

Article

# Price Determinants of Affordable Apartments in Vietnam: Toward the Public–Private Partnerships for Sustainable Housing Development

Ducksu Seo <sup>1,\*</sup>, You Seok Chung <sup>2</sup> and Youngsang Kwon <sup>1,\*</sup>

<sup>1</sup> Department of Civil and Environmental Engineering, Seoul National University, Seoul 08826, Korea

<sup>2</sup> National Housing Organization, Ho Chi Minh City 700000, Vietnam; nho.yschung@gmail.com

\* Correspondence: handonge@gmail.com (D.S.); yskwon@snu.ac.kr (Y.K.);

Tel.: +82-(0)-2-880-7374 (D.S.); +82-(0)-2-880-8200 (Y.K.)

Received: 11 December 2017; Accepted: 12 January 2018; Published: 15 January 2018

**Abstract:** Since the Doi Moi policy of economic reform in 1986, Vietnam has experienced economic development and housing market growth with increasing foreign direct investment. While high-end apartment development has dominated since the emergence of the privatized housing market, more recent focus is on the affordable apartment segment with the remarkable surge of middle-income households in Ho Chi Minh City (HCMC). While most previous studies have analyzed housing price determinants based on locational classification, this study is based on the affordability framework of the housing market in HCMC. It aims to investigate the price determinants of affordable and unaffordable apartment units using the hedonic regression model. The study identified common factors between the two types of apartments, such as vertical shared access and proximity to downtown, as well as unique factors for each, such as more high-rise towers, foreign development, proximity to main roads, and shopping malls only for the affordable segments. The findings have valuable implications, not only for future investors and developers in setting up successful housing development strategies, but also for the public sector in strongly encouraging public–private partnerships for sustainable housing development in Vietnam.

**Keywords:** Vietnam; Ho Chi Minh City; affordable housing; apartment; hedonic regression model

## 1. Introduction

### 1.1. Economic Growth and Housing Development in Vietnam

Vietnam has registered dynamic national growth following the introduction of economic reform, the Doi Moi (Đổi Mới: open door) policy, in 1986. It has moved away from the government-led economic structure by opening up the local market. The economic renovation attracted foreign investment and promoted overseas business to promote economic growth. The policy goal was to create a socialist-oriented market economy and to accelerate the economic transition to industrial manufacturing, creating employment opportunities and economic output [1]. This led to a remarkable growth in foreign direct investment (FDI) and spurred industrial manufacturing development in Vietnam. The reforms have achieved a steady annual GDP growth of 5–10% for the last several decades, enabling Vietnam to leap forward as one of the fastest-growing countries in Asia, with falling poverty rates and improved quality of life [2]. The resulting surge in foreign direct investment (FDI) into Vietnam was particularly evident in the real estate sector, which received the second-largest proportion of FDI (18%) after the manufacturing and processing industries (58%) [3].

The housing market in Vietnam has been steadily growing over the last two decades. From 1999 to 2009, 275,000 housing units were supplied in Vietnam and an additional 325,000 are expected between

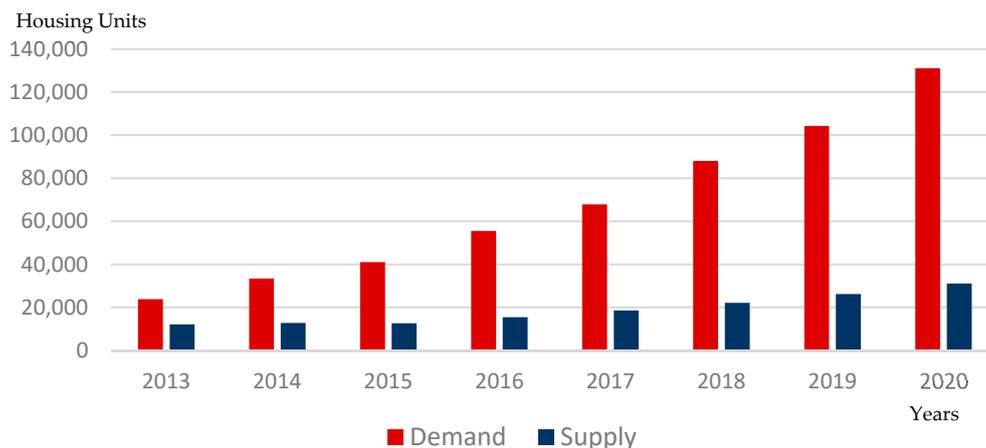
2009 and 2019. Housing demand has increased by about 10% every year, and reports suggest an additional 394,000 housing units need to be built annually until 2049, considering Vietnam's current urban population growth rate (3%). This is equivalent to 1079 homes per day or 45 homes per hour [2]. In particular, with a recent surge in the middle-income class, the popularity of affordable apartment segments for the middle class can be observed in various market analysis reports. The rapid and continuing increase in Vietnam's middle class (the fastest in Asia) means demand for affordable apartments is predicted to increase fivefold between 2013 and 2020, a demand that can only be sustainably met by apartment projects in urban areas to provide the quantity and quality of housing needed [4,5].

The popularity of apartments is associated with urbanization trends and traffic issues in Vietnam. According to Seo and Kwon (2007), apartments are the preferred choice of middle-income purchasers, with commuting conditions and transportation being the key factors [6]. As the economy booms, so does vehicle ownership [7]. Car ownership has increased at over 10% per annum (320% in the period 2005–2014) while there are now more motorbikes (8.5 million) than people (8.2 million) in Ho Chi Minh City (HCMC) [8]. This overburdening of the city's road capacity has led to massive traffic congestion and declining air quality for commuters. Apartments, therefore, are seen as at least a partial adaptation to this problem. While other forms of housing (e.g., row houses) suffer from urban densification and poor vehicular accessibility, high-rise apartments built with foreign investment offer spacious units, open spaces, parking lots for cars and motorbikes, and excellent access to main roads [9].

### *1.2. Affordable Housing in Vietnam*

Housing affordability generally indicates a ratio approach between household disposable income and housing prices. In other words, the affordability estimates if the household's purchasing power is sufficient to secure a residential property in the housing market. Affordable housing in developing countries is defined with the following criteria: housing-related spending should be no more than 30 to 40% of household income, adequate living space and amenities should be available, and 80% of middle-income residents should be able to afford the housing based on the Housing Affordability Index [10]. According to the World Bank, household purchasing power has been estimated for each income quantile with regard to payment capacity and access to housing finance in Vietnam. The monthly income of a median quantile household was USD 460 and that of the highest income class USD 1340. In this income structure, it was difficult for the middle-income households to obtain access to housing. To enhance housing affordability for the middle-income class, the Vietnamese government launched a subsidized mortgage program as per the regulations of the central banks in June 2013 called 'VND 30 Trillion Home Loan Package,' which was available at a maximum fixed annual interest rate of 6%, a maximum loan tenure of 15 years, and a loan to the value of 70 to 80% of the purchase price for first purchasers of social housing or apartments. Since the subsidized program was launched, around 80% of apartment buyers in HCMC have taken advantage of the package [11,12].

