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Examining the Effect of Urban Rail Transit on Property Prices from the Perspective of Sustainable Development: Evidence from Xuzhou, China

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Abstract: Urban rail transit (URT) promotes sustainable urban development by alleviating traffic congestion and environmental degradation. However, many cities have developed URT projects recently, often encumbering local governments with debt. Land value capture (LVC) is an important theory that explores the new financing modes for urban rail transit. Despite prior studies that have found a positive relationship between URT and property prices based on LVC, limited empirical studies explore sustainable paths to better examine the effect of URT on property prices. This study collects 1036 properties in Xuzhou, China. Meanwhile, multiple regression models are established to analyze the impact mechanism of URT on property prices, and to further examine the combination effects of multidimensional neighborhood infrastructure and URT on property prices from the perspective of sustainable development. The results show that the coefficients of URT in all models are negative, indicating that the property prices decrease as the distance from the URT to the property increases, and the positive coefficient of TRANS implies that the transfer station would raise house prices. Combining Park, School (and Hospital) variables with URT, respectively, the negative coefficients of URT increase from 0.0435 to 0.0846 and 0.0525, and these URT variables are significant, indicating that parks, schools, and hospitals can enhance the effect of URT on property prices. However, adding the Shopping variable, the negative value of URT drops from 0.0435 to 0.0192, and is not significant, which means shopping centers have a restraining impact. Moreover, the combination of parks and schools (and hospitals) can better enhance the effect of URT on property prices (the highest URT negative coefficient is 0.0870). This study can provide a reference for the government to facilitate URT planning and better decision-making.

Keywords: urban rail transit; property prices; multiple regression; sustainable development; land value capture

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1. Introduction

China's urbanization rate has surged, increasing from 17.92% in 1978 to 64.72% in 2021. Since urban rail transit (URT) promotes surrounding businesses, improves social equity and justice, and reduces carbon emissions, it has claimed the top priority worldwide [1]. For instance, 48% and 38% of residents travel using URT in Tokyo and Seoul, respectively. However, numerous cities are facing a wide variety of unsustainable problems, such as low transportation efficiency and environmental degradation. Importantly, URT systems also incur huge costs, resulting in the government facing huge financial pressure, especially in local governments with limited budgets. URT projects in some cities even were suspended during construction due to the public debt burdens [2]. As a vital tool to cope with this challenge, land value capture (LVC) would enhance the value and price of related properties and produce economic profits and welfare for surrounding businesses to recover the construction costs and reinvest in urban infrastructure.

To better implement LVC, it is essential to grasp the influence mechanism of increasing the price of properties. URT shows the most remarkable performance in improving the surrounding property prices as it improves accessibility for residents in the vicinity and increases the land density [1]. Besides, since the rapid development of urbanization resulted in limited urban space, intensive land use should be emphasized to create greater social welfare. In this way, the government should rationally plan the layout of various urban neighborhood infrastructures to promote agglomeration effects. Specifically, neighborhood infrastructures (e.g., public hospitals, schools, and parks) around residential buildings would increase property prices through more extensive positive externalities. Munshi (2020) [3] suggested that schools and parks were important factors in enhancing property prices due to the provision of high-quality education and a more comfortable ecological environment. Although URT and neighborhood infrastructure can boost property prices, respectively, it has not been proven that neighborhood infrastructure can further enhance the positive effect of URT on property prices.

In this way, it is essential to explore the combination effects of different neighborhood infrastructures and URT on urban economic development. Existing research suggests that the combination of hospitals and URT would bring a higher commercial property price [4], but ignored the effect on residential property prices. Meanwhile, few quantitative studies examined the comprehensive impact of different neighborhood infrastructures on housing prices based on a sustainable development perspective to achieve an efficient combination of different functions in the urban area. Multiple regression is the most widespread tool in empirical analysis used to explore the mechanisms between independent and different dependent variables. Meanwhile, this model is essential for determining the optimal combination of many variables. Based on the 1036 properties collected from Xuzhou, China, this study used a multiple regression model to examine the combination effects of multidimensional neighborhood infrastructures (parks, schools, hospitals, and shopping malls) and URT on the prices of properties. This study can help governments make decisions about neighborhood infrastructure and URT based on the sustainable development principle and provide insights into the design of LVC in the financing structure of URT projects.

2. Literature Review

2.1. Sustainable Development and Infrastructure

With the continuous advancement of the industrial revolution and globalization, the negative impacts of urban development on the environment have gradually emerged [5], indicating that human beings need a new way to deal with nature [5]. Since the Brundtland Commission Report in 1987, sustainable development (SD) encapsulating intergenerational equity, which is defined as, "development that meet the needs of the present and future generations" [6], has gained worldwide attention. Moreover, SD is multidimensional and includes economic, social and environmental goals [6], which are generally recognized as the triple bottom line (TBL).

In 2015, the United Nations proposed 17 Sustainable Development Goals, including sustainable infrastructure for satisfying worldwide urbanization processes. At a neighborhood level, both physical and social characteristics of sustainable infrastructure can reflect the development level of economic, social, and environmental sustainability around the residential structure. In this study, sustainable neighborhood infrastructure refers to basic public services related to economic, environmental, and social development. Specifically, the infrastructure related to economic development refers to public facilities contributing to urban economic growth by facilitating commerce and promoting consumption [7]. Social infrastructure means public facilities that positively impact the quality of life, such as improved healthcare and education and public service accessibility [8]. Infrastructure related to environmental performance means the public facilities which would prompt urban ecologies, such as landscapes, air quality, and water quality [9]. In this study, neighborhood infrastructure refers to basic public services, including education, medical care, urban landscapes, and shopping malls.

