strong relationship between leverage and standardised residuals – a desirable outcome, suggesting the model performs consistently even for high-leverage observations. Notably, removing identified outliers from the dataset did not materially affect the results, further supporting the robustness of the models.

Discussion

The results of this study challenge the traditional amenity capitalisation framework by revealing a spatial mismatch: high-end new developments, despite exhibiting lower kindergarten accessibility, command premium prices. This finding may be attributed to several interrelated factors. First, peripheral developments might benefit from lower land costs and more lenient planning regulations, allowing developers to build premium housing even if public services lag behind. Second, lifestyle preferences in suburban areas may favour larger properties and quieter environments over immediate access to urban amenities.

This study employed a broad and diverse set of indicators to measure the accessibility of (dis)amenities. However, it omitted several relevant dimensions, such as proximity to shopping centres, secondary and tertiary schools, environmental quality, noise levels, crime rates, and other factors commonly used in international research. These omissions stemmed partly from an effort to streamline the models and, in some cases, from a lack of geocoded data at the address-point level. While some scholars (e.g., Zhou, 2018; Cortés, Iturra, 2019; Heyman, Sommervoll, 2019) address such data limitations by aggregating to higher spatial levels (e.g., LAU 2 or LAU 1), we argue that such aggregation introduces bias and opted instead for a more spatially granular approach. Rather, some authors conducted a questionnaire survey to assess the neighbourhood characteristics (e.g., Wen et al., 2018, Wen et al., 2019).

The selection of specific variables could also be subject to debate. For instance, using advanced machine learning techniques, Liu, Chen, Orford, Tian and Zou (2024) found that closeness centrality, derived from graph theory, better captures accessibility to urban centres. Their study, set in the monocentric city of Cardiff, offers a useful analogue to Bratislava. Considering the resulting outcomes, this approach might be applied to verify the results in future studies. Also, for this reason, we included not only accessibility to Bratislava (DBA) but also the distance to the nearest economic subcentre (DCBD) as a control variable.

Prior studies further guided our indicator choices (e.g., Theisen, Emblem, 2018; Zhou, 2018; Heyman, Sommervoll, 2019; Cellmer et al., 2024). However, in an attempt to build on previous research, we encountered some limiting factors tied to the data. We also chose to omit certain property characteristics, such as floor level, year of construction, and internal amenities, due to extensive missing data. These attributes were absent in approximately half of the observations, and their inclusion would have significantly reduced data granularity. Such variables could be more feasibly incorporated in larger spatial settings or longer time series.

The value of residential properties was measured using insertion prices rather than actual transaction prices due to data availability and the presence of a richer database. Although offer prices react more quickly to housing market dynamics, transaction prices better reflect final negotiated values, including discounts and bidding wars, particularly during boom-bust cycles. Nevertheless, these differences

are unlikely to systematically bias spatial or temporal trends in housing values. The divergence between the two price types is expected to be random rather than systematic.

Using road-network travel times by car instead of walking accessibility may have influenced the accuracy of our accessibility measures. However, the data underlying the OSRM engine were not sufficiently detailed for pedestrian routing in the studied region, and results using the `osrm.profile = "foot"` parameters were identical to the car travelling distances. Given these constraints, the car-based measure is a reasonable proxy for this study. Moreover, experience from Slovakia suggests that the car is the most frequently used means of transportation for children to attend kindergarten (Rišová, 2024; Križan et al., 2025).

Kindergarten accessibility was measured based on whether the preschool facility existed at the time of listing. That raises the issue of temporal alignment: in cases where kindergartens were opened or closed around the time of the property listing, a time lag may have been more appropriate. Between 2020 and 2024, 41 kindergartens were opened, and 10 were closed in the study area. However, it remains unclear what the optimal time lag should be or whether it should precede or follow the listing date. While it is plausible that real estate agencies are aware of upcoming openings, it is uncertain whether such knowledge directly affects pricing. Families with children aged 3–6 – those in kindergarten age – are likely to demand functioning facilities rather than future promises. The effect of new infrastructure may be delayed, particularly in the context of new residential developments, where a temporal mismatch often occurs between housing delivery and amenity provision. Their suburban-residential function has gradually been joined by service, commercial, employment or leisure functions (Kubeš, Ouředníček, 2022), including (pre)school facilities (Kubeš, Vokrouhlík, 2019). Housing construction in many post-socialist suburban areas, including Bratislava's, frequently precedes infrastructure development, leading to short-term accessibility deficits and delayed price adjustments.