The dynamic of high-rise apartment development is mainly evident in HCMC and Hanoi, representing between them 85% of Vietnam's total housing market. This is particularly the case for HCMC as Vietnam's largest city and key economic hub. With GDP growth at an annual 10% for 10 years and HCMC experiencing annual urban growth of 3%, the city's ever-increasing population means the housing market is experiencing remarkable growth but is also under severe pressure. According to the statistics for 2010–2015, 58% of the total housing supply in HCMC was affordable high-rise housing: 153 apartment projects, containing 79,967 units, were supplied to the middle-income bracket. In 2015, 77 affordable apartment projects with 40,008 units were developed, while growth in the high-end housing market was also strong [13]. Future projections for affordable apartment demand are remarkable: according to the EZLand study (2016), only 12,128 units were produced in 2013 to meet a demand for 23,838 units. By 2020, demand is expected to reach 130,962 units while the supply will be only 31,042 units (Figure 1), leading to an even more critical housing shortage in HCMC.



**Figure 1.** Affordable Apartment Demand and Supply (Source: EZLand [13]).

### 1.3. Study Purpose and Framework

While high-end apartment development has prevailed in Vietnam since the emergence of a privatized housing market, the affordable apartment segment has recently come to the fore with a remarkable surge of middle-income households in HCMC. This research therefore attempted a different approach to find an answer to the research question of identifying the similarities and differences in price determinants between affordable and unaffordable apartments. Since apartment housing on the Vietnamese real estate market is classified into affordable, mid-end, high-end, and luxury apartment segments, this study classifies these last three segments as “unaffordable” (Figure 2). By dividing the apartment projects into affordable and unaffordable segments, the housing attributes that affect the market price of each segment will be investigated and compared, and the reasons for the similarities and differences discussed in the urban context of HCMC. This provides valuable references for housing developers and investors to understand the pricing determinants in the Vietnamese housing market, helping them to make decisions for successful investment and development by utilizing appropriate development strategies for various classes of people. This can also help central and local authorities improve the quality of a diverse range of developments with public–private partnerships.



**Figure 2.** Affordable Apartments (left); and Unaffordable Apartments (right) (Copyright: Authors).

## 2. Literature Review

### 2.1. Hedonic Price Model

Court (1939) was an early pioneer in using the term ‘hedonic’ to investigate demand and prices for individual sources of pleasure [14]. He believed heterogeneous commodities contained multiple attributes to meet individual preferences for usefulness and desirability. This significant application of

Multivariate statistical methods had major implications for housing price studies. Lancaster (1966) then developed the argument further with the theory of consumer demand [15]. He demonstrated that composite goods contain a variety of attributes; thus, customers make a decision to purchase when the composite attributes meet their specific desires. Rosen (1974) then took the discussion to a new level by applying hedonic theory to a pricing model. He argued that the total price of an item means the sum of the prices of the individual attributes of the item, and that each characteristic can be a unique implicit price in the market [16]. This provided critical implications for advanced price regression models, a way to find which unique attributes influence total composite prices [17]. Once Rosen's theory of a hedonic pricing model was generally accepted, regression analysis methods began to be broadly used for housing market analysis and urban studies. The basic hypothesis of the hedonic price model for housing studies is that the total price of a property represents the combined individual attributes of the property and what customers are willing to pay for the package of attributes. There are numerous empirical studies proving the hypothesis and the attributes can be categorized in three groups: housing structure, community, and locational attributes.

Housing structure describes the physical characteristics and conditions of housing and land. Specific attributes are lot size, unit size, building age, number of bedrooms and bathrooms, garage, swimming pool, fireplaces, and air conditioning [18,19]. The importance of structural attributes can change over time and vary among countries in accordance with culture, tradition, and local climate but the attributes of room number and housing unit size are relatively critical in most nations [20].

Community attributes indicate the quality of socioeconomic and environmental characteristics in the neighborhoods. Education is the most influential factor in housing choice decisions. Kilpatrick and Hefner (1998) found an association between school quality and housing price [21]. In particular, Gibbons and Machin (2003) highlighted the influence of primary school quality on prices [22]. The socioeconomic characteristics of the community population are also significant, such as high-income neighborhoods and the presence of western (as opposed to non-western) residents, as these lead to a presumption of better community quality and amenities [23]. Baumont and Legros (2009) investigated the metropolitan districts of Paris and housing prices and found that neighborhood renewal plans and policies can influence housing prices [24]. In addition, the environmental externalities of neighborhoods can be critical for housing choice and price [25–27]. Aircraft and transportation noise were negative determinants for housing prices [28–31] while air and water quality were similarly influential [32–35]. On the other hand, public open spaces and urban parks increased the value of community environments with more fresh air, recreational facilities, and aesthetic enhancement [36–39].

Locational attributes consist of accessibility and proximity to major public facilities and places, such as downtown areas, shopping malls, transportation stations, main roads, highways, and schools [40–43]. The distance to central business districts (CBDs) has been critical for housing choice and prices with the "access/space trade-off" model [44,45] depicting a trade-off between the reduced land cost of suburban areas and the increasing commuting cost of travel and transportation to CBDs. Hwang and Thill (2011) found an association between job accessibility and housing price by measurement of travel-time-based job accessibility in Seattle [46]. There have been, however, contradictory debates regarding the model due to the assumption limitation, such as monocentric urban structures, the isotropic condition of terrain, and perfect competition markets [41,47,48]. For other attributes, Bowes and Ihlanfeldt (2001) found proximity to railway stations significant for housing prices due to lower costs and better convenience for commuting [49], while Debrezion et al. (2006) further developed the impact of the railway network on house prices [50]. Munoz-Raskin (2010) examined the positive significance of proximity to bus rapid transit (BRT) networks for property values [51]. There is also a study that shows the significance of spatial accessibility to retail and commercial centers for housing values [52]. As previously noted for community attributes, proximity to urban parks, public open spaces, and education facilities is also critical for increasing prices.

## 2.2. Studies of Apartments for Price Determinants in Vietnam

While housing price determinants in other countries have been intensively studied and analyzed, few studies for apartment price determinants in HCMC are available. Chung et al. (2014) analyzed 197 HCMC apartment projects using the hedonic regression model [9] and found pricing factors for three groups: whole city, downtown, and the new town district (Phu My Hung city). The result was that positive pricing factors for the whole city were land prices, projects by foreign developers, swimming pools, and proximity to international schools, parks, the new town, and downtown. The negatively significant factors were the age of the buildings and distance to downtown. In the case of downtown apartments, the positive factors were the total number of apartment units in a project, unit area, swimming pools, and unit access structure (vertical shared access), and the negatively significant factors were ward population density and land prices. For the new town apartments, positive factors were land prices, ward population density, and the proximity of parks and international schools. This study found similarities and differences between apartment price determinants among downtown, the new town, and the rest of the city.

Huynh's study (2015) analyzed the determinants of the apartment prices of the new town, Phu My Hung city and its surrounding areas, in HCMC [53]. Twenty apartment projects with 263 units in the new town and 16 apartment projects with 172 units outside were analyzed by the hedonic regression model. It was found that the positive factors were apartment project land size, housing unit size, and apartment grade. The negatively significant determinants were building age, floor area ratio (FAR), and distance to downtown.

