Determinants of the Public's Attitude Towards Social Housing Construction Under High Home Ownership Rate

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Social housing projects often face the "not-in-my-back-yard" (NIMBY) backlash from the local community who oppose and reject their construction. Considering the prevalence of NIMBY, this study examines the factors that influence the attitude of the public towards social housing construction under high home ownership rates. We conduct an ordered logistic regression analysis by using 14,275 responses from the 2015 Residential Status Survey in Taiwan. The results show some interesting findings. First, home ownership and families with a child under 18 are two of the most influential variables that have significantly negative influences on the approval of social housing construction. Renters and people with physical and mental disabilities are however more supportive of social housing. Secondly, residents in buildings with high development intensity are very supportive of the construction of social housing. Thirdly, satisfaction with neighborhood environment has a positive impact on social housing approval. Finally, residents who live in dense cities tend to support the construction of social housing. However, residents who live in satellite cities of a metropolitan region are less supportive. The results of this study reveal a regional difference in the approval of residents for social housing construction.

Keywords

Social Housing, Public Attitude, Home Ownership, NIMBY

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1.   Introduction

For many countries, the common goal of housing policy is to provide all citizens with a decent and affordable residential environment. There are many different local/central programs for making housing more affordable. These programs can be implemented from the demand side (such as rent subsidy, housing vouchers, preferential mortgage interest, etc.) or the supply side (such as public housing, social housing, private developer tax incentives, etc.).

Public housing is usually owned and managed by a government authority, for selling or leasing.[1] As opposed to public housing, social housing is regarded as any rental housing that is owned and managed by the government, non-profit organizations, or a combination of both. Among all of the different types of housing assistance, social housing offers affordable housing for people with low and moderate incomes, as well as for disadvantaged groups whose housing needs are not adequately met in other forms of housing. Considering this, social housing can prevent potential discrimination in the housing market and is usually seen as a remedy for housing inequality.

Some countries have a very high ratio of social housing. For instance, 37.7% of the housing in the Netherlands is social housing, 29% in Hong Kong, 21.2% in Denmark, 18% in Sweden, and 16.9% in England. However, in many countries with high home ownership rates (more than 80%), such as Singapore, Hungary, Lithuania, Romania, and Taiwan, the ratio of social housing is less than 5% of the total housing stock.[2] In this study, we focus on the rental characteristics of social housing, which are affordable rent (for example, 25% to 30% of the income of the tenant) and prioritization of disadvantaged groups.

The rate of social housing in Taiwan, 0.174%, is significantly lower than that in other developed countries. From the demand side, the housing prices in Taiwan have continuously escalated over the past 20 years. However, the personal income of most people has stagnated due to the ineffectiveness of economic transformation strategies and an unequal distribution of land. A high housing price to income ratio is a problem that has existed in the housing market of Taiwan for a long period of time. In particular, the house price to income ratio increased from 6.1 to 16.1 in Taipei during 2002Q1 to 2015Q1, and

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[1] The U.S., Singapore, and Hong Kong prefer the term public housing, which encompasses housing that is either for rent or sale. Europe prefers the term social housing and is primarily rental only. In Taiwan, social housing is a legally defined term in the Housing Act which refers to housing that is only for rent and differentiated from traditional public housing that is primarily for sale. However, the Taiwanese public has negatively labeled social housing, especially in Taipei, where housing prices are high.

[2] Source of ratio of social rental housing and home ownership rate is from OECD data. https://data.oecd.org.

remained at around 15.29 in 2020Q3.[3] This issue has significantly deteriorated the ability of people to afford housing and greatly impacted economically disadvantaged groups (low-income households) and socially disadvantaged groups (disabled people, seniors who live alone, and Aboriginals). Therefore, it can be observed that there is an extremely high demand for social housing in Taiwan.

When observing from the supply side of social housing, poor governmental finances, combined with extremely expensive private land costs, mean that the government has no alternative choice but to construct social housing on publicly owned vacant lands. However, the amount of publicly owned land with suitable conditions is scarce and distributed unevenly. Publicly owned land may thus be unable to meet the requirements of social housing. Furthermore, society is worried that social housing will lead to traffic congestion and decline in quality of public facilities, and might cause housing prices to fall. As a result, social housing projects are often viewed met with a "not-in-my-back-yard" (NIMBY) response (Scally and Tighe, 2015; Korsu, 2016).