2.2. The Effect of URT on Property Prices

On the one hand, most studies have concluded that URT could increase nearby housing prices. URT can connect different functional units (such as residential districts and commercial centers) to form a compact spatial structure [10]. The improved transportation accessibility would increase purchase rates and housing prices [11]. URT can improve accessibility to public facilities, enhance community well-being, attract investment, and reduce transportation and production costs [12], thus increasing property prices. In practice, improving property prices can reflect the positive effect of URT on economic growth [13]. Meanwhile, residents benefit from reduced transportation costs when taking URT for employment, healthcare, and education, and are willing to transfer these savings to residential and commercial property investments [13]. On the other hand, some studies suggested that URT may decrease property prices due to public safety, pollution, and increased crime near stations [14]. Similarly, considering the transfer station traffic congestion and noise, Dai et al. [15] found that rail transit (especially transfer stations) negatively impacts housing prices.

Furthermore, for the intergenerational equity of SD, the financial pressure on local governments brought on by the huge investment in URT projects will negatively influence property prices. A sustainable financing mechanism should be developed for URT, which will decrease the capital pressure for the present generation and the financial debt for the future generation [16]. LVC provides a potential tool. Since URT can increase property prices, the government could finance the URT by capturing part of the increased profits from owners [11]. LVC can address the financial constraints of URT in the present and obtain additional revenue to develop more infrastructure, to further increase the property price and form a strengthening effect [17]. LVC has been practiced worldwide, such as with the Hong Kong Mass Transit Railway and Tokyo Metro [17]. It is important to note that an essential step in implementing LVC is to confirm whether the URT has increased the property prices and understand how URT raises the property prices.

2.3. The Effect of Neighborhood Infrastructure on Property Price

Various neighborhood infrastructures provide more public services and improve the convenience of the surrounding properties, thus attracting a greater population [18]. Some studies have explored better paths to enhance property prices from the perspective of SD. Ma et al. [19] and Li et al. [20] point out that the neighborhood infrastructure of landscapes, schools, and shopping malls can better promote the property prices. Choi, Park, and Dewald [13] and Xiao, Lo, Liu, Zhou, and Li [18] indicated that planners should create ecological environments near URT for more dynamic civic activities. In recent years, education has become a critical consideration of residents. Therefore, the concepts of "school district house" or "educational real estate" are becoming hot topics in China. Thus, schools significantly influence property prices. Besides, healthcare is also a key to improving the health of urban residents in the post-pandemic era. High-quality hospitals around a property have improved the property's price.

Prior studies related to the infrastructure around the property mainly focused on parks and landscapes, education, healthcare, and shopping malls [21]. Specifically, parks and landscapes can improve air quality, and provide aesthetic and natural amenities, thus being related to environmentally sustainable development [22]. Education and healthcare are related to the basic needs of human beings and socially sustainable development. The shopping mall exerts attraction effects by providing convenient access to entertainment facilities, promoting business prosperity, and supporting sustainable economic development.

Many studies have confirmed that the investment in neighborhood infrastructures can increase property prices. However, existing studies mainly focused on the effect of a single infrastructure (school, shopping mall, park, or URT) on property prices, whereas some studies pointed out the combination effects of limited infrastructures (hospital and URT) on commercial property prices [4]. Few quantitative studies indicate that various neighborhood infrastructures can better enhance the impact of URT on the prices of properties.

From the perspective of SD, a conceptual framework is developed in this study to put forward research hypotheses to better increase property prices (shown in Figure 1). First, the URT would directly increase the surrounding property prices. Second, a single neighborhood infrastructure (such as education, healthcare, park, or shopping mall) would enhance the effect of URT on the prices of properties. Third, the combination of various neighborhood infrastructures would further enhance the effect of URT on the prices of properties. The increased housing prices can promote economic development by enhancing regional attractiveness to the population and promoting intergenerational equity by supporting a sustainable LVC mechanism.

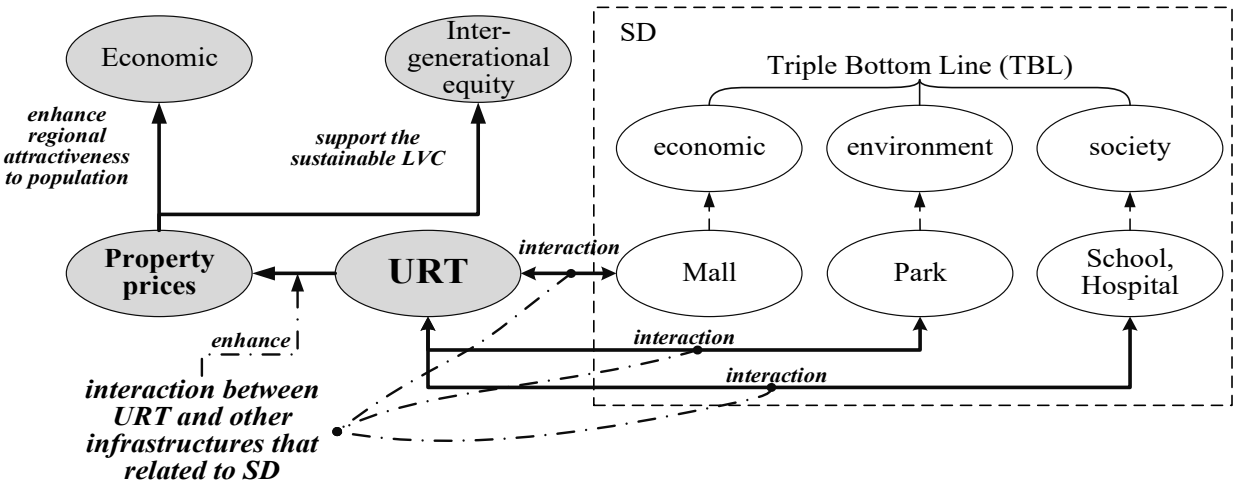

Figure 1. The effects of URT and neighborhood infrastructures on property prices from perspective of sustainable development.