Jung et al. (2013) analyzed the development patterns of foreign and local developers' apartment projects through the factor analysis and logistic regression model [54]. An investigation of 139 foreign and local projects in HCMC found that numerous foreign apartment projects were developed in suburban areas because land prices were relatively cheaper and legal licensing for housing development was easier than in downtown areas. The influential independent variables for the foreign developments were accessibility to downtown, higher sale prices, various public community amenities and their proximity to housing, potential population growth with job opportunities, larger apartment units, and proximity to rivers.

These previous studies show that the price determinants of apartments in HCMC can be summarized as follows: (1) structural characteristics of apartments such as housing unit size, community density, FAR, and unit access structure (horizontal corridor access and vertical shared access); (2) locational features of the project such as proximity to downtown, the new town, and suburban areas; (3) public facilities in the community such as swimming pools and retail units, and mixed-use development; (4) accessibility and proximity to public facilities such as urban shopping malls, international schools, urban parks, and rivers (Table 1).

**Table 1.** Housing Attributes and Price Determinants for a Hedonic Price Model.

	Studies for Cities World-Wide	Studies for Cities in Vietnam (Apartments)
Housing Structure	Land size/Unit size/Building age/Number of bedrooms and bathrooms/Garage/Swimming pool/Fireplaces/Air conditioning	Project land size/Unit size/Apartment grade/Mixed-use development/Building age/Floor Area Ratio/Land price/Foreign developers/Unit access structure/Natural ventilation
Community Attributes	School/Ethnicity/Income level/Redevelopment policies/Transportation and aircraft noise/Water quality	Swimming pool/International school Park/Neighborhood population density/Riverfront
Locational Attributes	Accessibility to central business districts Proximity to transportation stations Proximity to shopping malls Proximity to main roads and highways Proximity to coast Proximity to parks/public open spaces	Proximity to downtown Proximity to new town Proximity to shopping malls Proximity to rivers Proximity to main roads Accessibility to work places

While most previous studies have analyzed housing price determinants based on locational classifications like downtown, new town, and peripheral areas in cities, this study started by examining the question of the housing affordability framework of the real estate market in HCMC, which is experiencing rapid economic growth. While high-end apartment development has been dominant since the emergence of the privatized housing market, the recent remarkable upsurge of middle-income households in HCMC has produced a new emphasis on the affordable apartment segment. Since apartments in the Vietnamese housing market are classified as affordable, mid-end, high-end, and luxury apartment segments, this study separates the affordable segment from the mid-end, high-end, and luxury apartments ('unaffordable' segment).

### 3. Methods

#### 3.1. Data Collection

This study used a data set covering 714 unit prototypes in 211 apartment projects in HCMC that have been sold since 2000, which covers most apartment projects in the period. We collected the data set in three steps. First, the bulk of raw data on apartments was provided by the National Housing Organization (NHO), which is an affordable housing development institute in Vietnam, and the NIBC Investment and Consulting company (Ho Chi Minh City, Vietnam), which conducts professional housing market surveys and feasibility studies for housing development in Vietnam. The series of data sets included apartment unit prices, multiple apartment unit sizes and drawings, project land size, and lists of public facilities. They were restructured for the purpose of this study. Second, additional data on more apartment projects were collected through popular Vietnamese real estate websites (<http://khudothimoi.com/> and <https://batdongsan.com.vn/>). Third, the information on proximity to urban public facilities was measured based on Google Maps. This data includes distances to urban parks, schools, shopping malls, rivers, main roads, the downtown area, and so forth. When we got the data from the collection procedure, we double-checked the data set with local real estate consultants.

#### 3.2. Identification of the Price Range for Affordable Housing in Vietnam

As mentioned earlier, it is the ratio between housing prices and a household's disposable income that determines housing affordability, a measurement of whether or not a given household has sufficient purchasing power to secure a residential property. Since the government of Vietnam launched subsidized mortgage programs, such as mortgage finance, the VND 30 Trillion Home Loan Package, and housing microfinance, to enhance housing affordability, the Vietnamese consumer's power has increased remarkably and this has significantly impacted on the housing market [11,12]. In this context, according to the 2016 JLL data for the HCMC real estate market, affordable housing was categorized as having an average price of USD 740 per square meter, with mid-end housing at USD 1343 per square meter in secondary prices [12]. A maximum value for affordable housing can be estimated at \$ 1041 per square meter, which is the mean of the two average prices. Therefore, we considered the price range of affordable housing as under \$1041 per square meter in this study.

#### 3.3. Variables for Hedonic Regression Model

In this study, the apartment unit price per square meter is set as the dependent variable. It is a standardized value regardless of the size of the apartment, so it is possible to objectively investigate the factors that affected the apartment price. The independent variables were based on the factors considered from earlier studies on apartments in HCMC. The hedonic regression model uses the following formula:

$$\ln p = \beta_0 + \sum_{k=1}^K \beta_k x_k + \varepsilon$$

where

$p$  denotes the per-unit sales price of property;

$\varepsilon$  is a random error term vector;

$\beta_k$  ( $k = 1, \dots, K$ ) indicates the coefficient matrix of independent variables  $x$  and shows the rate of price change with the characteristics  $x$ .

The dependent variable,  $Lnp$ , is the log of the per-unit sales price of property. Using a logarithmic scale for the price makes interpretation easier than other methods [55]. The  $\beta$  shows the coefficient matrix of independent variables. The independent variables were selected based on previous hedonic model studies of Vietnamese housing and various discussions with local experts on housing development. Most variables were categorized under general headings, while some were removed due to correlation. In the case of land prices, we considered a special land pricing system for Vietnam as the process here does not follow that normally observed in capitalist systems. The socialist system does not allow private land ownership but provides land use rights in the form of a lease. Thus, the official land price, which the Vietnamese government sets, is not for a permanent property value but a transferrable value. The price estimation is based on the street value evaluation method and we found that the land price of our data set was not closely correlated with other factors. Thus, the independent variables were categorized into three groups: housing unit values, residential community features, and proximity to urban public facilities. Table 2 shows the contents and details of each.

**Table 2.** Variable Descriptions for Hedonic Price Modeling.

Categories	Variables	Code	Unit	Note
Housing Structure	Apartment price (Dependent)	AptPrice	USD/m <sup>2</sup>	Sales price per square meter
	Unit size	Area	m <sup>2</sup>	Unit area
	Building age	Year	year	Building age
	Total floors	AllFloors	floor	Number of building floors
Community Attributes	Ward population density	WardDen	person/ha	Ward of apartment location
	Total units of apartment	AllUnits	unit	Total number of units
	Swimming pool	Pool	dummy	Existence in the project
	Mixed-use apartment	Mixeduse	dummy	Commercial and residential
	Foreign development	ForeignDev	dummy	Foreign developer
	Natural ventilation	Ventil	dummy	Possibility of natural air flow
Locational Attributes	Unit access structure	UnitAccess	dummy	Access types to each unit
	Land price	LandPrice	USD/m <sup>2</sup>	Street value evaluation
	Location to new town	Newtown	dummy	Phu My Hung new town
	Proximity to main road	Road	dummy	Over 4 lane road
	Dist. to downtown	Cbd	m	To the Presidential Palace
	Dist. to park	Park	m	Formal urban parks
	Dist. to river	River	m	Formal urban rivers
	Dist. to international school	School	m	Primary to secondary schools
Dist. to shopping mall	ShopMall	m	Corporate shopping malls	

The formula was structured in a semi-logarithmic form as this is widely used in hedonic regression models for proportional understanding of the interaction between a property's price and its housing characteristics. When sales prices are expressed as logarithms, the coefficients can be interpreted as the percentage change in price resulting from an additional unit of the independent variable. For the dummy variables, the coefficients can be interpreted approximately as the percentage difference in price between properties with the attribute and those without.