As social housing projects undergo construction, the severity of the negative labels attached to social housing often leads local residents to strongly oppose them and sometimes even results in massive protests. This may be the most critical factor in the challenge of promoting social housing in Taiwan. In order to prevent social housing from being designated and labeled as slums, a limited amount of social housing is generally reserved for disadvantaged groups at the minimum legal threshold of 30%, while 70% is provided for general households. However, the effect of this policy has made it very challenging for disadvantaged groups to move into social housing. Therefore, understanding the factors that influence the attitude of the public towards social housing will be beneficial to government promotion of social housing. The main research questions in this study are "What factors affect the attitude of the public towards social housing construction, especially in a high home ownership society?" and "Is there a regional difference for the attitude of the public towards social housing construction, especially in high versus low housing price cities?"

Social housing has diverse functions and is often regarded as solving the housing problems of disadvantaged groups, promoting social integration and stability, improving public safety and sanitation, supporting the operation of a healthy housing market, and promoting economic development (Currie and Yelowitz, 2000; Korsu, 2016; Pareja-Eastaway and Sánchez-Martínez, 2017; Norris and Byrne, 2018). Furthermore, there are many debates on whether social housing can achieve such functions due to the practical limitations of the financial and democratic political environments (Scally and Tighe, 2015; Byrne and Norris, 2017; Fitzpatrick and Watts, 2017; Yuan et al., 2017). However, there are few studies in the literature that explore the factors that affect the

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[3] Source of house price to income ratio is from the Real Estate Information Platform, Ministry of Interior, Taiwan, R.O.C.: https://pip.moi.gov.tw/V3/E/SCRE0201.aspx.

attitude of the public towards constructing social housing under high home ownership rates.

We find some research gaps that need to be addressed. First, most previous studies use more qualitative methods or a quantitative analysis with a small sample size for studying social housing. Second, the empirical focus of most previous social housing studies has been on cities or countries with a relatively low home ownership rate, and the high home ownership rate context has been rarely discussed. Third, the empirical focus of most previous studies has been on one specific city, and the differences between cities largely devoid of discussion. In response, we conduct an ordered logistic regression analysis by using 14,275 responses from the 2015 Residential Status Survey in Taiwan to fill these research gaps in the literature.

The remainder of this paper is organized as follows. The next section reviews the benefits of social housing and debates around them. The third section consists of the research design and provides an introduction of the data and research methodology. The fourth section presents the empirical results and discussion. Finally, we provide the conclusion in the last section.

2.   Literature Review
2.1   Benefits of Social Housing

Studies that support or oppose public or social housing are abundant in the literature. Some previous studies that support social housing claim that social housing produces many direct and indirect benefits. In addition to solving the housing problems of disadvantaged groups, social housing also promotes social integration and stability, improves public safety and sanitation, assists with the operation of a healthy housing market, and promotes economic development. These are the primary reasons why much of the previous literature supports the construction of social housing (Currie and Yelowitz 2000; Onatu 2010; McCormick et al., 2012; Livingston et al., 2013; Forrest and Yip 2014; Oakley and Fraser 2016; Huang et al. 2017; Pareja-Eastaway and Sánchez-Martínez 2017; Verdugo and Toma 2018; Costarelli et al. 2019; Wong and Chan, 2019).

In terms of the perspective that social housing promotes economic development and housing market stability, Forrest and Yip (2014) examine the growth and resilience of the public rental sector in Hong Kong. They argue that public housing plays a distinct role in a productivist welfare regime, both materially and symbolically. Public housing is indisputably an investment that stimulates economic development, while at the same time, a symbol of wealth accumulation and an effective motivator for hard work. This may also explain why cash transfers for housing, such as housing vouchers, have never been included in the policy agenda in Hong Kong. Pareja-Eastaway and Sánchez-Martínez (2017) emphasize the benefits of social housing for combatting

market inefficiency and inequities. They argue that since the 1950s, Spain has encouraged home ownership. The global financial crisis of 2008 is however evidence of the vulnerabilities of this system, which forced governments to address the pressure of political reforms while financial institutions held massive numbers of empty homes. Pareja-Eastaway and Sánchez-Martínez (2017) suggest that, in the future, the Spanish government should aggressively provide more affordable homes for disadvantaged groups.