3. Methodology

A multiple regression model is constructed to examine the combination effects of multiple neighborhood infrastructures and URT on property prices. Figure 2 shows the research framework. First, the effect of URT on property prices is tested. Then, from the perspective of sustainable development, the effects of each single neighborhood infrastructure (park, hospital/school, and shopping mall) and URT on the prices of properties is investigated. This study further proposes four combination schemes, including park–shopping, shopping–hospital (and school), park–hospital (and school), and park–shopping–hospital (school). to explore the combination effects of multiple neighborhood infrastructures and URT on property prices.

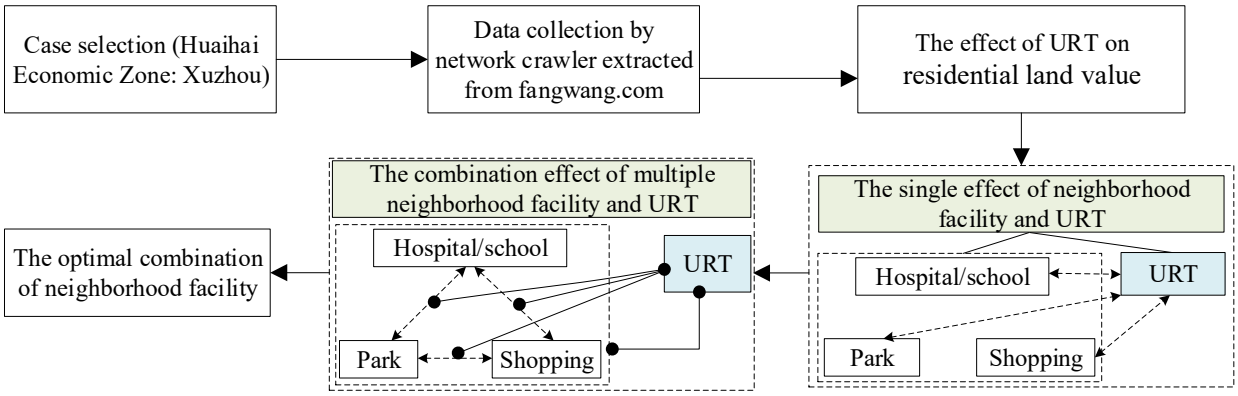

Figure 2. The research framework.

3.1. Case Selection

To reduce potential location bias, the cases should be selected from specific economies. Huaihai Economic Zone is an important comprehensive transportation hub in China and is a critical node for the development of "Belt and Road Initiative" [23]. As the central city of this Economic Zone, Xuzhou is an important center of economic, cultural, financial, medical, foreign trade, scientific, and educational activities. In this way, this study chose Xuzhou as the research area (Figure 3). Metro Line 1 of Xuzhou is the first URT line that covers the east–west passenger flow in the whole city. This metro connects the necessary public facilities of the hospital, university, business center, and Xuzhou railway station, significantly stimulating the surrounding land and real estate markets. Meanwhile, the operating URT projects should be selected to guarantee sufficient empirical data. Xuzhou Metro Line 1, which has 18 stations (6 transfer and 12 regular stations), has been in operation since September 2019, indicating that complete research data can be collected.