## 4. Results and Findings

### 4.1. Descriptive Statistics

Table 3 shows the descriptive statistics for 714 apartment prototype units in 211 HCMC projects that have been built since 2000; this includes most apartment projects in the period.

Table 3. Descriptive Statistics.

Variables		Total		Affordable		Unaffordable	
		<i>n</i> = 714		<i>n</i> = 427		<i>n</i> = 287	
		Mean	S.D.	Mean	S.D.	Mean	S.D.
Apartment price	AptPrice	1060	588	718	151	1570	627
Unit size	UnitArea	94.7	43.4	83.9	39.7	111	43.8
Years since construction	Year	4.06	3.13	3.63	3.12	4.71	3.05
Total floors	AllFloors	18.3	6.85	17.2	6.43	19.8	7.17
Ward population density	WardDen	178	237	158	218	209	260
Total apartment units	AllUnits	562	1014	682	1241	384	466
Swimming pool	Pool	0.52	0.50	0.40	0.49	0.68	0.47
Mixed-use apartment	MixedUse	0.18	0.38	0.13	0.34	0.25	0.43
Foreign development	ForeignDev	0.21	0.41	0.08	0.26	0.42	0.49
Natural ventilation	Ventil	0.42	0.49	0.45	0.50	0.37	0.48
Unit access structure	UnitAccess	0.14	0.34	0.18	0.39	0.07	0.25
Land price	LandPrice	500	414	307	229	789	459
Location to new town	Newtown	0.19	0.40	0.10	0.30	0.33	0.47
Proximity to main road	Road	0.42	0.49	0.31	0.46	0.59	0.49
Dist. to downtown	Cbd	6298	3069	7687	2829	4230	2096
Dist. to park	Park	2441	2959	3348	3469	1094	919
Dist. to river	River	1102	1767	1319	2039	780	1192
Dist. to international school	School	2439	2811	3454	3197	929	804
Dist. to shopping mall	ShopMall	1436	1728	1847	2055	825	725

In the housing unit category, the average price of the apartments is 1060 dollars per square meter, 718 dollars for affordable housing, and 1570 dollars for an unaffordable apartment. The average unit size of unaffordable housing is 24 percent higher than that of affordable housing. In the residence community category, the average land price of the unaffordable group is 61 percent higher than that of the affordable one. The average apartment unit number in the latter is 44 percent higher than that of the former, indicating a far higher building density for the affordable housing project. It was also observed that the unaffordable group has more mixed-use development and foreign development projects and is more closely located to international schools, parks, and riversides (Figure 3). In addition, the affordable group shows more heterogeneous data patterns in the variable of total apartment units and the unaffordable group in foreign development within the community attributes. In the locational sectors, the affordable group is more heterogeneous, particularly for distances to parks, rivers, international schools, and shopping malls (Table 3).

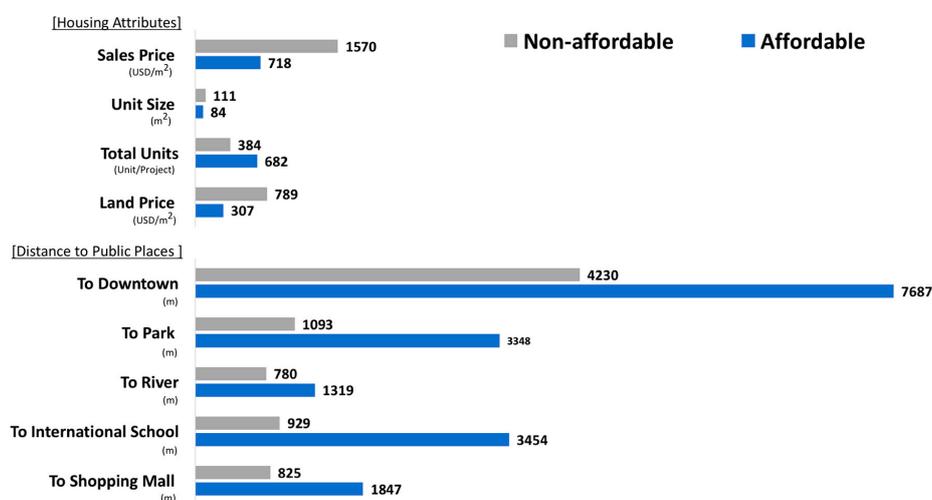


Figure 3. Average Data Comparison of Descriptive Statistics Between Affordable and Unaffordable Housing (Housing Attributes and Distance to Public Places).

#### 4.2. Regression Results

The hedonic model produced regression results as shown in Table 4. The stepwise method was applied to the regression model for accurate factor finding. As shown from the results, it reported significant independent variables for each group: full samples, the affordable group, and the unaffordable group. In the total group, positively significant independent variables for price determinants are housing unit size, existence of a swimming pool, mixed-use development, foreign development, land price, and new-town (Phu My Hung) location. The negatively significant factors are length of time since construction, ward population density of the projects, and distance to downtown (District 1) and shopping malls. In the affordable group, positive significant factors are total floors, foreign development, unit access structure, and accessibility of main roads. The distance from downtown and shopping malls are negatively significant factors. In the unaffordable group, positive factors are housing unit size, existence of a swimming pool, unit access structure, and land price. Negatively significant are building age, ward population density, natural ventilation, and distance to downtown, the river, and international schools (Table 4).

