HOUSING POLICY

EE464: Urban Economics
EE562: Selected Topics in Development Economics 2
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Faculty of Economics, Thammasat University

Special features of housing stock

- Housing has **three features** that make it **different from other products**.

  (1) the **housing stock** is **heterogeneous**, with dwellings that differ in size, age, style, interior features, utilities, and location.

  (2) housing is **durable** and can **deteriorate over time** at a fast rate or a slow one, depending on the maintenance and repair decisions of its owner.

  (3) **moving is costly**, so when income or housing preferences change, consumers don't instantly adjust their housing consumption. Instead, residents **wait until** the **gap between the ideal house and their actual house** is **large enough** to justify the large cost of moving.

Source: O'Sullivan (2018) and O'Sullivan (2012)

Heterogeneous characteristics of housing stock

- The housing stock is **heterogeneous**, with each dwelling offering a different bundle of housing services.
- Dwellings differ in **size**, **layout**, **style**, **utilities** (heating and electrical), and the **quality of the interior** and the **exterior**.
- When you choose an apartment or house, you also choose a **neighborhood**, with its own bundle of housing services.
- **Neighborhoods** differ in **accessibility to jobs** and **social opportunities**, **local public goods** and **taxes**, and environmental quality.

Source: O'Sullivan (2018) and O'Sullivan (2012)

Heterogeneous characteristics of housing stock

- What **determines** the **equilibrium price** of a dwelling?
- Under the **hedonic approach**, we determine the price of each part of the housing bundle.
- A hedonic study of the market might generate the following information:
- **Base price:** The average house, with a price of **$200,000.**
  - 3 bedrooms
  - 5 miles from the city center
  - 6 years old.
- **Access price:** The price drops by **$2,000** for every additional mile from the city center.
- **Size:** The price increases by **$30,000** for every additional bedroom.
- **Roof age:** The price of housing decreases by **$500** for every year of roof age.
- **Air quality:** The price decreases by **$1,000** for every additional unit of air pollution.
- **Schools:** The price increases by **$2,000** for every one-unit increase in the average test score of students in the local elementary school.

Source: O'Sullivan (2018) and O'Sullivan (2012)

Hedonic Pricing Model

- To predict the price of a particular dwelling, we add to the base price to reflect **differences between** the **average dwelling** and a particular dwelling.

Example

- The **fourth bedroom** adds **$30,000** to the price.
- A **new roof** adds another **$3,000**.
- The **four-unit difference** in **air pollution** adds **$4,000**.
- If the average **test scores** in the **local school** are **three points higher** than the city average, that adds another **$6,000**.
- Adding up these adjustments, the predicted price of the dwelling is **$243,000**.

Source: O'Sullivan (2018) and O'Sullivan (2012)

Hedonic Pricing Model

- The **classic hedonic** study is by **Kain and Quigley (1970)**.
- They used data from the **St. Louis housing market** in the **1960s** to estimate the dollar values of **different housing attributes**.
- The following figure shows the **percentage changes** in **monthly rent** and house value for **one-unit changes** in each of various **housing features**.

Example

- A one-unit increase in **interior quality** increases monthly rent by 2.1 percent and market value by 5.6 percent.
- The **exterior quality of nearby dwellings** was measured on **a scale of 1 (bad) to 5 (excellent)**.
- A one-unit increase in the **quality of adjacent dwellings** increased **rent** by **3%** and **market value** by **5.3%**.
- A one-unit increase in the **quality of dwellings on the block** increased **rent** by **6%** and **market value** by **2.9%**.

Source: O'Sullivan (2018) and O'Sullivan (2012)

Hedonic Pricing Model

- Other hedonic studies have explored the effects of amenities on housing prices.
- Among the **neighborhood characteristics** with positive effects on housing prices are **proximity to jobs**, **high-performing schools**, transit stations, and churches.
- In contrast, property values are **lower** in neighborhoods close to areas with **high crime rates**, **toxic waste facilities**, and **noisy highways**.
- How does a household choose among alternative dwellings, each of which provides a different bundle of characteristics?
- Most consumers **do not have access** to a **hedonic study** of their housing market.
- As they shop, they **gather their own information** about the **implicit prices** of location, size, and design features.

Source: O'Sullivan (2018) and O'Sullivan (2012)

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Hedonic pricing model of assessed and market land values: A case study in Bangkok metropolitan area, Thailand

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ABSTRACT

Bangkok Metropolitan Area, the capital of Thailand, is known as one of the world's most traffic-congested cities. Lots of transport-related projects to alleviate traffic congestion especially rapid transit system always require an amount of land. Therefore, several privately owned lands have to be acquired by the government agencies due to the lack of available spaces in an urban area. However, the assessment of compensation for a compulsory land acquisition is determined on the basis of the assessor's database that often values each of properties lower than expected. In this paper, the assessed prices data and the offering prices for sale data of Bangkok are analyzed with the use of regression framework through the hedonic pricing model. The spatial non-stationarity to examine the variations of the implicit effects to property value is also included bases on the geographically weighted regression (GWR) technique. The results show that the determinants of property value are myriad and varied over space, i.e. spatial non-stationarity exists in the study area. The obtained results indicate that the difference between two data is extremely large. These results provide the basic information to compute the fair compensation for the landowners and allow the government agencies to tax the direct beneficiaries of their investments in advance so as to finance infrastructure projects.