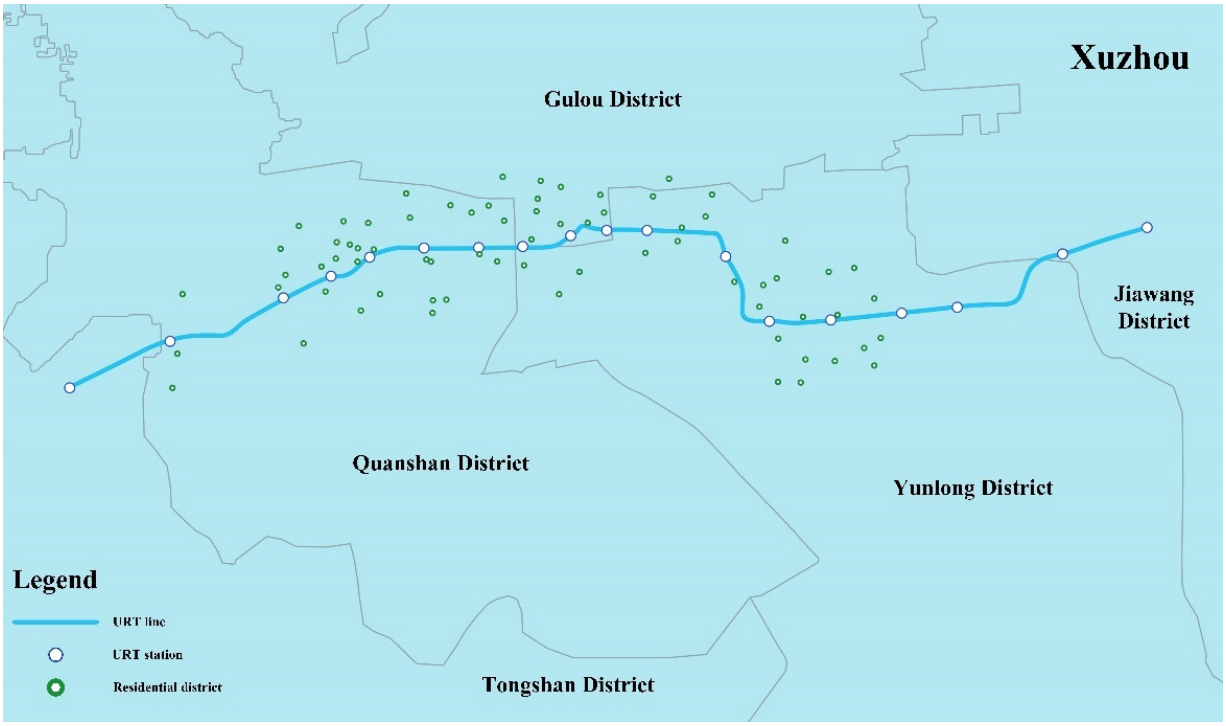

Figure 3. The geographic location of Xuzhou.

The study selected residential areas covered by the URT network as the analysis sample. The data were collected from fangwang.com (a leading real estate website in China). Due to the different effects of URT on different types of real estate (such as single-family houses and villas), the dataset collected in this study is of general residences. Moreover, since the prices of new real estate are affected by macro-policies, the data on second-hand houses were collected. Because the maximum scope of URT on property prices was about 1500 m [15], this study collected information on residences located within 1500 m of URT stations on Line 1. Furthermore, this study collected the property prices along the URT in 2018 (before the construction of the URT) to compare whether the construction of the URT had an impact on housing prices. Statistical results show that after the construction of the URT, the prices along the URT route show an upward trend of about 10–30%. To further demonstrate that the combination of URT and neighborhood infrastructure can better promote house prices, this study collected data after the construction of the URT (during September 2019–February 2020) as a sample. Therefore, this study excludes the missing samples of related attributes to obtain valid housing information from 1036 properties in 72 residential districts in Xuzhou, China.

3.2. Variables

It is important for a multiple regression model to select various proxy variables to measure the dependent variable and explanatory variables (see Table 1). Referring to Li and Huang [24] and Dai, Bai, and Xu [15], property prices were approximately measured by house prices per square meter. Moreover, many studies have discussed the determinants of the property prices. According to Wu et al. [25], the determinants can be categorized into URT stations, property structures, and neighborhood infrastructures. Specifically, the URT station reflects the accessibility of public transport around the residence. Jiang [26] pointed out that the closer the URT is to the residential building, the more convenient transportation is nearby. Zhen et al. [27] suggested that areas close to transfer stations can better prompt economic development. Thus, this study selected the URT station (URT) and transfer station (TRANS) as critical explanatory variables to explore the development level of URT. According to Pan and Li [25] and Dai, Bai, and Xu [15], the URT variable was calculated as the nearest distance from the residential districts to the URT station, and the TRANS variable was regarded as a dummy variable (TRANS = 0,1). Specifically, TRANS = 1 when the URT station is a transfer station; otherwise, TRANS = 0.

Table 1. Various proxy variables.

	Variable	**Meaning**	**Sign**
Dependent variable	Price	The house price per square meter.	+
Structural variables	Area	The property area.	+
	Decoration	Dummy variable: 1 for fine decorations, otherwise 0.	+
	Room	The number of bedrooms.	+
	Floor	Dummy variable: 1 for middle floors, otherwise 0.	+
	Volume	Plot ratio.	−
	Age	Property or building age.	−
Neighborhood variables	Park	The distance of the residential districts to the nearest park.	−
	School	Dummy variable: 1 for school-district housing, otherwise 0.	+
	Hospital	The distance of the residential districts to the nearest hospital.	−
	Shopping	The distance of the residential districts to the nearest mall or supermarket.	−
URT station variables	URT	The distance of the residential districts to the nearest URT station.	−
	TRANS	Dummy variable: 1 for a transfer station, otherwise 0.	+

Urban sustainable development is the basic premise for increasing property prices. From the perspective of SD, the social, economic, and ecological dimensions of urban residences should be emphasized. Social sustainability is concerned with the life-quality improvements of the occupiers. For example, the hospital and school are closely related to the residents' health and education level, which would reflect the social sustainability around the property. In recent years, the continuous construction of new buildings has led to the deterioration of the urban environment. Since the urban park could prompt a better physical environment around the property, parks can be used to represent urban ecological sustainability. Meanwhile, since regions with higher economic levels have strong consumption power, shopping centers can reflect the economic level of different areas. This study uses the shopping mall to represent the economic level around an urban property. Therefore, from the perspective of SD, urban parks, hospitals, shopping malls, and schools are chosen as neighborhood infrastructures, which are denoted as Park, Hospital, Shopping, and School. In practice, URT is more likely to have an impact on property prices within a certain distance of the surrounding area. According to Dai [15] and Ren [28], property prices would be affected by neighborhood infrastructures within 1500 m. In this way, the above neighborhood infrastructures are measured as the nearest distance (within 1500 m) between the property and these infrastructures (urban park, hospital, and shopping mall). The high-quality schools around the residence will be favored by the residents, and thus, schools will have a positive effect on housing prices. According to Yang [29] and Zhang et al. [30],

the School variable is regarded as a dummy variable (School = 0, 1). Specifically, when the property is school-district housing, School = 1; otherwise, School = 0.