In terms of the perspective of the impacts of social housing on housing market stability, Huang et al. (2017) investigate the impact of social housing on housing prices in Taipei City within a distance of 100 to 300 meters. They find that current publicly operated housing for rent has caused a significant increase in the prices of nearby homes, thus showing the positive external effects of public housing. The NIMBY effect does not exist as expected, at least for the new social housing projects located in old neighborhoods. Verdugo and Toma (2018) use French census data collected over three decades to examine how the increase in public housing participation has affected segregation. They find that the overall effect of public housing on segregation has been ambiguous. While large projects have increased segregation, the inflow of non-European immigrants into small projects has diminished segregation levels. Costarelli et al. (2019) discuss the new practices of social mixing in social housing in Italy and the Netherlands. Social mixing is reframed among five domains: discourses, target groups, practices, institutional frame, and urban downscaling. The new role models are defined according to the resourcefulness of the tenants rather than economic capital, and require tenants to take part in community-oriented activities in return for affordable rents.

As for the benefits of social housing to residents in social housing, Currie and Yelowitz (2000) state that one of the key goals of the federal public housing policy in the U.S. is to improve the lives of children in poor families. They investigate the impact of participation in public housing on housing quality and educational performance. The results show that living in public housing has a negative impact on children. Currie and Yelowitz (2000) conclude that this is the result of unobservable heterogeneity and that after comprehensively controlling for heterogeneity and potential endogeneity, they find that public housing has a positive impact on the living quality and grades of children. Wong and Chan (2019) examine the impacts of household income and housing factors on the deprivation of residents in Hong Kong. They state that income level has a crucial effect on the deprivation level of households, whereas housing cost and living area per capita, and living quarters problems significantly influence deprivation. However, for public rental housing residents, only the effect of living quarters on deprivation is significant. Wong and Chan (2019) recommend that improving maintenance and renovation schemes for public and private housing with poor living conditions is a good strategy to improve housing conditions and deprivation.

2.2   Debates on Benefits of Social Housing

While there are many studies that support the benefits and necessity of social housing, several authors have focused instead on the NIMBY effect and some restrictions in real-life environments (Levy et al. 2013; Matthews et al. 2015; Scally and Tighe 2015; Korsu 2016; Byrne and Norris 2017; Fitzpatrick and Watts 2017; Yuan et al. 2017; Norris and Byrne 2018; Lau 2018). From the perspective of the NIMBY effect, Nguyen et al. (2013) investigate the framing of affordable housing by opponents and responses to this framing by local housing actors in the U.S. They find that opposition to affordable housing and the process of framing result in changes to development designs and siting decisions based on the least resistance, rather than sound planning and decision-making, thereby directing affordable housing projects to particular jurisdictions, new development areas, or concentrated poor neighborhoods. Matthews et al. (2015) claim that a key barrier to supply and affordability in England is community activism by so-called NIMBY activists. They use the British Social Attitudes Survey data to conclude that it is unlikely that localism will deliver new housing. They argue that those who plan housing need to understand the negotiation of the complex interests of communities.

There are some debates on whether social housing is beneficial to the operation of the housing market. For instance, Byrne and Norris (2017) examine the role of social housing in the housing bubble of Ireland and experiences during the global economic crisis. They argue that the role of social housing has transformed from causing a downturn to the economic cycle to boosting the economic cycle because the financial reforms of social housing and their procurement mechanisms have integrated social housing into the fluctuation system of private housing. Norris and Byrne (2018) find that social housing plays a critical, but contradicting, role in the housing markets of Ireland and Austria. Social housing in Ireland has a pro-cyclical role. This increases the fluctuations in the housing market. In Austria, social housing has a countercyclical role and stabilizes the prices of homes. The results offer a partial reflection on the policy differences of social housing in different countries. Furthermore, the financial source and subsidies for the demand or supply of social housing are known to be the cause of the two contradicting results described above.