3. Methodology

3.1. Model specifications

Hedonic pricing model is used to model the relationship between one (or more) dependent or response variables and independent or predictor variables. The equation of the hedonic pricing model can be written in the basis of the classical linear regression specification as follow:

$$Y_i = \beta_0 + \beta_1 X_{i1} + \ldots + \beta_k X_{ik} + \varepsilon_i$$

An equation can be written more compactly for n observations as

$$\boldsymbol{Y} = \boldsymbol{X\beta} + \boldsymbol{\varepsilon}$$

where

$\mathbf{Y}$ = a vector (n x 1) of observations corresponding to a dependent variable,
$\mathbf{X}$ = a matrix (n x k) of observations of k independent variables,
$\boldsymbol{\beta}$ = a vector (k x 1) of regression parameters, and
ε = a vector (n x 1) of random errors, assumed to be normally distributed

Source: Malaitham et al. (2020)

3.2. Study area

The study area compasses the Bangkok Metropolitan Area. The region, shown in Fig. 1, covers an area of 1568.7 km^2 with 50 districts. There is the Chao Phraya River meandering through the city in the southward direction. This river divides Bangkok into two sides: the eastern bank and the western bank of the Chao Phraya. On the west side, it is known as the Bangkok's old town where the original CBD situated. As the city expanded, parts of the areas along Silom Rd. and Sukhumvit Rd. located on the east side of the Chao Phraya River has been the CBD of Bangkok. There are lots of premium office buildings, five-star hotels, luxury condominiums, entertainment buildings, shopping malls and so on throughout the areas. By contrast, the Bangkok's old town has become the top tourist destination and led them be the heart of Bangkok's tourist and commercial center where many unique retail shops are concentrated.

Bangkok has a registered population of 5.69 million while a total number of registered vehicles have hit 8.92 million in 2015 which was two times higher than the total number of registered vehicles in 2004 (National Statistical Office). Undoubtedly, the growth of motorization is remarked as one of the critical causes that contributes to traffic congestion. The rail transit system to alleviate the traffic congestion was firstly introduced at the end of the 1970s. Although it has been known more than 30 years, the first rail transit of Bangkok, namely BTS Skytrain, has started its service along the heavily congested arterial roads such as Phaholyothin Rd., Sukhumvit Rd., Silom Rd., Sathorn Rd.,

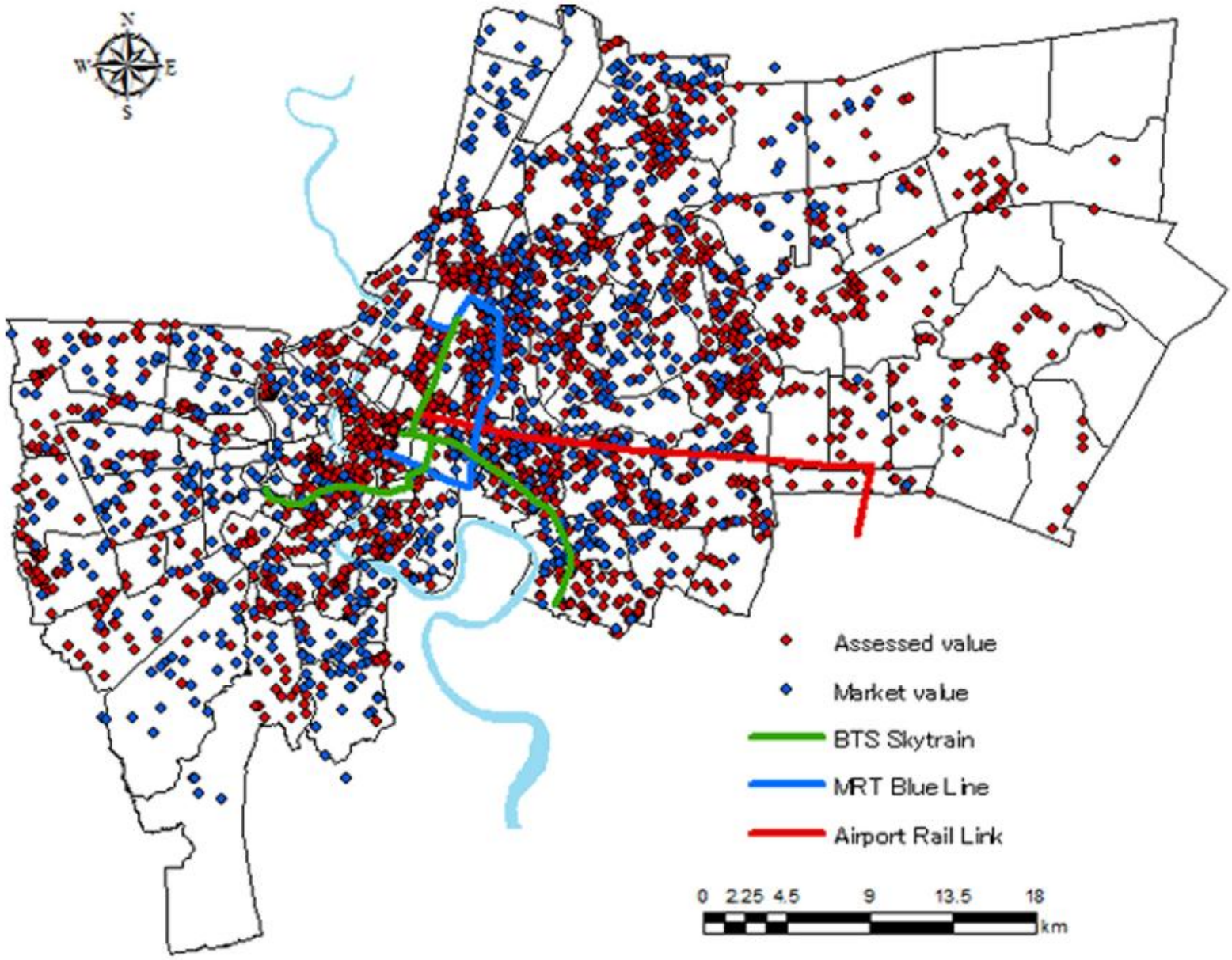
Source: Malaitham et al. (2020)