Structural variables are the basic factor that affects property prices, which is composed of the internal properties of the property [28]. With regard to the structural variables, Area, Decoration, Rooms, Floor, Volume, and Age are considered in this study. According to Zhang, Xu, Jia, and Liao [30], the variables of Decoration and Floor are regarded as dummy variables. For instance, Decoration = 1 when the property is finely decorated, and Floor = 1 when the property has middle floors. Meanwhile, according to Ren, Li, Cai, Ran, and Gan [28,31], Room, Volume, and Age are determined by the number of bedrooms, plot ratio, and the age of the property, respectively.

To avoid spurious regression and eliminate heteroscedasticity, this study takes the natural logarithm of time-series variables, such as Area, Park, Hospital, Shopping, and URT variables. Therefore, six structural variables, four neighborhood variables, and two URT variables are selected to analyze the impact of URT and neighborhood infrastructure on property prices.

3.3. Multiple Regression Model

Different research methods can be used to analyze the relationship between different variables. The most common methods include econometric modeling, which has one dependent variable and focuses on one-way causality. Multiple regression models are classical econometric models.

The multiple regression model can be used to determine linear or nonlinear quantitative relationships between multiple variables. This model is the most widespread tool in empirical analysis that explores the mechanisms between independent and different dependent variables. Importantly, this model is essential for analyzing the relative importance of different variables and determining the optimal combination of many variables. For example, using the multiple regression model, Hoffman [32] found that the underground site condition, project management works, estimating works, competency of the subcontractor, accuracy and completeness of the design, and the owner's project financing affected the time performance. Weshah [33] pointed out that the technical engineering and site issue factor, bidding and contracting factor, and information factor were the strongest influences on the schedule and cost project performance indicators in the multiple regression model. In this way, multiple linear regression is an appropriate method to analyze the optimal effect of different combinations of dependents on independents.

In this study, multiple regression is used to verify the combination effects of neighborhood infrastructure and URT on property prices. The following regression model can be used for estimation.

$$y = \beta_0 + \sum_{i=1}^{n} \beta_i x_i$$

where y is the dependent variable, representing the property prices. x_i represents the explanatory variables, which include the URT station characteristic variable, neighborhood variables, and structural variables. β_i denotes the regression coefficient of the explanatory variables.

4. Results

First, using the multiple regression model, the results show the effect of URT on property prices. Then, the effects of a single neighborhood infrastructure (such as a school/hospital, shopping mall, and park) and URT on property prices are shown, followed by the combination effects of different neighborhood infrastructures and URT on property prices.

4.1. The Effect of URT on Property Prices

Model 1 in Table 2 first explores the relationship between property structures and property prices. Based on this, Model 2 in Table 2 verifies the effect of URT on property

prices. Based on Model 1, Model 2 adds two vital explanatory factors (URT and TRANS) to verify the effect of URT and transfer stations on the prices of properties. The coefficient of URT in Model 2 is negative and significant, which demonstrates that the property prices decrease as the distance between URT station and property increases. Meanwhile, the TRANS variable is positive, which means that the transfer station would increase the property price. Consistent with Ren [28] and Zhang [22], URT and transfer stations would enhance the property prices because URT can alleviate traffic congestion and expand consumption facilities.

Table 2. The results of the effect of URT on residential property price.

Variable		Model 1 Coefficient	Model 2 Coefficient
Explanatory variables	URT		−0.0435 *** (0.0138)
	TRANS		0.0718 *** (0.0231)
Structural variables	Area	0.1624 *** (0.0301)	0.1865 *** (0.0308)
	Decoration	0.0643 *** (0.0138)	0.0688 *** (0.0139)
	Room	0.0433 *** (0.0143)	0.0327 ** (0.0145)
	Floor	0.0406 *** (0.0133)	0.0435 *** (0.0132)
	Volume	0.0630 *** (0.0068)	0.0480 *** (0.0077)
	Age	−0.0094 *** (0.0011)	−0.0104 *** (0.0011)
	(Constant)	8.4783 *** (0.1228)	8.638 *** (0.1626)
		R^2 = 0.4020 Adjusted R^2 = 0.3985 F = 90.23 ***	R^2 = 0.4127 Adjusted R^2 = 0.4082 F = 90.23 ***

Note: *** means significant (1% level). ** means significant (5% level).

Moreover, the coefficient of the Room variable decreased, from 0.0433 in Model 1 to 0.0327 in Model 2. This result means that with the positive effect on property prices around URT, the number of rooms will reduce. Liu [34] revealed that high-end properties (such as villas) were generally distributed in the surrounding urban areas. Since URT would reduce travel time to work, homeowners near URT mainly are working-class residents. Due to this condition, considering the high property prices, residents have a greater demand for houses with fewer rooms. Other structural variables of Model 2 show similar results to Model 1 in terms of the signs and estimated coefficients. Among them, the Age variable had a negative coefficient, suggesting that the property price decreases with the age of the property. The variables of Area, Floor, Volume, and Decoration are positive, which means that the area, floor, plot ratio, and decoration of the property increase with the property price.