Some other studies have examined whether social housing can promote social integration. For example, Levy et al. (2013) argue that mixed-income strategies usually begin with the hypothesis that mixing incomes will address many problems associated with poverty concentration and neighborhood disinvestment. However, the practice might best address the goals of economic desegregation and poverty alleviation that income mixing has yet to achieve. Korsu (2016) finds that social housing can indeed promote social integration, but the effects of the integration are not as high as originally expected in France. In reality, there are factors that inhibit the integrating effects of social housing. Financial restrictions reduce the number of social housing projects, the NIMBY

attitude of wealthy residents, and homeowners who refuse to rent expensive homes to low-income households and realize the benefits of social housing.

The execution ability of the government is also a critical factor that influences the functions of social housing. Scally and Tighe (2015) investigate the power of the impact of local opposition parties on affordable housing developments, especially whether the planning of housing policy achieves the goal of fairness and justness. Their empirical results indicate that the opposition of local communities is indeed an obstacle to the effective selection of affordable housing sites. Therefore, local governments should propose more effective planning and execution strategies in the future to reduce opposition and produce more fair results. Yuan et al. (2017) believe that the primary reason for the low move-in rate of social housing in China is due to the unreasonable price of rent as constructing social housing with public–private partnerships complicates rental fees. Lau (2018) examines why planning delays are fairly common in Hong Kong. By examining a major dispute over public housing development, Lau (2018) concludes that the lengthy processes of bargaining might have constrained the emergence of radical contention.

Additionally, Fitzpatrick and Watts (2017) examine the impact of recent terminations of guaranteed rental periods in social housing in England and now view that such guaranteed rental periods as a temporary social benefit only provided to the poorest families. They point out that restricting social housing to fixed rental periods will only slightly increase the turnover rate of social housing. This benefit may offer insufficient guarantees regarding tenant rental periods and will be offset by the additional administrative burden on landlords.

From the previous studies on the benefits and restrictions of social/public housing summarized above, we find that most of them are merely contextual or tangential. These previous studies address the benefits or restrictions of social housing, however, very few empirical research work investigate the determinants of the attitude of the public towards social housing construction, especially using nationally representative data. The main objective of this study is to address this research gap. Based on the potential factors behind those who support or oppose social housing, this study will separate explainable variables into five main variables: family attributes, housing attributes, perception of the neighboring facilities and environment, housing environment improvements, and regional differences.

3.   Research Design
3.1   Data

The empirical data used in this study primarily references the 2015 Residential Status Survey conducted by the Construction and Planning Agency, Ministry of the Interior, Taiwan. The survey is conducted every ten years and the 2015

survey is the most recent one. The sample is representative of the whole population of 23 million in Taiwan. The sampling method utilizes the stratified two-stage systematic sampling method by dividing cities and counties into 22 sub-populations and then further dividing them into strata, according to the district, city, town, and township. Each village within the stratum is then ordered from largest to smallest. The first stage of each stratum utilizes the probability proportionate to size (PPS) sampling method to systematically draw 600 sample villages; the odds of drawing each village is proportional to the number of houses in each village. In Stage 2, the sample villages are categorized according to the type of housing (farmhouse, traditional home, walk-up apartment, elevator building with fewer than 10 floors, and elevator building with more than 11 floors) and then ordered according to the address, before drawing approximately 25 homes. Out of a total of 15,000 homes ($600 \times 25 = 15,000$), the total draw rate is two thousandth, and after removing empty homes and incomplete surveys, the sample size is reduced to 14,275.

3.2 Model and Variables

The study uses the question "Do you approve of government construction of social housing that is "for rent only and not for sale"?" from the 2015 Residential Status Survey as the dependent variable for the attitude of the public towards social housing.[4] Approval is gauged by using a Likert scale in which Strongly Agree = 5, Agree = 4, Neither Agree nor Disagree = 3, Disagree = 2, and Strongly Disagree = 1. Based on Long (1997) and Long and Freese (2006), the factors that impact the attitude of the public towards the construction of social housing are analyzed by using the ordered logistic model as follows:

$$y_i^* = x_i\beta + \epsilon_i \qquad (1)$$

Here, y_i^* is the actual degree of approval, while x_i refers to the dependent variable that impacts social housing approval. y_i^* cannot be observed, while y_i can be observed, so the relationship between y_i and y_i^* is

$$y_i = \begin{cases} 1 & if \ \tau_0 = -\infty \leq y_i^* < \tau_1 \\ 2 & if \ \tau_1 \leq y_i^* < \tau_2 \\ 3 & if \ \tau_2 \leq y_i^* < \tau_3 \\ 4 & if \ \tau_3 \leq y_i^* < \tau_4 \\ 5 & if \ \tau_4 \leq y_i^* < \tau_5 = \infty \end{cases} \qquad (2)$$

τ_i is the cutoff point, while τ_i and β are coefficients that have be to be estimated. ϵ_i is the residual term, assuming that ϵ_i has a logistic distribution of mean = 0 and variance = $\pi^2/3$, the conditional probability of an event is the probability of y^* being located at cut off points τ_{m-1} and τ_m, which means:

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[4] The question "How much do you agree with government construction of rental social housing?" is more suitable to measure the attitude of the public toward social housing construction. Unfortunately, the public found that the question is too difficult and complex to answer, so the question was omitted in the survey.

$$Pr(y_i \leq m|x_i) = Pr(y^* < \tau_m|x_i) \tag{3}$$

The following probability is obtained after calculation:

$$Pr(y_i \leq m|x_i) = Pr(x_i\beta + \epsilon_i < \tau_m) = Pr(\epsilon_i < \tau_m - x_i\beta)$$
$$= F(\tau_m - x_i\beta) \tag{4}$$

Here, $F(\cdot)$ represents the cumulative distribution function of random error ϵ, and its log-likelihood functions are then used to estimate the coefficients with the most approximate method.

The non-linear relationship with the independent variable in the probability of Equation (4) can be converted into a linear one by using an ordered logistics model. The odds are the probability ratio of an event occurring and not occurring, where y is a polynomial variable, so the equation of the model is

$$logit[Pr(y_i \leq m|x_i)] \equiv \ln \Omega_{\leq m|>m}(x_i)$$
$$= \ln \left[\frac{Pr(y_i \leq m|x_i)}{1 - Pr(y_i \leq m|x_i)} \right] = \tau_m - x_i\beta \tag{5}$$

for $m = 1$ to 4.

Equation (5) represents the logarithm odds of variable y_i falling into "class 1 to class m" under the conditions of independent variable x_i. In other words, the probability odds of "including class m and below" as opposed to "class m or above" are first calculated, and then, considering the natural logarithm, Equation (5) can be rewritten as:

$$Pr(y_i \leq m|x_i) = logit^{-1}(\tau_m - x_i\beta)$$
$$= \frac{exp(\tau_m - x_i\beta)}{1 + exp(\tau_m - x_i\beta)} \tag{6}$$

for $m = 1$ to 4.

For the choices in selecting the independent variables, this study separates the variables into family and housing attributes, perception of neighboring facilities and environment, and housing environment improvements. Additionally, considering the differences in housing market development in the different regions in Taiwan, especially the six municipalities of Taipei City, New Taipei City, Taoyuan City, Taichung City, Tainan City, and Kaohsiung City, and differences in housing prices and rent across them, the areas outside of these municipalities are used as a benchmark reference, with the addition of virtual variables from the six municipalities. The definition, settings, and expected signs of the variables used in this paper are detailed in Table 1. Table 2 shows the descriptive statistics for each variable, including the percentage, mean, standard deviation, and minimum and maximum values.