3.3. *Descriptive statistics*

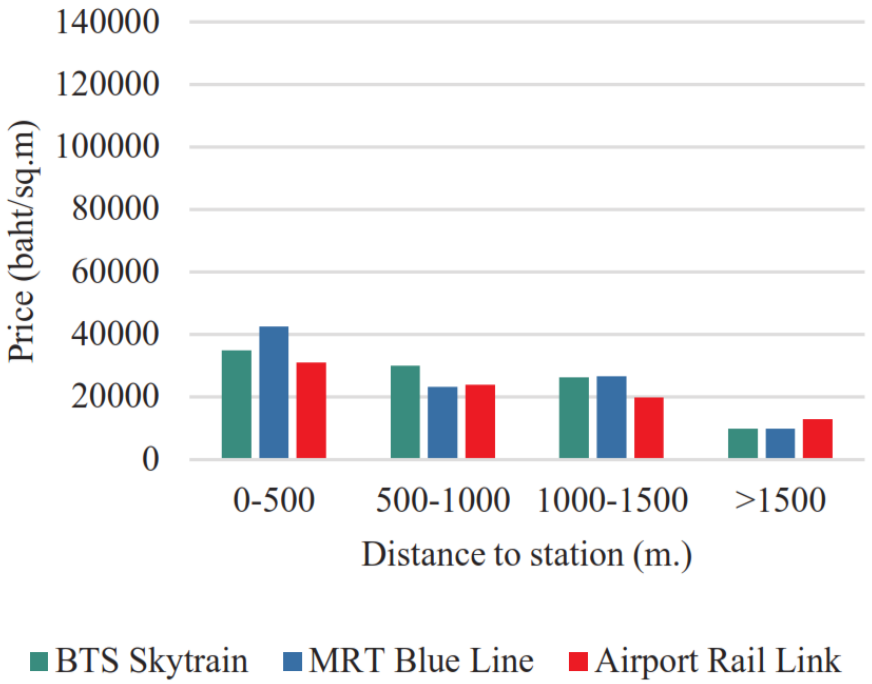
The data used for modeling involve two types of land values data, i.e., assessed and market land values. Both are assigned as the dependent variable (**Y**) in the equation. The assessment data obtaining from the reports of Treasury Department, Thailand are evaluated based on type of land use categories, proximity from main roads, size of lands, etc. This report continuously uses to levy the property's taxes over the period of 4 years without major change or update the values, while land values in the market are annually changing. The period of land value report employs to capture taxes during the year 2012–2015 were used in this study; however, it was generally evaluated before published around 2 years, i.e., this assessed value had started evaluated since 2010 and published in the year 2012.

The market values refer to the prices at which land are offered for sale on the market. The offering prices data to estimate were collected from the for-sale advertisements by landowners on the internet from August 2014 to February 2015. Advertisements normally include location, price, and size of land lot. Furthermore, convenient access such as to the nearest shopping malls, expressway ramps and also rail transit stations are almost mentioned in the advertisements.

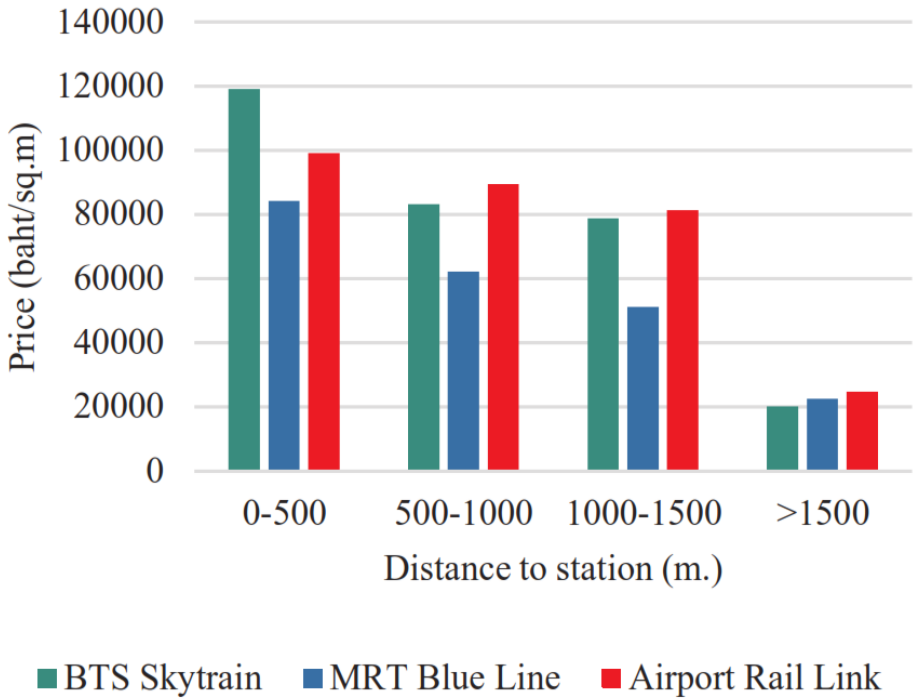
Source: Malaitham et al. (2020)