4.2. The Effect of URT and Neighborhood Infrastructures on Property Price

To explore the positive effect of a single neighborhood infrastructure (including a park, hospital, school, and shopping mall) and URT on property prices, Table 3 shows the results of simple combinations, including park–URT, hospital (school)–URT, and shopping–URT.

Table 3. The results of the effects of URT and single-dimension neighborhood infrastructures on property prices.

Variable		Model 2 Coefficient	Model 3 Coefficient	Model 4 Coefficient	Model 5 Coefficient
Explanatory variables	URT	−0.0435 *** (0.0138)	−0.0846 *** (0.0125)	−0.0525 *** (0.0117)	−0.0192 (0. 0131)
	TRANS	0.0718 *** (0.0231)	0.1014 *** (0.0207)	0.0864 *** (0.0198)	0.0577 *** (0. 0218)
Structural variables	Area	0.1865 *** (0.0308)	0.1510 *** (0.0275)	0.1732 *** (0.0258)	0.1601 *** (0.0264)
	Decoration	0.0688 *** (0.0139)	0.0641 *** (0.0124)	0.0468 *** (0.0118)	0.0614 *** (0.0290)
	Room	0.0327 ** (0.0145)	0.0151 (0.0130)	0.0390 *** (0.0122)	0.0456 *** (0.0137)
	Floor	0.0435 *** (0.0132)	0.0341 *** (0.0118)	0.0380 *** (0.0111)	0.0381 *** (0.0125)
	Volume	0.0480 *** (0.0077)	0.0355 *** (0.0069)	0.0272 *** (0.0065)	0. 0394 *** (0.0072)
	Age	−0.0104 *** (0.0011)	−0.0090 *** (0.0010)	−0.0163 *** (0.0010)	−0.0112 *** (0.0011)
Neighborhood variables	Park		−0.1899 *** (0.0117)		
	School			0.1809 *** (0.0115)	
	Hospital			−0.1177 *** (0.0085)	
	Shopping				−0.0645 *** (0.0056)
	(Constant)	8.6386 ***	10.6384 ***	9.4606 ***	9.0453 ***
		R^2 = 0.4127 Adjusted R^2 = 0.4082 F = 90.23 ***	R^2 = 0.5335 Adjusted R^2 = 0.5294 F = 130.38 ***	R^2 = 0.5886 Adjusted R^2 = 0.5845 F = 146.63 ***	R^2 = 0.4802 Adjusted R^2 = 0.4757 F = 105.33 ***

Note: *** means significant (1% level). ** means significant (5% level).

Model 3 emphasizes the effect of ecological sustainability and URT on property prices. The sign for Park is negative, indicating that the closer the distance is between the property and the nearest park, the higher the property prices. This result was supported by Pan and Li [35], who took Shanghai as the case study to verify the positive effect between the presence of a park and the prices of properties. After adding the Park variable, the negative coefficient of the URT increases from 0.0435 (Model 2) to 0.0846 (Model 3) and has a significance of 1%, which means that the park would enhance the effect of URT on property prices. This means that ecological sustainability would further help to build a new financing mode for urban rail transit. Li and Huang [24] supported this result, finding that environment-oriented infrastructure would enhance the URT's impact on property prices.

Compared to Model 2, Model 4 adds School and Hospital variables to consider more social sustainability. The coefficient of the School variable is positive, indicating that a school would increase property prices. This is consistent with the findings of Pan and Li [35]. The coefficient of Hospital is 0.1177, negative, and significant, which means that the property prices increase the nearer the hospital is to the property. Importantly, the combination of School (and Hospital) and URT enhances the effect of URT on property prices, with the coefficient of the URT variable increasing from 0.0435 (Model 2: URT) to 0.0525 (Model 4: School and Hospital–URT). This result further indicates that social sustainability would strengthen the effect of URT on the property prices.

Moreover, Pan and Li [35] pointed out that the business economy around the neighborhood infrastructure will affect property prices. Model 5 shows the combination effects

of economic sustainability and URT on property prices. The Shopping variable is negative and significant, which implies that the closer the distance between the shopping mall and the property, the higher the property prices. This result is similar to that of Zhang et al. [36], who found that a shopping mall would increase the housing prices in nearby neighborhoods. However, adding the Shopping variable, the negative coefficient of URT in Model 5 drops from −0.0435 to −0.0192, and is not significant, which means shopping centers weaken the promotion effect of URT on the prices of properties. Meanwhile, despite the TRANS variable being significant, the negative coefficient of TRANS drops from 0.0718 (Model 2) to 0.0577 (Model 5), indicating that the shopping mall and URT have a restraining impact on the prices of properties.

The results from Table 3 indicate that the combinations of URT and single neighborhood variables have different positive effects on property prices. Overall, the combination of URT and ecologic sustainability is more likely to increase property prices.

To verify the effect of the combination of URT and multidimensional neighborhood variables on property prices, Table 4 shows the result of various combinations, including park–hospital (and school)–URT, park–shopping–URT, hospital (and school) –shopping–URT, and park–hospital (and school) –shopping–URT.

Table 4. The results of the combination effects of neighborhood infrastructure and URT on property prices.