Our analysis excluded unregistered early childcare centres (i.e., kindergartens not recorded in the official school registry) and nurseries (for children under the age of three). This exclusion was due to the lack of a comprehensive and reliable database for these facilities. Their long-term viability is uncertain, and no consistent data on capacity are available. Including such facilities might influence the results, though we expect the effect to be minimal. The location of unregistered centres is strongly correlated with existing kindergartens and typically complements established capacity (Sládeková Madajová et al., 2021). A further (significant) EU-funded increase in kindergarten capacities in the Bratislava hinterland is unexpected (Švecová, Križan, 2023). In the case of nurseries, they are still underused in Slovakia compared to other countries and are mainly localised in urban areas.

Conclusion

This study aimed to investigate the relationship between housing prices and the spatial accessibility of public amenities, with a particular focus on kindergartens, within the suburban context of Bratislava. By integrating individual geospatial property price data, diverse accessibility indicators, and a log-linear regression framework, we sought to uncover whether proximity to early childhood education facilities – commonly assumed to be a positive externality – translates into measurable capitalisation in housing markets. Our findings challenge some of these assumptions and contribute to a more nuanced understanding of suburban housing dynamics in post-socialist urban regions.

Across six model specifications, the results consistently indicate that proximity to kindergartens exerts only a marginal influence on housing prices. While the statistical significance of the accessibility variables was confirmed, their effect sizes remained negligible. These findings suggest that, contrary to initial expectations, kindergartens do not significantly influence residential property values in the Bratislava hinterland. Moreover, the relationship appeared mildly negative in some models, indicating that a kindergarten within 1 km may be associated with lower offer prices, albeit only marginally.

Several explanations are plausible. First, the high overall density and uniform spatial distribution of kindergartens in the studied area may attenuate their potential price effect. When a public good is ubiquitously available, its spatial advantage diminishes. Second, the relatively small geographic size and polycentric nature of the Bratislava hinterland – with several secondary commuting centres (see Šveda, Sládeková Madajová, Barlík, Bago, 2020) – reduce the salience of minor accessibility variations. Third, families might prioritise location-specific attributes – such as proximity to workplaces, environmental quality, or neighbourhood prestige – over access to kindergartens. Fourth, housing market dynamics may be driven more by general accessibility (e.g., commuting time to the city or subcentres) and socio-economic signals than by the presence of individual public services. Finally, the spatial distribution of new residential development reveals a pattern where high-priced housing is increasingly being built on the outskirts of municipalities, despite lower accessibility to public services such as kindergartens, which remain concentrated in municipal centres. In contrast, new kindergartens are often opened in response to new residential development. This spatial mismatch challenges conventional expectations that lower accessibility would correspond to lower housing values. Instead, our findings suggest that these peripheral locations, although less well-served by amenities, attract high-end development, possibly due to planning permissiveness, land availability, or lifestyle preferences. This interpretation introduces a novel explanation for the higher prices of new housing. It adds a new dimension to understanding the drivers of affordability and spatial inequality in the suburban context of post-socialist contexts.

Nevertheless, the robustness of the models – tested against different multi-collinearity thresholds, variable combinations, and sub-sample analyses – supports the validity of the negative but weak association. Importantly, the spatial lag in amenity provision in many newly developed suburban areas likely contributes to this result (see Wittowsky et al., 2020). As documented in the discussion, housing construction often precedes the delivery of educational and childcare infrastructure in post-socialist suburbanisation processes, leading to temporary mismatches between residential supply and amenity access. These temporal gaps may reduce the price-signalling effect of amenities such as kindergartens, as their presence does not immediately reflect the neighbourhood's maturity or attractiveness.

From a policy perspective, the findings suggest that in highly saturated or evenly distributed educational landscapes, marginal improvements in kindergarten accessibility may not yield measurable increases in housing values. Urban planners and municipal governments should not assume automatic price premiums based solely on school proximity, especially in suburban contexts where supply-side infrastructure development often lags behind housing construction. Instead, integrated and anticipatory planning – ensuring temporal alignment between residential development and public service provision – may enhance both the functionality and the perceived value of suburban environments. However, as the results suggest, high-priced new residential development – a large interest for young families with little children – is often situated in areas with little to no amenities, including kindergartens, leading to lower accessibility and potentially lower enrollment rates. Municipal planners should consider strategies to better align the timing of infrastructural investments with residential development.