Table 1   Definition of Variables

Variable	Definition	Expected Sign
Degree of Approval		
Public approval rating for the construction of social rental housing	Strongly approve = 5, Approve = 4, Neither approve nor disapprove = 3, Disapprove = 2, and Strongly disapprove = 1	
Family Attribute		
Family with senior over 65	Yes = 1, No = 0	+
Family member with a disability	Yes = 1, No = 0	+
Family with child under 18	Yes = 1, No = 0	+
Family home is self-owned	Self-owned = 1, Rented = 0	-
Average regular monthly income of each household (NT$10,000 or US$334)	1. Less than NT$20,000, 2. NT$20,000 - Less than NT$40,000 , 3. NT$40,000 - NT$60,000 …11. More than NT$200,000	+/-
Age of the primary provider (years)	Continuous variable	+
Education level of the primary provider	1: Elementary school or below, 2: Junior high, 3: High (vocational) school, 4: Junior college, 5: University, 6: Master's degree or higher	+/-
Occupation of the primary provider (those without jobs are the benchmark group) (Note 1)	Refers to how the job of the family's primary provider affects approval of social housing: Public representative, manager, or supervisor = 1, Other = 0; Professional = 1, Other = 0; Military = 1, Other = 0; Technician and assistant staff = 1, Other =0; Administrative support staff = 1, Other =0; Service and sales staff = 1, Other = 0; Craft-related worker = 1, Other = 0; Mechanical equipment operator or assembly staff = 1, Other = 0; Basic technician or labor staff = 1, Other =0; Agriculture, fishery, or forestry worker = 1, Other = 0.	+/-
Housing Attribute		
Housing type (traditional house is the benchmark group)	Refers to how the housing density impacts approval of social housing: Farmhouse = 1, Other = 0; Walk-up apartment = 1, Other = 0; Elevator building with fewer than 10 floors = 1, Other = 0; Elevator building with more than 11 floors = 1, Other = 0.	+
Age of home	Continuous variable	+/-
Area of home	Continuous variable	+/-
Security facilities	Yes = 1, No = 0	+

(*Continued…*)

(Table 1 Continiued)

Variable	Definition	Expected Sign
Perception of the Neighboring Facilities and Environment		
Parks and green fields near home	Yes = 1, No = 0	+
Sports field near home	Yes = 1, No = 0	+
Libraries or cultural centers near home	Yes = 1, No = 0	+
Level of satisfaction with living environment beautification, management, and maintenance near the home	Very satisfied = 5, Satisfied = 4, Neither satisfied nor dissatisfied = 3, Dissatisfied = 2, and Strongly dissatisfied = 1	+
Level of satisfaction with views and landscapes near the home	Very satisfied = 5, Satisfied = 4, Neither satisfied nor dissatisfied = 3, Dissatisfied = 2 , and Strongly dissatisfied = 1	+
Housing Environment Improvements		
Frequency of traffic accidents needs to be reduced	Needs to be reduced = 1, Other = 0	+/-
Outdoor accessibility ramps need to be increased	Need to be increased = 1, Other = 0	+/-
Privacy needs to be increased	Needs to be increased = 1, Other = 0	+/-
Frequency of theft needs to be reduced	Needs to be reduced = 1, Other = 0	+/-
Noise interference needs to be reduced	Needs to be reduced = 1, Other = 0	+/-
Community and neighborhood interactions need to be increased	Need to be increased = 1, Other = 0	+/-
Region		
Taipei City	Taipei City = 1, Other = 0	+
New Taipei City	New Taipei City = 1, Other = 0	+
Taoyuan City	Taoyuan City = 1, Other = 0	+
Taichung City	Taichung City = 1, Other = 0	+
Tainan City	Tainan City = 1, Other = 0	+
Kaohsiung City	Kaohsiung City = 1, Other = 0	+

Note: 1. Occupation of the primary provider family is based on the standard categories listed by the Directorate-General of Budget, Accounting and Statistics, Executive Yuan.

2. The exchange rate for USD and NTD is 1:30

Table 2   Descriptive Statistics

	Mean	SD	Min	Max
Dependent Variable				
Public approval rating for the construction of social housing	3.62	1.12	1	5
Independent Variable				
Family Attribute				
Average regular monthly income of each household	3.06 (Note 1)	1.87	1	11
Age of the primary provider	52.58	13.72	18	94
Education level of the primary provider	3.18 (Note 2)	1.50	1	6
Housing Attribute				
Age of home	27.46	14.11	0	100
Area of home	15.71	14.34	1.16	378.1
Perception of the Neighboring Facilities and Environment				
Level of satisfaction with environment beautification, management, and maintenance near home	3.42	0.79	1	5
Level of satisfaction with views and landscapes near the home	3.45	0.78	1	5