Variable		Model 6 Coefficient	Model 7 Coefficient	Model 8 Coefficient	Model 9 Coefficient
Explanatory variables	URT	−0.0870 ***	−0.0603 ***	−0.0395 ***	−0.0760 ***
		(0.0096)	(0.0117)	(0.0115)	(0.0095)
	TRANS	0.0876 ***	0.0872 ***	0.0820 ***	0.0841 ***
		(0.0161)	(0.0192)	(0.0193)	(0.0158)
Control variable (property structural characteristics)	Area	0.1293 ***	0.1249 ***	0.1594 ***	0.1198 ***
		(0.0211)	(0.0256)	(0.0252)	(0.0206)
	Decoration	0.0530 ***	0.0596 ***	0.0447 ***	0.0512 ***
		(0.0096)	(0.0115)	(0.0115)	(0.0094)
	Room	0.0170 *	0.0279 **	0.0461 ***	0.0231 **
		(0.0099)	(0.0121)	(0.0119)	(0.0098)
	Floor	0.0276 ***	0.0287 **	0.0352 ***	0.0257 ***
		(0.0090)	(0.0110)	(0.0108)	(0.0088)
	Volume	0.0085	0.0269 ***	0.0251 ***	0.0074
		(0.0054)	(0.0064)	(0.0064)	(0.0052)
	Age	−0.0150 ***	−0.0099 ***	−0.0161 ***	−0.0149 ***
		(0.0008)	(0.0009)	(0.0010)	(0.0008)
Control variable (neighborhood characteristics)	Park	−0.2249 ***	−0.1893 ***		−0.2189 ***
		(0.0098)	(0.0108)		(0.0096)
	School	0.1120 ***		0.1719 ***	0.1068 ***
		(0.0098)		(0.0113)	(0.0096)
	Hospital	−0.1698 ***		−0.0958 ***	−0.1515 ***
		(0.0072)		(0.0088)	(0.0076)
	Shopping		−0. 0642 ***	−0.0381 ***	−0.0295 ***
			(0.0049)	(0.0052)	(0.0042)
	(Constant)	12.2503 ***	11.0373 ***	9.5387 ***	12.2363 **
		R^2 = 0.7280 Adjusted R^2 = 0.7251 F = 249.14 ***	R^2 = 0.6003 Adjusted R^2 = 0.5964 F = 153.94 ***	R^2 = 0.6092 Adjusted R^2 = 0.6050 F = 145.12 ***	R^2 = 0.7402 Adjusted R^2 = 0.7372 F = 242.95 ***

Note: *** means significant (1% level). ** means significant (5% level). * means significant (10% level).

Model 6 shows the combination effects of park–hospital (and school)–URT on property prices. The negative coefficient of the URT variable is 0.087, which is higher than that of Model 3 (park–URT) and 4 (hospital (and school)–URT); additionally, the coefficients of the Park, School, and Hospital variables are significant. These results show that the

effect of the combination of park–hospital (and school)–URT is greater than that of a single dimension (park–URT or hospital (and school)–URT), indicating that the combination of the parks, hospitals, and schools will better enhance the effect of URT on property prices. Model 7 shows the effect of park–shopping–URT on property prices. The coefficient of URT is lower than that of Model 3 (park–URT), decreasing from 0.0846 to 0.06033, which indicates that the shopping mall will offset the positive effect of the park–URT on property price. Meanwhile, Model 8 shows the effect of the hospital (and school)–shopping–URT on property prices. The coefficient of URT dropped from 0.0525 (Model 4: hospital (and school)–URT) to 0.0395, indicating that the shopping mall would reduce the positive effect of hospital (and school)–URT on property prices. Model 9 is the effect of URT–park–hospital (and school)–shopping on property prices. The results show that the URT variable has a negative coefficient of 0.076, which is lower than that of Model 6 (0.087), but higher than those of Model 7 (0.0603) and Model 8 (0.0395).

Model 6–Model 9 show the effect of different combination schemes on property prices. Overall, the URT coefficient of Model 6 (park–hospital (and school)–URT) is higher than the other models in Table 4, indicating that the combination of ecological sustainability and social sustainability can better promote the positive impacts of URT on property prices.

5. Discussion

5.1. The Effect of URT on the Property Prices

The combination effects of multidimensional neighborhood infrastructures and URT on property prices are analyzed in this study. Structural characteristics are basic elements that affect the capitalization of property prices [4]. Specifically, the noise, building size, housing age, and the total number of rooms were proposed to verify the impact on property prices. This study constructs a more complete set of structural characteristic variables, including property area, room, volume, age, decoration, and floor, to prevent omitting important structural factors.

Based on the above structural characteristics, this study found that the property prices, in time, will increase with URT and transfer station construction. This result was supported by Ren [28], who explored the influence of a subway on property prices in Chengdu. By contrast, Geng (2015) pointed out that, due to the noise and safety problems, a URT system may reduce the housing prices of residences that are within a short distance of a subway station [37]. Although the URT system negatively impacts the living comfort of residents, most cities have built URT-related facilities, such as sound insulation panels, to enhance the availability of URT in urban areas. Additionally, properties around the URT are more likely to be favored by low- and medium-income people. These residents rely more on public transport than high-income people to save money, and thus, are more willing to pay the premium that subway accessibility produces. In this situation, the price of housing along the URT will not decrease. Besides, URT connects important commuter pathways associated with residential areas to improve the accessibility of surrounding properties. The regional accessibility improvements brought on by URT attract a greater population flow and increases property prices. The improved accessibility and convenience of the metro will enhance the positive impact, thus increasing house prices continually. The local governments of second-tier cities in the URT planning stages should consider the effect of URT on surrounding property prices. Specifically, rail transit companies should simultaneously plan and develop the URT to capture the land value added.