This study contributes to the broader discourse on amenity capitalisation, housing affordability, and post-socialist suburbanisation by demonstrating the weak but consistent link between early childcare accessibility and housing prices. While kindergartens remain an essential public service, their price-signalling power appears limited in Bratislava's evolving hinterland. Future research should build on these insights by incorporating a broader range of amenities, applying longitudinal designs, and exploring heterogeneity across municipal contexts and population groups. Such work is essential for informing equitable and evidence-based urban development policies in Central and Eastern Europe and beyond.

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Table 2 Descriptive statistics of individual data. Data source: authors.

* All distances are car-travel distances. ** Distances calculated by authors

Variable*	Source of raw data**	N	Min	Mean	Median	Max	SD
<i>Dependent variable</i>							
Residential property offer price [ln(Price)]	United Classifieds (2025)		10.597	12.152	12.128	13.271	0.418
<i>Main independent variables</i>							
Distance to the nearest kindergarten [ln(DKind)]	Ministry of Education, Research, Development and Youth of the Slovak Republic (2024)		0	6.288	6.324	8.8	0.776
At least one kindergarten within 1 km [AccKind]	ibid		0	0.815	1	1	0.388
The cumulative capacity of all kindergartens within 1 km [ln(CapaKind)]	ibid, Slovak Center of Scientific and Technical Information (2024)		0	4.159	4.754	6.75	2.164
<i>Property characteristics</i>							
Property livable area in sq m [ln(LivableArea)]	United Classifieds (2025)		2.773	4.466	4.5	5.298	0.418
Property plot area in sq m [ln(LandArea)]	ibid		0	3	0	9.127	3.087
Property type [PropType]	ibid						
Family House		33,490					
Single-Room Apartment		3,328					
Two-Bedroom Apartment		11,219					
Three-Bedroom Apartment		12,495					
Four+-Bedroom Apartment		3,521					
Other Apartment		390					
Property state [PropState]	ibid						
Original state		4,773					
Partial reconstruction		8,021					
Complete reconstruction		8,435					
New building		43,214					
<i>Proximity to amenities</i>							
Distance to the nearest elementary school [ln(DElem)]	Ministry of Education, Research, Development and Youth of the Slovak Republic (2024)		0	6.571	6.576	8.754	0.886
Distance to the nearest grocery store [ln(DShop)]	Financial Administration of the Slovak Republic (2025)		0	5.965	6.205	8.817	1.083
Distance to the nearest bus stop [ln(DBUS)]	Ubian (2025)		0	5.819	6.052	9.572	0.967
Distance to the nearest train stop [ln(DTrain)]	Railway Infrastructure Authority of the Slovak Republic (2025)		2.079	7.413	7.799	10.184	1.999
Distance to the nearest bus/train stop [ln(DPubTrans)]	Ubian (2025), ibid		0	5.403	5.817	9.091	1.283
Distance to the nearest motorway link [ln(DMotorway)]	Slovak Road Administration (2025)		5.858	8.475	8.447	10.202	0.646
Distance to the nearest urban green area [ln(DGreen)]	Geodesy, Cartography and Cadastre Authority of the Slovak Republic (2019)		0	5.352	5.521	8.829	1.427

Table 2 Descriptive statistics of individual data. Data source: authors.

* All distances are car-travel distances. ** Distances calculated by authors

Variable*	Source of raw data**	N	Min	Mean	Median	Max	SD
Distance to the nearest forest [ln(DForest)]	ibid		0	5.908	6.328	8.539	1.365
Distance to the nearest orchard [ln(DOrch)]	ibid		0	4.741	5.069	8.201	1.720
Distance to the nearest vineyard [ln(DVineyard)]	ibid		0	7.095	7.479	9.481	1.452
Distance to the nearest river or waterbody [ln(DWater)]	ibid		0	6.139	6.392	8.355	1.223
Distance to the nearest cultural facility (museum, observatory, opera house, theatre, cinema, library, gallery) [ln(DCulture)]	ibid		0	8.028	8.489	9.858	1.117
Distance to the nearest historical monument/site (castle, palace, manor house) [ln(DMonuments)]	ibid		0	7.775	7.793	9.857	0.980
Distance to the nearest sports facility [ln(DSport)]	ibid		0	6.044	6.094	8.365	1.006
Distance to the nearest religious facility (chapel, sanctuary, church, seminar, cathedral, synagogue, monastery) [ln(DReligious)]	ibid		0	6.576	6.727	8.787	0.919
Distance to the nearest healthcare facility (hospital, clinic, sanatory, spa, medical centre) [ln(DHealth)]	ibid		0	7.288	7.143	9.539	1.102
Distance to the nearest graveyard [ln(DGraveyard)]	ibid		0	6.958	7.026	8.804	0.841
Distance to the nearest dump [ln(DDump)]	ibid		0	6.856	6.870	8.790	0.652
Distance to the nearest parking lot [ln(DParking)]	ibid		0	5.568	5.817	9.350	1.493
<i>Distance to city centres</i>							
Distance to the nearest central business district (LAU 2 capitals) [ln(DCBD)]	Ministry of Interior of the Slovak Republic (2025), authors		0	8.082	9.144	10.324	2.949
Distance to Bratislava city centre [ln(DBA)]	ibid		9.589	10.291	10.313	11.110	0.253
<i>Time & Space</i>							
Quarter and year of latest insertion change [Time] 20 groups	United Classifieds (2025)		2020/Q1			2024/Q4	
Municipality (LAU2 unit) in Bratislava Hinterland [Municipality] 86 groups	Geodesy, Cartography and Cadastre Authority of the Slovak Republic (2025)						