Source: Malaitham et al. (2020)



Property values by station's distance intervals: Assessed Value



Property values by station's distance intervals: Market Value

Source: Malaitham et al. (2020)

Descriptive statistics (average of all variables)

Variables	Description	Assessed value (1871 data)	Market value (823 data)
Dependent variable			
P_VALUE	Property value (baht/m^2)	13,736	29,202
LOT_SIZE	Size of land Parcel (m^2)	3,704	4,073
Independent variable			
Property attributes			
DIST_MAINRD	Distance to the nearest main road (km)	0.49	0.58
DIST_STA	Distance to the nearest station (km)	4.29	4.58
TIME_CBD	Time to CBD (min)	61.05	71.39
DIST_SHOP	Distance to the nearest shopping mall (km)	3.09	2.82
DIST_EXP	Distance to expressway (km)	5.31	4.97
JOB_ACCESS	Job accessibility (jobs)	2,298,110	2,250,783
Zonal attributes			
HH_DENS	Household density (households/sq.km)	3675	3116
EMP_DENS	Employment density (jobs/sq.km)	9,60	5599
MED_INC	Median income (baht)	30,787	29,388
%L_RESIDENCE	Percentage of residence area	33.21	34.37
%L_COMMERC	Percentage of commercial area	4.51	4.61
%L_INDUST	Percentage of industrial area	11.36	11.44
%L_EDUCA	Percentage of education area	2.19	1.92
%L_VACANT	Percentage of vacant area	20.31	22.31

Source: Malaitham et al. (2020)

Estimation results for OLS models.

Variables	Assessed prices data (1871 data)			Offering prices data (823 data)		
	Parameter	P-Value		Parameter	P-Value	
Property attributes						
ln (DIST_MAINRD)	−0.777	0.000	***	−0.060	0.005	***
ln (DIST_STA)	−0.044	0.055	*	−0.263	0.000	***
ln (TIME_CBD)	−0.241	0.000	***	−0.394	0.000	***
ln (DIST_SHOP)	−0.077	0.000	***	−0.141	0.000	***
ln (DIST_EXP)	−0.033	0.028	n/s	−0.006	0.912	n/s
ln (JOB_ACCESS)	0.281	0.059	*	0.580	0.028	**
Zonal attributes						
ln (HH_DENS)	0.089	0.000	***	0.039	0.310	n/s
ln (MED_INC)	0.245	0.004	***	0.036	0.792	n/s
ln (%L_RESIDENCE)	-0.329	0.000	***	0.016	0.865	n/s
ln (%L_COMMERC)	0.444	0.000	***	0.183	0.005	***
ln (%L_INDUST)	-0.077	0.000	***	-0.029	0.365	n/s
ln (%L_EDUCA)	0.079	0.005	***	-0.041	0.401	n/s
ln (%L_VACANT)	-0.137	0.000	***	-0.110	0.030	**
Constant	3.156	0.000	***	2.413	0.564	n/s
Goodness-of-fit						
R^2		0.641			0.604	
RSS		973.962			429.613	
AIC		4,118.432			1,792.245	

*** = Significant at 0.1% level.
** = Significant at 1% level.
* = Significant at 5% level.
n/s = Insignificant at 5% level.