**Table 4.** Regression Results.

Dependent Variables	Total Apts.	Affordable Apts.	Unaffordable Apts.
UnitArea	0.052 (2.503) *	−0.035 (−0.896)	0.137 (3.89) **
Year	−0.149 (−6.607) **	−0.066 (−1.444)	−0.214 (−5.458) **
AllFloors	0.041 (1.728)	0.166 (4.575) **	0.041 (0.977)
WardDen	−0.061 (−2.717) **	0.062 (1.53)	−0.322 (−7.086) **
AllUnits	−0.033 (−1.729)	−0.03 (−0.817)	−0.007 (−0.194)
Pool	0.084 (3.645) **	−0.072 (−1.568)	0.304 (7.044) **
MixedUse	0.103 (5.234) **	0.048 (1.065)	0.072 (2.047) *
ForeignDev	0.272 (11.26) **	0.226 (6.171) **	0.058 (0.861)
Ventil	0.002 (0.077)	0.013 (0.296)	−0.101 (−2.622) **
UnitAccess	−0.003 (−0.146)	0.111 (2.826) **	0.192 (5.462) **
LandPrice	0.429 (16.367) **	0.034 (0.716)	0.507 (10.324) **
Newtown	0.081 (3.391) **	0.046 (1.161)	0.061 (1.342)
Road	0.031 (1.533)	0.098 (2.574) **	−0.02 (−0.568)
Cbd	−0.411 (−14.419) **	−0.563 (−14.867) **	−0.387 (−6.311) **
Park	0.033 (1.374)	0.066 (1.478)	0.05 (1.336)
River	0.013 (0.673)	0.069 (1.895)	−0.078 (−2.238) *
School	0.025 (0.928)	−0.004 (−0.082)	−0.16 (−4.426) **
ShopMall	−0.065 (−3.178) **	−0.137 (−3.595) **	−0.057 (−1.579)
<i>n</i>	714	427	287
Adjusted $R^2$	0.761	0.452	0.710

Notes: T-stats in parentheses. \*\* denotes 1% significance level; \* denotes 5% significance level. The Chow test was conducted to verify whether the coefficients in two regressions on the data sets are equal. The test statics is 33.68 and this is bigger than the critical value for F (18,678). Therefore, there was no problem with this structure.

In the results, two determinants, unit access structure and distance to downtown, are shown for both the affordable and unaffordable groups. The rest of the significant variables are, however, different for each group (Table 5). It indicates that a larger number of housing characteristics and environmental factors affect the price structure of housing property in the unaffordable housing segment, like high-end and luxury apartments.

**Table 5.** Comparison of the Price Determinants Between Affordable and Unaffordable Housing.

	Affordable Apts.	Unaffordable Apts.
Positive (+)	Unit access structure **	Unit access structure **
	Total floors **	Swimming pool **
	Foreign development **	Land price **
	Proximity to main roads **	Unit Area **
Negative (-)		Mixed-use development *
		Distance to downtown **
	Distance to downtown**	Distance to international school **
	Distance to shopping malls **	Distance to river *
		Building age **
		Ward population density **
	Natural Ventilation **	

Notes: \*\* denotes 1% significance level; \* denotes 5% significance level.

## 5. Discussion

### 5.1. Common Price Determinants for Both Affordable and Unaffordable Segments

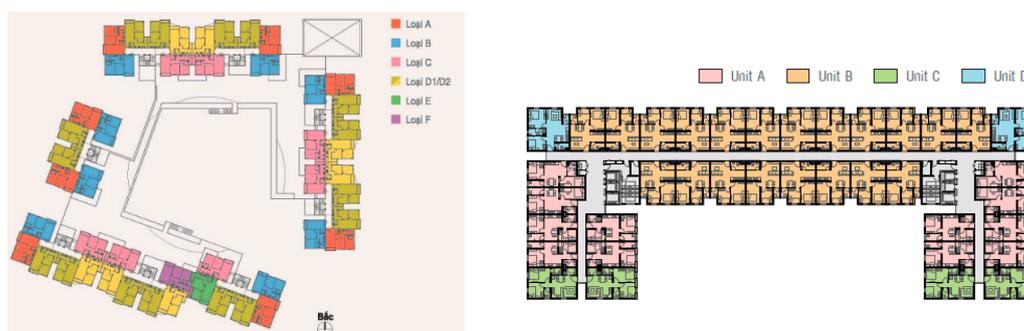
Both apartment segments display locational influences to downtown. The prices increase as the housing is more closely located to the downtown area, location of District 1 (the central business district). This is related to heavy traffic congestion on roads and poor commuting conditions for citizens, regardless of affordable or unaffordable apartments. Since a high proportion of workplaces in HCMC are concentrated in the downtown districts, accessibility and proximity are critical for housing choice. With insufficient road capacity and increasing numbers of vehicles every year, peak-hour traffic congestion has become appalling [56]. Commuters using motorbikes battle daily against not only heavy traffic jams but also contaminated air quality. A report from the Ministry of Natural Resources and Environment in Vietnam showed that 70% of pollution gases were generated from motorized vehicles in cities [57]. Motorbikes are the main polluters and the drivers are, consequently, exposed to the contaminants every day [58]. In addition, 70% of urban areas will be vulnerable to seasonal urban flooding, further worsening traffic conditions [59] (Figure 4). In this regard, proximity and accessibility to downtown can be a critical factor for apartment selection.



**Figure 4.** Peak Hour Commuting (left) and Urban Flooding in HCMC (right) (Copyright: Authors).

The structural attributes of housing also affect housing prices. Apartment developments generally consist of two types of home access: vertical shared access and horizontal corridor access (Figure 5). The former, which allows access to homes organized around a vertical core of elevators or stairs, is a determinant for higher apartment prices in both segments. It shows a greater level of residence individuality than the other and enables more intimate social interaction with neighbors, limiting the

number of homes around the core to a manageable number. It can also allow more fresh air and light in communal spaces. However, although the horizontal corridor access carries the benefit of efficient circulation by hallways for more units on each floor, its higher density is a negative factor due to lack of privacy, exposure to noise, and increased feelings of anxiety, stemming from perceptions of insecurity and increased vulnerability to house invasion or robbery which occur frequently in Vietnam.



**Figure 5.** Vertical Shared Access of Nest Home Apartments (**left**) and Horizontal Corridor Access of First Home Apartments (**right**) (Copyrights: NHO).

### 5.2. Unique Price Determinants for Affordable Apartments

First, one of the determinants that only applies to affordable housing is foreign development. This means that the prices of apartments built by foreign developers are more expensive than those of local developers. A large portion of affordable housing has been built by the land owners and local builders, who are not professional designers or constructors. The housing unit spaces are not well arranged and the quality of community facilities and open spaces is substandard. However, foreign developers normally supply better-quality affordable housing with superior amenities, and this positively affects their price. The unaffordable apartment segment, on the other hand, is not influenced by whether they have been built by local or foreign developers. Most international developers are focused on the unaffordable segments of the market and there are also professional local developers such as the Vinh Group and Novaland, which have already completed dozens of luxury apartment projects in Vietnam. They are highly appreciated for the excellent quality of their housing developments, which are popular with both foreign and local customers. Therefore, the factor of foreign development only affects the sales price of affordable apartments.

Second, proximity to main roads is a critical price factor for this segment. Affordable housing is located farther from CBDs than unaffordable, at respective average distances of 7.6 km and 4.2 km (Table 3). While the downtown districts of HCMC were systemically planned in the French colonial period with a main road network, other districts enclosing the historic downtown districts have grown organically with massive self-built housing developments leading to urban densification and the formation of an unmanaged road infrastructure. Indeed, roads are so narrow (less than 1.5 m in self-built housing districts) that entire areas are inaccessible to either cars or public transport [3]. Thus, since affordable apartments have normally developed in the self-built dense districts far away from CBDs, proximity to main roads is critical for vehicle accessibility and it affects price determination.