Table 3: Estimates of log-linear models for housing price, kindergarten accessibility and selected control variables. Dependent variable: $\ln(\text{price})$. Standard errors in parentheses. * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$. Data source: authors.

	Model A1	Model A2	Model A3	Model B1	Model B2	Model B3
(Intercept)	-.8806*** (-.0553)	-.8868*** (-.0553)	-.8872*** (-.0554)	-.9907*** (-.0554)	-.9972*** (-.0553)	-.999*** (-.0554)
$\ln(\text{DKind})$	.0078** (-.0028)			.007* (-.0028)		
AccKind		-.0061* (-.0024)			-.0069** (-.0024)	
$\ln(\text{CapaKind})$			-.0018 (-.0028)			-.0042 (-.0028)
$\ln(\text{LivableArea})$	.5172*** (-.0034)	.5173*** (-.0034)	.5173*** (-.0034)	.5058*** (-.0034)	.5059*** (-.0034)	.5059*** (-.0034)
$\ln(\text{LandArea})$				.1429*** (-.005)	.1432*** (-.005)	.1431*** (-.005)
PropType, Single-Room Apartment	-.8298*** (-.0127)	-.83*** (-.0127)	-.8298*** (-.0127)	-.5988*** (-.015)	-.5985*** (-.015)	-.5985*** (-.015)
PropType, Two-Bedroom Apartment	-.6633*** (-.0082)	-.6636*** (-.0082)	-.6634*** (-.0082)	-.4224*** (-.0117)	-.4222*** (-.0117)	-.4221*** (-.0117)
PropType, Three-Bedroom Apartment	-.5071*** (-.0063)	-.5077*** (-.0063)	-.5076*** (-.0063)	-.2569*** (-.0108)	-.257*** (-.0108)	-.2569*** (-.0108)
PropType, Four+-Bedroom Apartment	-.3759*** (-.0081)	-.3763*** (-.0081)	-.3764*** (-.0081)	-.1192*** (-.0121)	-.1191*** (-.0121)	-.1192*** (-.0121)
PropType, Other Apartment	-.5321*** (-.0226)	-.5328*** (-.0226)	-.5327*** (-.0226)	-.2805*** (-.0242)	-.2806*** (-.0242)	-.2806*** (-.0242)
PropState, New building	.1063*** (-.0057)	.1068*** (-.0057)	.1067*** (-.0057)	.1092*** (-.0057)	.1095*** (-.0057)	.1094*** (-.0057)
PropState, Original state	-.1832*** (-.0081)	-.1834*** (-.0081)	-.1834*** (-.0081)	-.1928*** (-.0081)	-.193*** (-.0081)	-.1931*** (-.0081)
PropState, Partial reconstruction	-.188*** (-.0069)	-.1882*** (-.0069)	-.1882*** (-.0069)	-.1927*** (-.0069)	-.1928*** (-.0069)	-.1929*** (-.0069)
$\ln(\text{DElem})$	-.0042 (-.0032)	-.003 (-.0032)	-.0029 (-.0032)	-.0037 (-.0033)	-.0028 (-.0032)	-.0029 (-.0032)
$\ln(\text{DShop})$	-.0114*** (-.003)	-.0104*** (-.0029)	-.0097** (-.003)	-.0122*** (-.003)	-.0116*** (-.0029)	-.0112*** (-.0029)
$\ln(\text{DBUS})$	.0087*** (-.0026)	.0087*** (-.0026)	.009*** (-.0026)	.0196* (-.0088)	.0184* (-.0088)	.0188* (-.0088)
$\ln(\text{DTrain})$	.013* (-.0062)	.013* (-.0062)	.0131* (-.0062)	.0231* (-.0095)	.0221* (-.0095)	.0223* (-.0095)
$\ln(\text{DPubTrans})$				-.0129 (-.0119)	-.0113 (-.0119)	-.0115 (-.0119)
$\ln(\text{DMotorway})$	.01 (-.0062)	.0101 (-.0062)	.0105 (-.0062)	.0033 (-.0069)	.0028 (-.0069)	.0033 (-.0069)