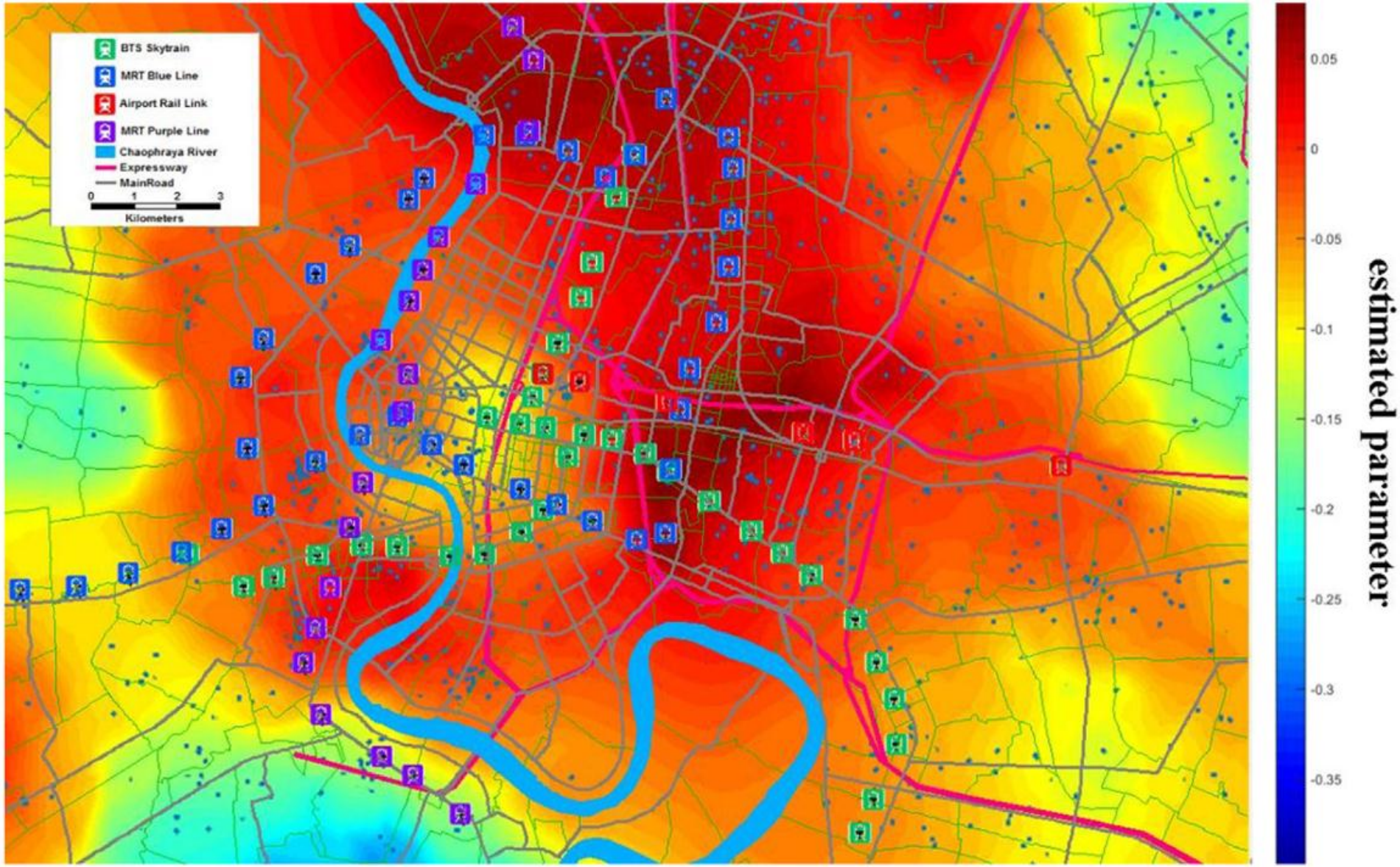
Source: Malaitham et al. (2020)

Estimation results for GWR models.

Variables	Assessed prices data (1871 data)			Offering prices data (823 data)		
	Parameter	P-Value		Parameter	P-Value	
Property attributes						
ln (DIST_MAINRD)	−0.063	0.000	***	−0.061	0.100	n/s
ln (DIST_STA)	−0.141	0.000	***	−0.239	0.030	*
ln (TIME_CBD)	−0.325	0.000	***	−0.459	0.000	***
ln (DIST_SHOP)	−0.145	0.000	***	−0.139	0.020	*
ln (DIST_EXP)	−0.092	0.000	***	0.011	0.030	*
ln (JOB_ACCESS)	0.289	0.000	***	0.634	0.000	***
Zonal attributes						
ln (HH_DENS)	0.022	0.000	***	0.041	0.040	*
ln (MED_INC)	0.099	0.000	***	−0.027	0.450	n/s
ln (%L_RESIDENCE)	−0.673	0.000	***	0.035	0.070	n/s
ln (%L_COMMERC)	0.057	0.000	***	0.106	0.000	***
ln (%L_INDUST)	−0.146	0.000	***	0.014	0.060	n/s
ln (%L_EDUCA)	0.353	0.000	***	−0.011	0.680	n/s
ln (%L_VACANT)	−0.154	0.000	***	−0.066	0.060	n/s
Constant	5.255	0.000	***	2.419	0.000	***
Goodness-of-fit						
R^2		0.771			0.660	
RSS		619.734			374.931	
AIC		3713.007			1792.245	