Third, high-rise residential towers with more floors also influence prices in the affordable segment of the market. In Vietnam, due to lower land costs, a large proportion of affordable high-rise apartments (with an average of 17 floors; Table 3) were developed within semi-urban districts comprising widespread low-rise townhouses of 2–4 floors. In the physical context, higher affordable apartments located in the low-rise blocks can see their prices increase because of their association with what are seen as conspicuous landmarks in the districts (Figure 6). However, mid- and high-end apartments are normally located relatively close to downtown comprising numerous high-rise buildings, and thus the attribute of apartment development height is not critical for price determinants in this segment.



**Figure 6.** Affordable Apartments in District 12 (left) and Unaffordable Apartments in District 1, CBD (right) (Copyrights: Authors).

Fourth, closer proximity to shopping malls is also a price determinant. This trend more clearly appears in the affordable segment as its coefficient ( $-0.137$ ) in regression modeling is more than twice as high as that ( $-0.065$ ) of total apartments (Table 4). As the unaffordable housing is relatively closer to the commercial malls (an average of 0.8 km) than the affordable (1.8 km), this determinant is not critical in that segment. In HCMC, considering the lack of community facilities and a tropical climate with dry and wet seasons, with an average temperature of 28 degrees Celsius with the highest peak of 39 degree Celsius around noon, proximity to a shopping mall can be an influential factor for housing choice, particularly for the lower-middle class. Since HCMC is modernizing with an ever-growing boom in supermarkets and shopping malls in recent decades (such as Coopmart, Big C, Aeon Mall, and the Vincom Center), they are positioning themselves not only as commercial centers but also as cultural epicenters for communities of families and friends to enjoy the air conditioning and a variety of entertaining events and performances with free access for the lower-middle class.

### 5.3. Unique Determinants of Price for Unaffordable Apartments

In the unaffordable housing segment, it was found that the older the apartment, the lower the apartment price. Overall operation and maintenance of apartments in Vietnam is not well managed with a variety of disputes between apartment residents and developers. According to official reports, there is misuse of public areas in the communities, cost disputes over the operation and maintenance of facilities, and issues pertaining to fire prevention and safety, construction quality, unqualified maintenance teams, public security, and inconsistent sales contracts [60]. These are leading to a rapid aging of apartments and a depreciation of property prices. As affordable apartments have been developed relatively recently (average building age 3.6 years; see Table 3), the building depreciation rate is a less sensitive issue for them.

Apartments containing a swimming pool are more expensive in the unaffordable segment. In the tropical climate of HCMC, this is one of the most popular public facilities in the residential sectors. While this is an optional service for the affordable segment, high-end and luxury apartments invariably provide swimming pools as part of a public amenity package, even competing in this area with more advanced outdoor locations and higher quality such as eye-catching rooftop pools. This factor positively influences housing prices.

Weather conditions also had a negative significance on the determinant of natural ventilation in the unaffordable apartments. This is not preferred due to both the tropical climate and security issues. To avoid hot weather (an annual average temperature of 28 degrees Celsius with the highest peak of 39 degrees Celsius around noon in HCMC), the residents of unaffordable apartments always opt for air-conditioning at home; natural air flow is not a requirement for them. In addition, natural ventilation requires additional windows facing public alleys or corridors in many apartments in

Vietnam. This is considered a threat to home security as burglars in Vietnam often break into luxury apartments through windows.

It is also found that the larger the unit size of an unaffordable apartment, the more positive its impact on housing price, in that its coefficient (0.137) is twice that of apartments in general (0.052) (Table 4). However, the affordable segment does not show the significance of unit size itself since customers in this segment tend to base their choice of housing units not on unit size but apartment layout, for instance, composed of one room with two toilets or two rooms with two toilets, based on the market price. This means that unit layout conditions are more important than the unit size. According to developers of affordable housing, the bottom line for housing prices is almost fixed for the affordable market at around 50,000 USD and what is most critical in development is more efficient unit layouts enabling more rooms, toilets, and a living room. In sales and marketing brochures, developers frequently use statements such as “An apartment of two bedrooms and two toilets for only USD 40,000”, while in the case of high-priced apartments, brochures usually advertise them with comments like “\$2500 per square meter in premium New Town”.

Mixed-use development integrating residential units, commercial units, or offices is becoming a popular trend for property developers in Vietnam since it is considered as a sustainable trend in the compact city concept, minimizing commuters’ need to travel and reducing the demand on the urban infrastructure network. While mixed-use structures significantly influence higher housing prices in the unaffordable segment, normally leading to well-managed leasing businesses with secure tenants, the popularity of the trend is not observed in affordable projects due to insufficient mixed-use cases or unsuccessful leasing status with empty retail units or offices, and thus it does not affect housing prices.

Proximity to international schools and rivers are also critical determinants in this segment. There are numerous previous studies showing a positive significance of better education facilities and natural conditions, such as parks and rivers, for housing prices. However, in the case of HCMC’s affordable housing, an international school with expensive tuition fees is not realistically an influential factor in their lives. Rivers and urban canals near affordable housing in peripheral districts are mostly contaminated and not well managed, so proximity to the environment is not critical for the price of the affordable housing segment.

## 6. Conclusions

Apartment development in HCMC has been driven by both the housing shortage caused by the rapid population influx and the boom in real estate investment. Since the opening of the Vietnamese housing market, high-end apartment development has dominated, but the affordable apartment market has also grown gradually in recent decades with the growth of a middle-income class. As demand for this market continues to rise significantly every year, housing developers and policy makers need to understand the market’s dynamics and how price determination is affected.

According to the hedonic regression model, significant common price determinants were found for both affordable and unaffordable housing segments. Structurally, vertical shared access in apartments creates an upward trend in housing prices because it secures both dwelling individuality and social intimacy with a manageable scale of neighbors, in contrast to horizontal corridor access. In addition, proximity to downtown is also a critical factor in the higher price of apartments in HCMC in terms of proximity to workplaces, given the lack of public transportation, serious traffic congestion caused by enormous numbers of private vehicles, and frequent flooding on roads.

Unique price determinants in each segment of housing are related to geographical conditions and their physical environment. Higher multistoried apartments raise the price of affordable housing since they attract premium values as landmarks in low-rise residential districts. Since these districts have developed organically, with urban densification and narrow streets, an apartment’s proximity to main roads enabling efficient vehicular access is critical to boosting housing prices. Foreign developments are associated with higher expectations for improved quality of design and construction. However, in the case of the unaffordable housing segment, better housing quality and enhanced amenities in

neighborhoods boosted housing prices, as did more recently developed and bigger housing units. Further advanced community facilities and environmental aspects, such as swimming pools, mixtures of residential and commercial development, lower-density neighborhoods, and proximity to rivers and international schools, significantly influence housing values.

These results can be valuable references for future investors and developers to set up successful housing development strategies and directions in Vietnam, enabling them to understand the different approaches and determinants for multiple classes of residents, and thereby making the national housing supply more economically and socially sustainable. Having largely focused until now on the provision of apartments for the upper-middle classes as a popular and cost-efficient response to housing demand, the government should now strengthen the public–private partnerships to achieve the same result for the lower-middle classes through promoting affordable apartment development. The government and local authorities, who have led regulatory reforms to incentivize further private developer participation and played active roles to encourage an affordable housing supply, should pay close attention to and take account of this study’s findings.