Table 3: Estimates of log-linear models for housing price, kindergarten accessibility and selected control variables. Dependent variable: $\ln(\text{price})$. Standard errors in parentheses. * $p \leq 0.05$; ** $p \leq 0.01$; *** $p \leq 0.001$. Data source: authors.

	Model A1	Model A2	Model A3	Model B1	Model B2	Model B3
$\ln(\text{DGreen})$	.0116*** (-.003)	.0118*** (-.003)	.0121*** (-.003)	.0119*** (-.003)	.012*** (-.003)	.0122*** (-.003)
$\ln(\text{DForest})$	.0045 (-.0027)	.0044 (-.0027)	.0041 (-.0027)	.0068* (-.0027)	.0068* (-.0027)	.0065* (-.0027)
$\ln(\text{DOrch})$	.0117*** (-.0028)	.0105*** (-.0027)	.0106*** (-.0027)	.0119*** (-.0027)	.0109*** (-.0027)	.0111*** (-.0027)
$\ln(\text{DVineyard})$	-.0208*** (-.0039)	-.0213*** (-.0039)	-.0204*** (-.0039)	-.0197*** (-.0039)	-.0205*** (-.0039)	-.0199*** (-.0039)
$\ln(\text{DWater})$	.0116*** (-.003)	.011*** (-.003)	.0111*** (-.003)	.01*** (-.003)	.0095** (-.003)	.0095** (-.003)
$\ln(\text{DCulture})$				-.0383*** (-.0062)	-.0378*** (-.0062)	-.0385*** (-.0062)
$\ln(\text{DMonuments})$	-.0411*** (-.0047)	-.0415*** (-.0047)	-.0417*** (-.0047)	-.0405*** (-.0046)	-.0409*** (-.0046)	-.0411*** (-.0046)
$\ln(\text{DSport})$	.0051 (-.0028)	.0048 (-.0028)	.0054 (-.0029)	.0055 (-.0028)	.005 (-.0028)	.0053 (-.0028)
$\ln(\text{DReligious})$	.0132*** (-.0036)	.0142*** (-.0036)	.0141*** (-.0036)	.0173*** (-.0037)	.0182*** (-.0037)	.0183*** (-.0037)
$\ln(\text{DHealth})$	.0115** (-.0044)	.0114* (-.0044)	.0113* (-.0044)	.0124** (-.0044)	.0124** (-.0044)	.0122** (-.0044)
$\ln(\text{DGraveyard})$	-.0074 (-.0039)	-.0089* (-.004)	-.0074 (-.004)	-.0078* (-.0039)	-.0097* (-.004)	-.0088* (-.0041)
$\ln(\text{DDump})$	-.0063* (-.0029)	-.0062* (-.0029)	-.0068* (-.0029)	-.0042 (-.0029)	-.0039 (-.0029)	-.0043 (-.0029)
$\ln(\text{DParking})$	.0285*** (-.0033)	.0284*** (-.0033)	.0288*** (-.0033)	.0269*** (-.0033)	.0267*** (-.0033)	.027*** (-.0033)
$\ln(\text{DCBD})$	.0187*** (-.0035)	.0175*** (-.0035)	.017*** (-.0035)	.0207*** (-.0035)	.0198*** (-.0035)	.0191*** (-.0035)
$\ln(\text{DBA})$				.0543*** (-.016)	.0572*** (-.016)	.056*** (-.016)
Time	Yes	Yes	Yes	Yes	Yes	Yes
Municipality	Yes	Yes	Yes	Yes	Yes	Yes
R2	.8066	.8066	.8066	.8092	.8092	.8092
R2 adj.	.8062	.8062	.8062	.8088	.8088	.8088
VIF mean	1.907	1.8973	1.9088	2.6744	2.6671	2.6776
VIF max	3.5613	3.5609	3.5613	9.2858	9.3062	9.3128