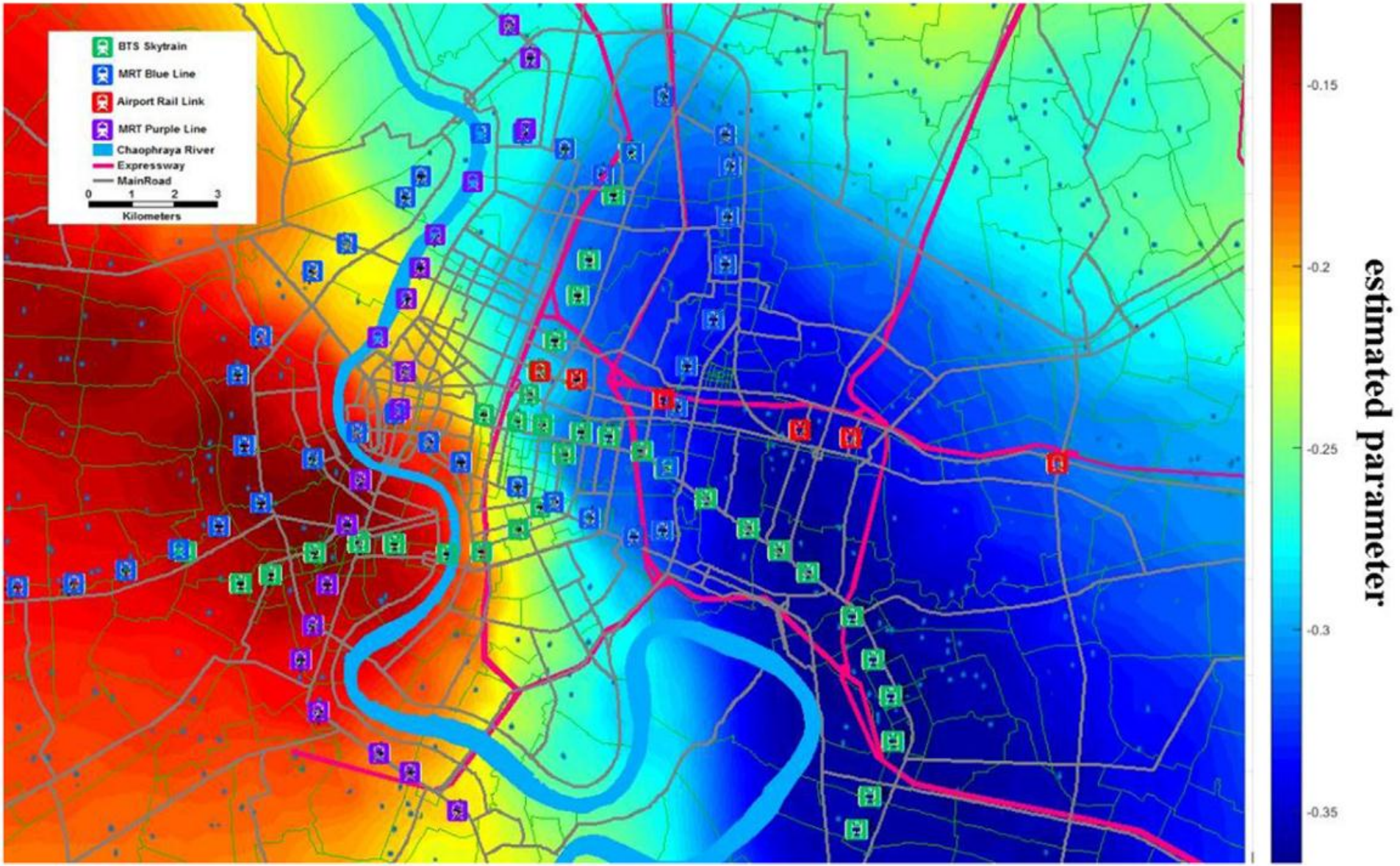
*** = Significant at 0.1% level.
** = Significant at 1% level.
* = Significant at 5% level.
n/s = Insignificant at 5% level.

Source: Malaitham et al. (2020)