Categorical Variable	Percentage
Family Attribute	
Disadvantaged	
Family with senior over 65	42.1
Family member with a disability	12.5
Family with a child under 18	63.3
Family home is self-owned	84.8
Occupation of the primary provider	
Public representative, manager, and supervisor	4.35
Professional	10.41
Military	0.67
Technician and assistant staff	8.21
Administrative support staff	5.12
Service and sales staff	19.93
Craft-related worker	4.34
Mechanical equipment operator or assembly staff	4.74
Basic technician or labor staff	10.99
Agriculture, fishery, or forestry worker	5.77
Unemployed	25.33

(*Continued…*)

(Table 2 Continued)

Categorical Variable	Percentage
Housing Attribute	
Housing Type	
Farmhouse	18.1
Traditional home	55.6
Walk-up apartment	18.08
Elevator building with fewer than 10 floors	9.42
Elevator building with more than 11 floors	15.08
Security facilities	20.1
Perception of the Neighboring Facilities and Environment	
Parks and green fields near home	68.66
Sports fields near home	68.20
Libraries or cultural centers near home	50.13
Housing Environment Improvements	
Frequency of traffic accidents needs to be reduced	3.68
Outdoor accessibility ramps need to be increased	1.89
Privacy needs to be increased	0.71
Frequency of theft needs to be reduced	3.81
Noise interference needs to be reduced	16.72
Community and neighborhood interaction need to be increased	1.70
Region	
Taipei City	8.70
New Taipei City	15.50
Taoyuan City	8.02
Taichung City	9.91
Tainan City	7.34
Kaohsiung City	10.31

Notes: 1. The mean of the average regular total income of each household is 3.06, and total income ranges from 1 to 11, defined as follows: 1: less than NT$20,000 (US$667) (18.4%); 2: NT$20,000 (US$667) - less than NT$40,000 (US$1333) (27.2%); 3: NT$40,000 (US$1,333) - less than NT$60,000 (US$2000) (23.2%); 4: NT$60,000 (US$2000) - less than NT$80,000 (US$2667) (13.5%); 5: NT$80,000 (US$2667) - less than NT$100,000 (US$3333) (8.4%); 6: NT$100,000 (US$3333) - less than NT$120,000 (US$4000) (4.9%); 7: NT$120,000 (US$4000) - less than NT$140,000 (US$4667) (1.5%); 8: NT$140,000 (US$4667) - less than NT$160,000 (US$5333); 9: NT$160,000 (US$5333) - less than NT$180,000 (US$6000) (0.4%); 10: NT$180,000 (US$6000) - less than NT$200,000 (US$6667) (0.5%); and 11: Higher than NT$200,000 (US$6667) (1.2%).

     2. The mean of the education level is 3.18, and education level ranges from 1 to 6, defined as follows: 1: elementary school or below (18.2%); 2: junior high (14.4%); 3: high (vocational) school (29.3%); 4: junior college (14.1%); 5: university (17.7%); 6: Master's degree or higher (6.3%).

     3. The three variables of families who have a senior over 65 (42.1%), families with a member with disabilities (12.5%), and families with a child under 18 (63.3%) are economically or socially disadvantaged groups, as defined by Article 4 of the Housing Act.

4.   Empirical Analysis
4.1   Results of Ordered Logistic Regression

The empirical work in the study is conducted by using Stata 15 software. Table 3 shows the results of the ordered logistic regression. The dependent variable in Models 1 to 5 is the degree of public approval of the government construction of social housing. The difference is that Model 1 includes all of independent variables in the model, while the independent variables of Models 2 to 5 respectively do not consider the family attributes, housing attributes, perception of the neighboring facilities and environment, housing environment improvements, and regional variables, to test the stability of the models. Most of the independent variables in the model are significant and in accordance with the expected signs. The model's goodness of fit indexes, including the log likelihood ratio, Akaike information criterion (AIC), and Bayesian information criterion (BIC), show that Models 1 and 5 have a better goodness of fit. However, Model 2 excludes the family attributes variable which more significantly reduces its independent power.