REFERENCES

- Brueckner, J. K. (1987). The structure of urban equilibria: A unified treatment of the muth-mills model. In: E. S. Mills (Ed.), *Handbook of Regional and Urban Economics, Volume 2: Urban Economics* (pp. 821–845). Amsterdam: Elsevier.
[https://doi.org/10.1016/S1574-0080\(87\)80006-8](https://doi.org/10.1016/S1574-0080(87)80006-8)
- Bursa, O. (2021). The role of civic amenities in the residential satisfaction in apartment-housing localities of Prague. *AUC Geographica*, 56(1), 3–17.
<https://doi.org/10.14712/23361980.2020.20>
- Cellmer, R., Belej, M., Trojanek, R. (2024). Housing prices and points of interest in three Polish cities. *J Hous and the Built Environ*, 39, 1509–1540.
<https://doi.org/10.1007/s10901-024-10124-7>
- Cheshire, P., Sheppard, S. (1995). On the Price of Land and the Value of Amenities. *Economica*, 62(246), 247–267. <https://doi.org/10.2307/2554906>
- Cortés, Y., Iturra, V. (2019). Market versus public provision of local goods: An analysis of amenity capitalization within the Metropolitan Region of Santiago de Chile. *Cities*, 89, 92–104. <https://doi.org/10.1016/j.cities.2019.01.015>
- Ellen, I. G., Horn, K. M., Schwartz, A. E. (2016). Why Don't Housing Choice Voucher Recipients Live Near Better Schools? Insights from Big Data. *Journal of Policy Analysis and Management*, 35(4), 884–905. <https://doi.org/10.1002/pam.21929>
- Financial Administration of the Slovak Republic (2025). Grocery stores [Data set].
- Geodesy, Cartography and Cadastre Authority of the Slovak Republic (2019). ZBGIS [Data set].
- Geodesy, Cartography and Cadastre Authority of the Slovak Republic (2025). Administration units [Data set]. <https://www.gku.sk/gku/produkty-sluzby/na-stiahnutie/na-stiahnutie.html>
- Glaeser, E. L., Kolko, J., Saiz, A. (2000). Consumer City. *NBER Working Paper Series, Paper no. w7790*. Cambridge. National Bureau of Economic Research.
- Gurňák, D. et al. (2019). *30 rokov transformácie Slovenska*. Univerzita Komenského v Bratislave.
- Halás, M., Klapka, P. (2024). Aktualizácia vymedzenia funkčných regiónov Slovenska: hierarchia, neurčitosť a využiteľnosť. *Geografický časopis*, 76(2), 141–163.
<https://doi.org/10.31577/geogrcas.2024.76.2.08>
- Heyman, A. V., Sommervoll, D. E. (2019). House prices and relative location. *Cities*, 95, art. no. 102373. <https://doi.org/10.1016/j.cities.2019.06.004>
- Hu, M., Lin, Z., Liu, Y. (2023). Amenities, Housing Affordability, and Education Elites. *The Journal of Real Estate Finance and Economics*, 66(1), 141–168.
<https://dx.doi.org/10.1007/s11146-022-09896-y>
- Huang, P., Hess, T. (2018). Impact of Distance to School on Housing Price: Evidence from a Quantile Regression. *The Empirical Economics Letters*, 17(2), 149–156.
- Kane, T. J., Riegg, S. K., Staiger, D. O. (2006). School Quality, Neighborhoods, and Housing Prices. *American Law and Economics Review*, 8(2), 183–212.
<https://doi.org/10.1093/aler/ahl007>
- Khoshnoud, M., Sirmans, G. S., Zietz, E. N. (2023). The Evolution of Hedonic Pricing Models. *Journal of Real Estate Literature*, 31(1), 1–47.
<https://doi.org/10.1080/09277544.2023.2201020>
- Križan, F., Šveda, M., Tarčáková, S., Bilková, K., Hencelová, P. (2020). Kam do školy? Transformácia a priestorové rozmiestnenie základného školstva v zázemí Bratislavy. In:

- M. Šveda, P. Šuška (Eds.), *Suburbanizácia 2. Sondy do premien zázemia Bratislavy* (pp. 171–194). Bratislava: Geografický ústav SAV.
- Križan, F., Sládeková Madajová, M., Rišová, K., Švecová, A., Chorvát, I. (2025). Preferencie rodičov pri výbere predškolského zariadenia: výsledky reprezentatívneho prieskumu na Slovensku. *Sociológia – Slovak Sociological Review*, 57(1), 25–53.
<http://dx.doi.org/10.31577/sociologia.2025.57.1.2>
- Kubeš, J., Ouředníček, M. (2022). Functional types of suburban settlements around two differently sized Czech cities. *Cities*, 127, art. no. 103742.
<https://doi.org/10.1016/j.cities.2022.103742>
- Kubeš, J., Vokrouhlík, T. (2019). Strategies and measures for preserving rural and increasing suburban primary schools in the district of České Budějovice, Czechia. *Geographia Cassoviensis*, 13(1), 53–67. <https://zenodo.org/records/5024579>
- Li, Y., He, L., Xu, W., Wang, H., He, Z. (2013). Using GIS and Hedonic in the modelling of spatial variation of housing price in Xiamen city. *International Review for Spatial Planning and Sustainable Development*, 1(4), 29–42. https://doi.org/10.14246/irpspd.1.4_29
- Liu, X., Chen, X., Orford, S., Tian, M., Zou, G. (2024). Does better accessibility always mean higher house prices? *Environment and Planning B*, 51(9), 2179–2195.
<https://doi.org/10.1177/23998083241242212>
- Lokšová, T., Galčanová Batista, L. (2021). Postsocialist suburban governmentality: A shift from reactive to proactive discourse in the case of Brno, Czech Republic. *Cities*, 110, 103074. <https://doi.org/10.1016/j.cities.2020.103074>
- Ministry of Education, Research, Development and Youth of the Slovak Republic (2024). Educational Facilities Registry [Data set]. <https://crinfo.iedu.sk/RISPortal/register/>
- Ministry of Interior of the Slovak Republic (2025). Addresses by regions [Data set]. <https://data.gov.sk/dataset/adresy-podla-krajov>
- Nestorová Dická, J., Lipták, F. (2024). Regional fertility predictors based on socioeconomic determinants in Slovakia. *Journal of Population Research*, 41(20), 1–43.
<https://doi.org/10.1007/s12546-024-09340-3>
- Novotný, L., Pregi, L. (2019). Región len pre mladých a vzdelaných? Selektívna migrácia vo funkčnom mestskom regióne Bratislava podľa veku a vzdelania. In: M. Šveda, P. Šuška (Eds.), *Suburbanizácia. Ako sa mení zázemie Bratislavy?* (pp. 134–156). Bratislava: Geografický ústav SAV.
- Ondoš, S., Miláčková, M., Belušák, L., Rusnák, J., Kusendová, D. (2017). Spatial Development of Residential Market in Bratislava Region. *Geografický časopis*, 69(2), 95–112.
- Qiu, L., Guo, D., Zhao, X., & Zhang, W. (2020). The value of school in urban China: a spatial quantile regression with housing transactions in Beijing. *Applied Economics*, 52(20), 2135–2146. <https://doi.org/10.1080/00036846.2019.1683146>
- Railway Infrastructure Authority of the Slovak Republic (2024). List of train stations and stops [Data set]. <https://data.gov.sk/dataset/zoznam-stanic-a-zastavok-csv>
- Rišová, K. (2024). Transport exclusion of suburban mothers: A critical review. *Geografický časopis*, 76(4), 319–339. <https://doi.org/10.31577/geogrcas.2024.76.4.17>
- Skaburskis, A. (2004). Decomposing Canada's Growing Housing Affordability Problem: Do City Differences Matter? *Urban Studies*, 41(1), 117–149.
<https://doi.org/10.1080/0042098032000155713>
- Sládeková Madajová, M., Šveda, M., Výboštok, J. (2021). Bude miesto pre všetky deti? Kapacita predškolských zariadení v Bratislavskom samosprávnom kraji. *Geografický časopis*, 73(4), 301–322. <https://doi.org/10.31577/geogrcas.2021.73.4.16>