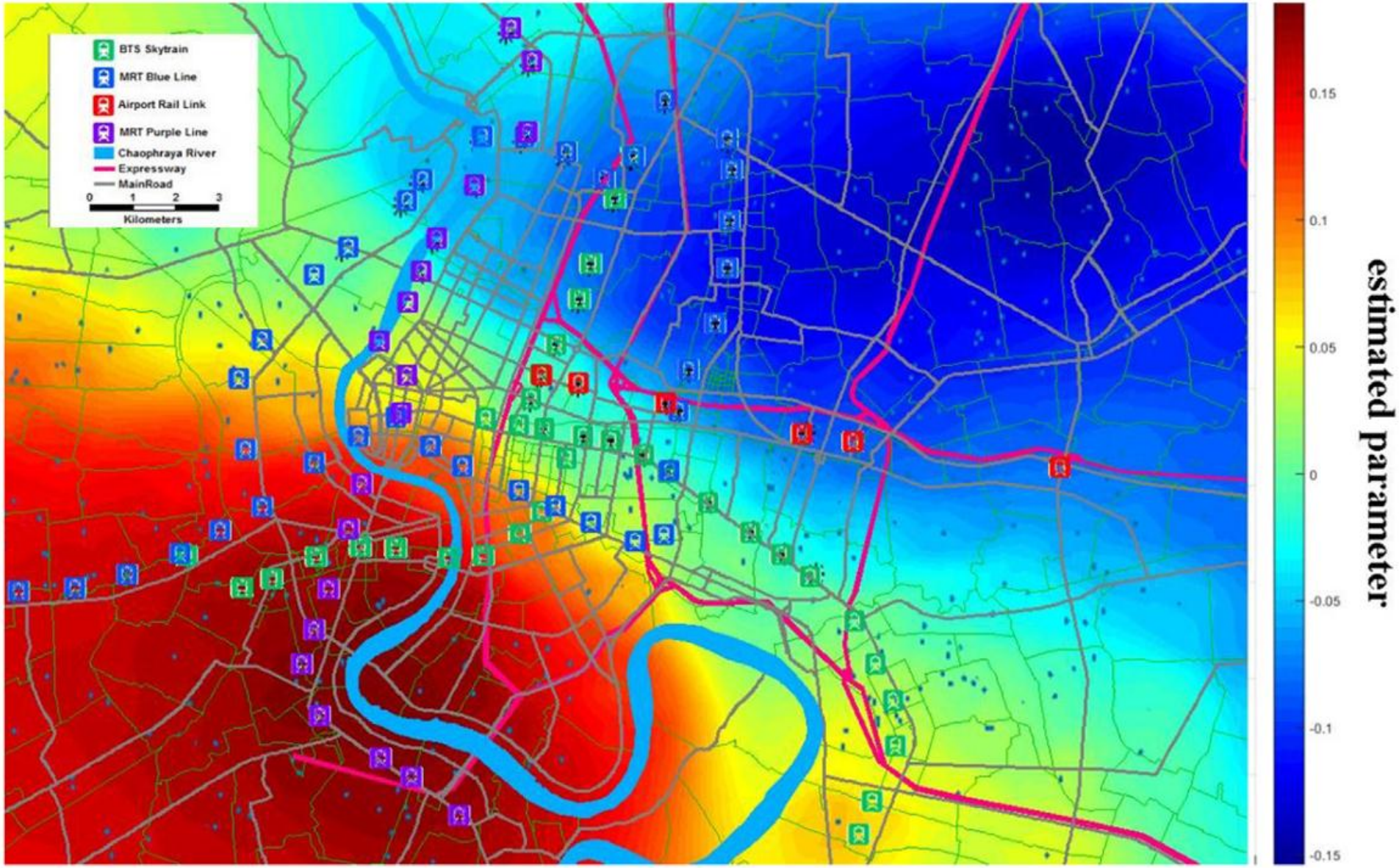
1% closer to the major roads can add 0.35% to the real estate value.

Source: Malaitham et al. (2020)



Located near the stations can significantly add a value to the property.

Source: Malaitham et al. (2020)



Located near the expressway can add a value to the property.

Source: Malaitham et al. (2020)

The Filtering Model of Housing Market

- The filtering model of the housing market shows how a dwelling changes over time in quality and in the income of its occupants.
- The filtering process has two basic features:

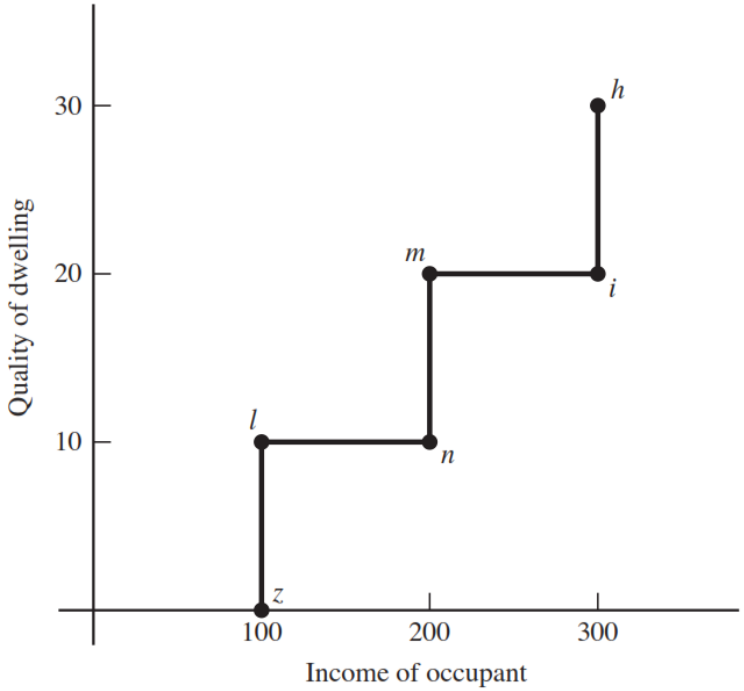
1. Decrease in quality The quantity of housing services generated by a dwelling (summarized in "quality") decreases over time because of physical deterioration, technological obsolescence, and changes in housing fashion.

2. Decrease in occupant income As a dwelling moves down the quality ladder, it is occupied by households with progressively lower incomes.

Source: O'Sullivan (2018) and O'Sullivan (2012)

The Filtering Model of Housing Market

- The following picture represents the essential features of the filtering model.



- The horizontal axis shows household income, with three types of households, low-income ($100), medium-income ($200), and high-income ($300).
- The vertical axis shows the quality of housing, with three levels, low (10 units), medium (20), and high (30).

Source: O'Sullivan (2018) and O'Sullivan (2012)

The Filtering Model of Housing Market

- (1) suppose that regular maintenance activity by the property owner means that each dwelling loses one unit of quality per year.
- (2) this underlying movement down the quality ladder can be reversed, but only at a substantial cost for remodeling and renovation.
- (3) each household has a maximum gap between its ideal and actual housing quality. Once the gap reaches 10 units, the household closes the gap by either upgrading its existing dwelling or moving to a different dwelling.