The regulatory reforms with the revised housing laws and subsidized financial programs have had a variety of beneficial effects on the housing market in HCMC. They have helped to reorient private housing developers toward the affordable housing market where there are real home ownership needs [11]. They have also reduced vulnerability to investment due to increased household purchasing power and enhanced the variability of the housing market. In particular, since the revised Housing Law of 2015 structured the government’s interventions in social housing development, the public and private sectors have been encouraged to work in partnership and this has led to a specific plan for social housing including land selection, housing design, construction, and housing provision. As this study shows key price determinants of locational attributes for affordable housing with proximity to main roads and shopping malls, these partnerships should select available land for social housing construction, securing road connectivity and accessibility to community facilities. As customers prefer affordable housing built by foreign developers because of the more professional quality of design and construction, the partnership should strictly monitor quality management during the course of the development. Therefore, both the private and public sectors need to understand the housing market dynamics associated with customers’ preferential interests and urbanization issues in HCMC. This study is, therefore, important in understanding how to pursue housing development in Vietnam on an economically and socially sustainable basis.

**Acknowledgments:** This research was supported by the Creative-Pioneering Researchers Program through Seoul National University (SNU) and the Institute of Construction and Environmental Engineering at SNU. This research was previously presented at the Sustainable Asia Conference on 23–25 June 2017, Nanjing, China. The authors wish to express gratitude for their support.

**Author Contributions:** Ducksu Seo conceived, designed, analyzed, and wrote this paper. You Seok Chung supported the data set collection, data analysis, and writing for this paper. Youngsang Kwon advised on this research from concept to writing. All authors have read and approved the final manuscript.

**Conflicts of Interest:** The authors declare there are no conflicts of interest.

## References

1. Beresford, M. Doi Moi in review: The challenges of building market socialism in Vietnam. *J. Contemp. Asia* **2008**, *38*, 221–243. [CrossRef]
2. UN\_Habitat. *Vietnam Housing Sector Profile*; UN Habitat: Nairobi, Kenya, 2014; p. 158.
3. Vietnam\_Property. Vietnam Real Estate Attracts a Large Amount of Foreign Direct Investment. Available online: <https://www.vietpropertynews.com/2017/07/03/vietnam-real-estate-investment/> (accessed on 11 November 2017).
4. Bang, L. Middle-Class Vietnamese: Who Are They? Available online: <http://english.vietnamnet.vn/fms/business/160959/middle-class-vietnamese--who-are-they-.html> (accessed on 11 July 2017).

5. CBRE. Vietnam Real Estate Market Insights. 2016. Available online: <http://www.cbrevietnam.com/> (accessed on 19 July 2017).
6. Seo, D.; Kwon, Y. In-migration and housing choice in Ho Chi Minh City: Toward sustainable housing development in Vietnam. *Sustainability* **2017**, *9*, 1738. [CrossRef]
7. Truitt, A. On the back of a motorbike: Middle-class mobility in Ho Chi Minh City, Vietnam. *Am. Ethnol.* **2008**, *35*, 3–19. [CrossRef]
8. Thanh-Nien-News. Ho Chi Minh City Now Has 7.4 Million Motorbikes, and Counting. Available online: <http://www.thanhniennews.com/society/ho-chi-minh-city-now-has-74-million-motorbikes-and-counting-57787.html> (accessed on 22 September 2017).
9. Chung, Y.S.; Kim, J.H.; Cho, J.H. Analysis of price determinants of apartments in ho chi minh. *J. Korean Hous. Assoc.* **2014**, *12*, 13–21.
10. Woetzel, J.; Ram, S.; Mischke, J.; Garemo, N.; Sankhe, S. *A Blueprint for Addressing the Global Affordable Housing Challenge*; McKinsey Global Institute: New York, NY, USA, 2014.
11. World\_Bank\_Group. *Vietnam Affordable Housing: A Way Forward*; World Bank Group: Washington, DC, USA, 2015; p. 117.
12. JLL. Ho Chi Minh City Trip Report: The Opportunity Lies in Building Homes. Available online: [http://www.ap.jll.com/asia-pacific/en-gb/research/798/hcmc-citytripreport-aug2016#.WlloP1JOb\\_8](http://www.ap.jll.com/asia-pacific/en-gb/research/798/hcmc-citytripreport-aug2016#.WlloP1JOb_8) (accessed on 12 November 2017).
13. EZLand. Affordable Housing Market Overviews. Available online: [https://www.vietnambusiness.tv/docs/vre/20160201EZLandPresentation\\_MarketOverviews.pdf](https://www.vietnambusiness.tv/docs/vre/20160201EZLandPresentation_MarketOverviews.pdf) (accessed on 1 November 2017).
14. Court, A.T. Hedonic price indexes with automotive examples. In *The Dynamics of Automobile Demand*; General Motors Corporation: Detroit, MI, USA, 1939.
15. Lancaster, K.J. A new approach to consumer theory. *J. Political Economy* **1966**, *74*, 132–157. [CrossRef]
16. Rosen, S. Hedonic prices and implicit markets: Product differentiation in pure competition. *J. Political Economy* **1974**, *82*, 34–55. [CrossRef]
17. Xiao, Y.; Webster, C. *Urban Morphology and Housing Market*; Springer: Berlin, Germany, 2017.
18. Sirmans, G.S.; MacDonald, L.; Macpherson, D.A.; Zietz, E.N. The value of housing characteristics: A meta analysis. *J. Real Estate Financ. Econ.* **2006**, *33*, 215–240. [CrossRef]
19. Kain, J.F.; Quigley, J.M. Measuring the value of housing quality. *J. Am. Stat. Assoc.* **1970**, *65*, 532–548. [CrossRef]
20. Kohlhase, J.E. The impact of toxic waste sites on housing values. *J. Urban Econ.* **1991**, *30*, 1–26. [CrossRef]
21. Kilpatrick, J.A.; Hefner, F. *House Price Impact of School District Choice*; South Carolina Center for Applied Real Estate Education and Research: Seattle, WA, USA, 1998.
22. Gibbons, S.; Machin, S. Valuing English primary schools. *J. Urban Econ.* **2003**, *53*, 197–219. [CrossRef]
23. Visser, P.; Van Dam, F.; Hooimeijer, P. Residential environment and spatial variation in house prices in the netherlands. *Tijdschr. Econ. Soc. Geogr.* **2008**, *99*, 348–360. [CrossRef]
24. Baumont, C.; Legros, D. *Neighborhood Effects in Spatial Housing Value Models. The Case of the Metropolitan Area of Paris (1999)*; Federal Reserve Bank of St Louis: St. Louis, MO, USA, 2009.
25. Anderson, R.J., Jr.; Crocker, T.D. Air pollution and residential property values. *Urban Stud.* **1971**, *8*, 171–180. [CrossRef]
26. Wilman, E.A.; Krutilla, J. Hedonic prices and beach recreational values. *Adv. Appl. Microecon.* **1981**, *1*, 98.
27. Murdoch, J.C.; Thayer, M.A. Hedonic price estimation of variable urban air quality. *J. Environ. Econ. Manag.* **1988**, *15*, 143–146. [CrossRef]
28. Day, B.; Bateman, I.; Lake, I. Beyond implicit prices: Recovering theoretically consistent and transferable values for noise avoidance from a hedonic property price model. *Environ. Resour. Econ.* **2007**, *37*, 211–232. [CrossRef]
29. Bateman, I.; Day, B.; Lake, I.; Lovett, A. *The Effect of Road Traffic on Residential Property Values: A Literature Review and Hedonic Pricing Study*; Scottish Executive: Edinburgh, UK, 2001; Volume 207.
30. Schipper, Y.; Nijkamp, P.; Rietveld, P. Why do aircraft noise value estimates differ? A meta-analysis. *J. Air Transp. Manag.* **1998**, *4*, 117–124. [CrossRef]
31. Nelson, J.P. Highway noise and property values: A survey of recent evidence. *J. Transp. Econ. Policy* **1982**, *16*, 117–138.