5.2. The Effect of Neighborhood Infrastructure and URT on Property Prices

Governments should improve transport accessibility by investing in more sustainable neighborhood infrastructure to obtain more benefits from the URT [20]. The combination results indicate that there are better ways to promote the URT's positive effects on the prices of properties. The combination of ecological sustainability (parks) and URT has a more significant impact on the property price. Eco-housing, which meets the goals of URT construction and eco-city planning, will be favored by consumers. There has been a

trend of ecological environment orientation in residential locations; that is, the properties closest to beautiful areas such as parks and public green spaces have great potential. This phenomenon implies that improving the urban ecological landscape can further promote the positive effect of URT on property prices, thus bringing great economic benefits.

Meanwhile, this study finds that social-related neighborhood infrastructure (schools and hospitals) can enhance the positive effects. This is inconsistent with Xu et al. [38], who pointed out that hospitals have a weakening effect on property price because of pollution and cultural factors. The COVID-19 outbreak in 2019 has made residents pay more attention to the relationship between health and urban space. Cities are facing various health challenges, including hazards from climate change, emerging infectious diseases, and aging populations. In these conditions, residents are aware urban planning, including health infrastructure, is a determinant of urban health. Importantly, with the public being very concerned about health services in the post-pandemic era, hospitals have become important public infrastructure for residents to protect their health, leading to more residents choosing medical-care properties.

Furthermore, this study also finds that shopping malls would reduce the positive effects of URT on property prices. The areas where shopping malls and URT are combined have large populations and noisy living environments, thus decreasing residential property prices. The properties preferred by residents have shifted from commercial centers with convenient transportation in the past to more comfortable and healthier areas [4].

In the past, URT was the main way to achieve LVC. Residents have now upgraded their living environment requirements to pursue a more sustainable living environment. Specifically, improving accessibility, a beautiful ecological environment, and basic health needs should be considered in the LVC model. Overall, the interaction with neighborhood infrastructure has produced a positive externality far greater than that of URT itself, expanding the positive effect of URT on urban economic sustainable development. The results further indicated that the government should diversify the ways to achieve LVC, such as combining URT with different community facilities.

5.3. Implications

The interaction between URT and multidimensional neighborhood infrastructures such as parks, schools, and hospitals can further exert a premium effect on the property prices and provide prerequisites for the property price chain, thus promoting sustainable economic development directly and indirectly.

Rapid urbanization has resulted in a reduction in available urban land. The government should emphasize the intensive land use to prompt the high-quality development of the urban economy. Based on the interaction between various infrastructures, the government should formulate a plan to improve the efficiency of land use. Specifically, the development of URT projects should require urban planning to ensure that the construction of URT projects is in line with urban ecological and social sustainability [39].

Meanwhile, the government should improve the supporting infrastructure around residential structures by accelerating the urban housing development mechanism. The optimal combination of different infrastructures proposed by this study can be used as a reference frame to determine the layout of the infrastructure around different urban residences. Importantly, the local governments of second-tier cities in the URT planning stages should develop a dynamic decision-making model that considers the land development intensity to verify the effect of URT and related facilities on surrounding property prices and capture the land value added. For example, since the nearby social and ecologic sustainability can enhance the impact of URT on the property price to the greatest extent, a park, school, or hospital would be a good alternative to increase the property prices; additionally, the co-development of parks, schools, and hospitals with URT would be a great way to increase the property prices.

Furthermore, the increase in property price can stimulate urban consumption and promote the prosperity of related industries (such as commerce and real estate). From

the perspective of intergenerational equity in SD, URT investment should not burden future generations in economic, ecological, and social dimensions [16]. The government can implement the LVC mechanism by taxing the property price added due to the URT or obtaining revenue from land concessions, leases, or real estate management around the URT. This mechanism can provide sustainable funding for expensive URT projects, and develop more urban infrastructure [39].

6. Conclusions

Despite URT systems mitigating numerous urban problems (e.g., traffic congestion, air pollution, automobile noise), URT can incur huge costs, resulting in a burden on local governments with limited budgets. LVC is an efficient tool to recover the construction costs and reinvest in urban infrastructure. For the best use of LVC, it is vital to verify the influence mechanism of URT on increasing housing prices.

A multiple regression model is adopted in this study to examine the combination effects of multidimensional neighborhood infrastructures and URT on property prices from the perspective of sustainable development. The results show the positive effect of URT on surrounding property prices, and that the transfer station also has a significant impact. Meanwhile, the urban parks, schools, and hospitals can better enhance the positive effects of URT on the prices of properties, whereas shopping centers will weaken the positive effects of URT on the prices of properties. Moreover, the results show that the combination of parks and schools (and hospitals) would help URT contribute the greatest impact on the prices of properties. The findings can be a guide to provide recommendations for policy makers to determine the layout of the infrastructure around different urban residential buildings.

Although housing prices are now stabilizing in many cities, residents will still prefer to buy properties with good neighborhood amenities, thus raising the price of such properties. Therefore, reasonable predictions of property prices will be widely followed. Future research should also predict the house price of a new residence based on neighborhood infrastructures of urban parks, schools, and hospitals by machine learning methods. There are several limitations to this study. First, since this study mainly focuses on residential property prices, LVC could be used to discuss the relationship between URT and prices of different types of properties in future studies. Second, the data of this study are from the Xuzhou Line 1 adjacent area. The study area should be expanded to ensure generalizability of the findings in the future.

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