Source: O'Sullivan (2018) and O'Sullivan (2012)

The Filtering Model of Housing Market

- All the action happens at the **end of each decade**.
- Each household experiences a **growing mismatch** between the **ideal** and the **actual quality** of housing.
- The **high-income** household starts at point h, but by the end of the decade is at point i, with a **10-unit gap** between the ideal and the actual quality.
- Similarly, the **middle-income** household goes from point m to point n.
- The **low-income** household goes from l to z.
- At the end of the decade, each household has to **choose** between **restoring the house** to the original quality, upgrading, or **moving to a different house**.

Source: O'Sullivan (2018) and O'Sullivan (2012)

The Filtering Model of Housing Market

High-income households

- Since upgrading is costly relative to the price of a new house, most **high-income** households **move rather than upgrade**.
- **Moving to a new house** gets them back to point h, with a quality level q = 30.
- They **vacate their old house** with q = 20, selling it to the highest bidder.

Source: O'Sullivan (2018) and O'Sullivan (2012)

The Filtering Model of Housing Market

Middle-income households

- An **alternative** to **upgrading the original house** (moving it from ***n*** back to ***m***) is to **buy a used house** from a high-income household.
- If the **supply of used housing** with **quality level 20** is relatively **large** (if a large number of high-income households sell their old houses), the **price** will be **low enough** that moving is **less costly than upgrading** the old house.
- So the dwelling formerly occupied by the high-income household moves from point ***i*** to point ***m***.
- To summarize, the filtering process is shown by the movement of a dwelling down the housing stepladder, from point ***h*** to ***i*** (decrease in quality) and then from point ***i*** to ***m*** (decrease in occupant income).

The Filtering Model of Housing Market

Low-income households

- If the **supply** of used housing of **quality level 10** is relatively **large**, the **price will be low enough** that it is more efficient to **move rather than upgrade**.
- So the household moves from point ***z*** back to point ***l*** by moving to a dwelling that has moved down the stepladder from point ***m*** to ***n*** (decrease in quality) and then from point ***n*** to ***l*** (decrease in occupant income).
- The houses vacated by the low-income households with quality = 0 are then retired from the housing market.

Source: O'Sullivan (2018) and O'Sullivan (2012)

The Filtering Model of Housing Market

- **Housing quality** is assumed to be **proportional to income**, and quality decreases by **10 units over the decade**.
- A dwelling occupied by a high-income household moves from point ***h*** to ***i*** (quality decreases), and then from point ***i*** to ***m*** (vacated by the high-income household after it moves to new housing and then occupied by the middle-income household).

Source: O'Sullivan (2018) and O'Sullivan (2012)

Abandonment and Public Policy

- We've seen that a dwelling will be abandoned if it cannot be profitably used for housing or any alternative use.
- **Local tax policy** can contribute to the **abandonment problem** if the **property tax** is **inflexible**.
- As a dwelling moves down the quality ladder over time, profit decreases.
- For example, suppose the annual profit from a dwelling is initially $4,000 and the annual tax is $3,000.
- If the **profit drops** to **$2,000 per year** and the **property tax** is fixed at **$3,000**, the **owner will abandon** the property because the **tax exceeds the profit**.
- In contrast, if the property tax were **flexible**, it would be cut in half from $3,000 to $1,500, and the owner would have an **incentive to keep** the property because the profit ($2,000) still exceeds the tax.

Source: O'Sullivan (2018) and O'Sullivan (2012)

Externalities cause inefficiency

- Abandoned buildings provide targets for **vandals and graffiti artists**, and they quickly become eyesores.
- They often become the **temporary homes** and retail outlets for transients and **drug dealers**, so they contribute to **crime**.
- For these reasons, abandonment **decreases the relative attractiveness of a neighborhood**, decreasing the rent that other landlords can charge for their properties.
- The decrease in profit on other properties **encourages more abandonment**, so the process can be self-reinforcing.

Source: O'Sullivan (2018) and O'Sullivan (2012)

Moving cost and consumer disequilibrium

- For most households, a change in housing consumption requires a move to a different dwelling, and the **cost of moving** is **substantial**.
- In addition to the **large cost** of **moving furniture** and other possessions, there is also a **large personal cost associated** with leaving a neighborhood, with its familiar **people**, **schools**, and **stores**.
- The notion of neighborhood attachment captures the idea that a **move** to a **new neighborhood disrupts social** and **consumption patterns**, imposing a substantial cost on the household.

Source: O'Sullivan (2018) and O'Sullivan (2012)

Moving cost and consumer disequilibrium

- (1) Households **do not instantly respond** to a change in circumstances, such as an increase in income or a decrease in the quality of housing, but instead **tolerate a gap** between the **ideal** and **actual consumption levels**.
- (2) When a household moves, it **eliminates the housing gap**, so the change in housing consumption is likely to be large.
- As **income increases**, the gap between the household's ideal dwelling and its actual dwelling will grow, and it eventually may become large **enough to justify moving**.
- In fact, if a household anticipates future changes in the utility-maximizing consumption level, it may overshoot its current ideal level to reduce the size of a future gap between the ideal and actual consumption.

Source: O'Sullivan (2018) and O'Sullivan (2012)