32. Graves, P.; Murdoch, J.C.; Thayer, M.A.; Waldman, D. The robustness of hedonic price estimation: Urban air quality. *Land Econ.* **1988**, *64*, 220–233. [[CrossRef](#)]
33. Smith, V.K.; Huang, J.-C. Can markets value air quality? A meta-analysis of hedonic property value models. *J. Political Econ.* **1995**, *103*, 209–227. [[CrossRef](#)]
34. Steinnes, D.N. Measuring the economic value of water quality. *Ann. Reg. Sci.* **1992**, *26*, 171–176. [[CrossRef](#)]
35. Michael, H.J.; Boyle, K.J.; Bouchard, R. *Water Quality Affects Property Prices: A Case Study of Selected Maine Lakes*; Maine Agricultural and Forest Experiment Station Report Number 398; University of Maine: Orono, ME, USA, 1996.
36. Nowak, D.J.; McPherson, E.G. Quantifying the impact of trees: The Chicago urban forest climate project. *Unasylva* **1993**, *173*, 39–44.
37. Tyrväinen, L. The amenity value of the urban forest: An application of the hedonic pricing method. *Lands. Urban Plan.* **1997**, *37*, 211–222. [[CrossRef](#)]
38. Lutzenhiser, M.; Netusil, N.R. The effect of open spaces on a home's sale price. *Contemp. Econ. Policy* **2001**, *19*, 291–298. [[CrossRef](#)]
39. Anderson, S.T.; West, S.E. Open space, residential property values, and spatial context. *Reg. Sci. Urban Econ.* **2006**, *36*, 773–789. [[CrossRef](#)]
40. Landau, U.; Prashker, J.N.; Hirsh, M. The effect of temporal constraints on household travel behavior. *Environ. Plan. A* **1981**, *13*, 435–448. [[CrossRef](#)]
41. Heikkila, E.; Gordon, P.; Kim, J.I.; Peiser, R.B.; Richardson, H.W.; Dale-Johnson, D. What happened to the cbd-distance gradient?: Land values in a Policentric city. *Environ. Plan. A* **1989**, *21*, 221–232. [[CrossRef](#)]
42. Henneberry, J. Transport investment and house prices. *J. Prop. Valuat. Investig.* **1998**, *16*, 144–158. [[CrossRef](#)]
43. Hanushek, E.A.; Yilmaz, K. *Household Location and Schools in Metropolitan Areas with Heterogeneous Suburbs; Tiebout, Alonso, and Government Policy*; National Bureau of Economic Research: Cambridge, MA, USA, 2010.
44. Evans, A. *Urban Economics: An Introduction/Alan w. Evans*; B. Blackwell: Oxford, UK; New York, NY, USA, 1985.
45. Hanushek, E.; Yilmaz, K. The complementarity of Tiebout and Alonso. *J. Hous. Econ.* **2007**, *16*, 243–261. [[CrossRef](#)]
46. Hwang, S.; Thill, J.-C. Delineating urban housing submarkets with fuzzy clustering. *Environ. Plan. B Plan. Des.* **2009**, *36*, 865–882. [[CrossRef](#)]
47. Boarnet, M.G. The monocentric model and employment location. *J. Urban Econ.* **1994**, *36*, 79–97. [[CrossRef](#)]
48. McMillen, D.P. The return of centralization to Chicago: Using repeat sales to identify changes in house price distance gradients. *Reg. Sci. Urban Econ.* **2003**, *33*, 287–304. [[CrossRef](#)]
49. Bowes, D.R.; Ihlanfeldt, K.R. Identifying the impacts of rail transit stations on residential property values. *J. Urban Econ.* **2001**, *50*, 1–25. [[CrossRef](#)]
50. Debrezion, G.; Pels, E.A.; Rietveld, P. *The Impact of Rail Transport on Real Estate Prices: An Empirical Analysis of the Dutch Housing Market*; Tinbergen Institute: Amsterdam, The Netherlands, 2006.
51. Munoz-Raskin, R. Walking accessibility to bus rapid transit: Does it affect property values? The case of Bogotá, Colombia. *Transp. Policy* **2010**, *17*, 72–84. [[CrossRef](#)]
52. Song, Y.; Sohn, J. Valuing spatial accessibility to retailing: A case study of the single family housing market in Hillsboro, Oregon. *J. Retail. Consum. Serv.* **2007**, *14*, 279–288. [[CrossRef](#)]
53. Huynh, D. Phu my hung new urban development in Ho Chi Minh City: Only a partial success of a broader landscape. *Int. J. Sustain. Built Environ.* **2015**, *4*, 125–135. [[CrossRef](#)]
54. Jung, S.; Huynh, D.; Rowe, P.G. The pattern of foreign property investment in Vietnam: The apartment market in Ho Chi Minh City. *Habitat Int.* **2013**, *39*, 105–113. [[CrossRef](#)]
55. Malpezzi, S. Hedonic pricing models: A selective and applied review. In *Housing Economics and Public Policy*; John Wiley & Sons: Hoboken, NJ, USA, 2003; pp. 67–89.
56. Thanh-Nien-News. Shocking Photos Reveal How Saigon Traffic Has Gone from Bad to Worse. Available online: <http://www.thanhniennews.com/society/shocking-photos-reveal-how-saigon-traffic-has-gone-from-bad-to-worse-51386.html> (accessed on 13 October 2017).
57. Hansen, A. Driving development? The problems and promises of the car in Vietnam. *J. Contemp. Asia* **2016**, *46*, 551–569. [[CrossRef](#)]
58. Lan, T.T.N.; Liem, N.Q.; Binh, N.T.T. Personal exposure to benzene of selected population groups and impact of commuting modes in Ho Chi Minh, Vietnam. *Environ. Pollut.* **2013**, *175*, 56–63. [[CrossRef](#)] [[PubMed](#)]

59. Eckert, R.; Schinkel, U. *Liveable City TP. Ho Chi Minh-Adaptation as Response to Impacts of Climate Change*; Narcotics Anonymous: Los Angeles, CA, USA, 2009.
60. Tuoi Tre News. Long-Lasting Troubles of Living in Apartments in Vietnam. Available online: <http://tuoitrenews.vn/features/26584/longlasting-troubles-of-living-in-apartments-in-vietnam> (accessed on 20 November 2017).



© 2018 by the authors. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).