- Slovak Center of Scientific and Technical Information (2024). Kindergartens – capacity, total number of children, by age and pending applications as of 15 Sep 2023 [Data set].
- Slovak Road Administration (2025). INSPIRE – Freely available WFS service on road transport network data [Data set]. <https://www.cdb.sk/en/inspire.alej>
- Špačková, P., Dvořáková, N., Tobrmanová, M. (2016). Residential satisfaction and intention to move: the case of Prague's new suburbanites. *Geografiska Annaler: Series B, Human Geography*, 98(4), 331–348. <https://doi.org/10.1111/geob.12108>
- Šprocha, B., Bleha, B., Nováková, G. (2022). Three Decades of Post-Communist Fertility Transition in a Subnational Context: The Case of Slovakia. *Tijdschrift voor Economische en Sociale Geografie*, 113(4), 397–411. <https://doi.org/10.1111/tesg.12515>
- Šuška, P., Šveda, M., Krivý, V. (2018). Hodnotová zmena v zázemí Bratislavy ako dôsledok suburbánneho rozvoja: analýza volebného správania. *Sociológia – Slovak Sociological Review*, 50(5). <https://doi.org/10.31577/sociologia.2018.50.5.23>
- Švecová, A., Križan, F. (2023). Aká je podpora zaškolenosti detí materských škôl z prostriedkov EŠIF? *Geografické informácie*, 27(2), 75–90. <http://dx.doi.org/10.17846/GI.2023.27.2.75-90>
- Švecová, A., Tolmáči, A. (2025). Pre-Primary Education in Slovakia over the Last Three Decades: Temporal and Spatial Analysis. *Geografický časopis*, 77(1), 33–42. <https://doi.org/10.31577/geogrcas.2025.77.1.03>
- Šveda, M., Sládeková Madajová, M., Podolák, P. (2016). Behind the Differentiation of Suburban Development in the Hinterland of Bratislava, Slovakia. *Czech Sociological Review*, 52(6), 893–925. <http://dx.doi.org/10.13060/00380288.2016.52.6.290>
- Šveda, M., Sládeková Madajová, M., Barlík, P., Bago, M. (2020). Kam siaha Bratislava? Metropolitný región Bratislavy z pohľadu lokalizačných údajov mobilnej siete. In: M. Šveda, P. Šuška (Eds.), *Suburbanizácia 2: Sondy do premien zázemia Bratislavy* (pp. 50–78). Bratislava: Geografický ústav SAV.
- Šveda, M., Výboštok, J., Gurnák, D. (2021). *Atlas suburbanizácie Bratislavy*. Bratislava: Geografický ústav SAV.
- Theisen, T., Emblem, A. W. (2018). House prices and proximity to kindergarten – costs of distance and external effects? *Journal of Property Research*, 35(4), 321–343. <https://doi.org/10.1080/09599916.2018.1513057>
- Ubian (2025). Rest API [Data set]. <https://ubian.azet.sk/navigation/stops/>
- United Classifieds (2025). Market Reports [Data set]. <https://app.trhovoreporty.sk/>
- Výboštok, J., Štefkovičová, P. (2023). Housing affordability, quality of life, and residential satisfaction in the Austrian cross-border suburban region of Bratislava, Slovakia. *Moravian Geographical Reports*, 31(1), 2–13. <https://doi.org/10.2478/mgr-2023-0001>
- Wen, H., Zhang, Y., Zhang, L. (2014). Do educational facilities affect housing price? An empirical study in Hangzhou, China. *Habitat International*, 42(2), 155–163. <https://doi.org/10.1016/j.habitatint.2013.12.004>
- Wen, H., Xiao, Y., Zhang, L. (2017). School district, education quality, and housing price: Evidence from a natural experiment in Hangzhou, China. *Cities*, 66, 72–80. <https://doi.org/10.1016/j.cities.2017.03.008>
- Wen, H., Xiao, Y., Hui, E. C. M., Zhang, L. (2018). Education quality, accessibility, and housing price: Does spatial heterogeneity exist in education capitalization? *Habitat International*, 78, 68–82. <https://doi.org/10.1016/j.habitatint.2018.05.012>
- Wen, H., Xiao, Y., & Hui, E. C. M. (2019). Quantile effect of educational facilities on housing price: Do homebuyers of higher-priced housing pay more for educational resources? *Cities*, 90, 100–112. <https://doi.org/10.1016/j.cities.2019.01.019>

- Wetzstein, S. (2017). The global urban housing affordability crisis. *Urban Studies*, 54(14), 373–394. <https://doi.org/10.1177/0042098017711649>
- Wittowsky, D., Hoekveld, J., Welsch, J., Steier, M. (2020). Residential housing prices: impact of housing characteristics, accessibility and neighbouring apartments – a case study of Dortmund, Germany. *Urban, Planning and Transport Research*, 8(1), 44–70. <https://doi.org/10.1080/21650020.2019.1704429>
- Zhang, J., Li, H., Lin, J., Zheng, W., Li, H. (2019). Meta-analysis of the relationship between high quality basic education resources and housing prices. *Land Use Policy*, 99, art. no. 104843. <https://doi.org/10.1016/j.landusepol.2020.104843>
- Zhou, T. (2018). Capitalization of Public School Quality into Housing Prices: An Empirical Analysis Based on School District Housing for Public Primary Schools in Shanghai. *Chinese Studies*, 7, 286–327. <https://doi.org/10.4236/chnstd.2018.74025>

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