In the family attributes variable of Model 1, the primary providers who are older in age with a higher income are more inclined to approve of social housing, but a child under 18 in the family has a negative impact on the approval. Primary providers who are employed in administrative support, service and sales, and craft-related work show more support for social housing. As well, primary providers who are more educated or have family members with disabilities are more inclined to approve of social housing. Those who possess ownership of their home are more prone to oppose social housing, while the influence of families with a senior over 65 in their household does not reach a significant level. The data show that those who do not own their home or have family members with disabilities are more likely to support social housing, as social housing can enhance the living environment of disadvantaged groups. For the housing attributes variable with traditional homes as the benchmark group, those who live in an elevator building with more than 11 floors are more inclined to approve of social housing, while those who live in farmhouses, walk-up apartments, and elevator buildings with fewer than 10 floors do not reach a significant level. Additionally, the influence of the age and size of a home, and existence of security facilities do not reach a significant level.

For the variable of perception of the neighboring facilities and environment, the existence of parks near the home correlates with increased approval towards social housing. Variables such as the availability of libraries or cultural centers nearby, environment beautification, and satisfaction towards management or maintenance show a significantly positive impact on social housing approval. However, the existence of a sports fields near the home does not have a significant impact. For the variable of environment improvements, increasing the number of outdoor accessibility ramps and community and neighborhood interactions show a significantly positive impact on social housing approval,

Table 3   Results of Ordered Logistic Regression

Variable	Model 1 Coefficient (t value)	Model 2 Coefficient (t value)	Model 3 Coefficient (t value)	Model 4 Coefficient (t value)	Model 5 Coefficient (t value)
Family Attribute					
Disadvantaged group					
Family with senior over 65	-0.04(-1.1)		-0.06*(-1.75)	-0.04(-1.1)	-0.04(-1.2)
Family member with a disability	0.13***(2.7)		0.12**(2.56)	0.12**(2.5)	0.13***(2.8)
Family with child under 18	-0.03**(-1.9)		-0.04**(-2.2)	-0.03*(-1.6)	-0.03*(-1.9)
Family home is self-owned	-0.48***(-10.6)		-0.49***(-11.0)	-0.47***(-10.5)	-0.48***(-10.6)
Average regular monthly income	0.07***(7.6)		0.08***(8.0)	0.08***(7.9)	0.08***(7.7)
Age of the primary provider	0.01***(5.9)		0.01***(5.8)	0.01***(6.2)	0.01***(6.1)
Education level of the primary provider	0.14***(10.0)		0.15***(10.7)	0.14***(10.3)	0.14***(10.2)
Occupation of the primary provider	-0.01(-0.06)		-0.01(-0.16)	-0.01(-0.03)	-0.01(-0.03)
Classification as high-income occupation					
Public representative, manager, and supervisor	0.10(1.5)		0.10(1.5)	0.11(1.6)	0.10(1.5)
Professionals	-0.06(-0.34)		-0.08(-0.42)	-0.07(-0.35)	-0.05(-0.24)
Classification as medium-income occupation					
Military	0.09(1.4)		0.09(1.3)	0.09(1.3)	0.10(1.4)
Technician and assistant staff	0.19**(2.4)		0.18**(2.3)	0.19**(2.4)	0.19**(2.4)
Administrative support staff	0.14***(2.7)		0.13***(2.6)	0.15**(1.79)	0.14***(2.8)
Service and sales staff	0.16**(1.9)		0.13(1.6)	0.15*(1.8)	0.17**(2.1)
Craft-related worker	-0.06(-0.80)		-0.08(-0.93)	-0.07(-0.92)	-0.06(-0.73)
Mechanical equipment operator or assembly staff					
Basic technician or labor staff	0.03(0.48)		0.02(0.27)	0.02(0.39)	0.03(0.46)
Classification as low-income occupation					
Agriculture, fishery, or forestry worker	0.05(0.69)		0.03(0.40)	0.01(0.42)	0.05(0.64)

(*Continued…*)

(Table 3 Continued)

Variable	Model 1 Coefficient (t value)	Model 2 Coefficient (t value)	Model 3 Coefficient (t value)	Model 4 Coefficient (t value)	Model 5 Coefficient (t value)
Housing Attribute					
Housing Type (Traditional home as the benchmark group)					
Farmhouse	-0.05(-0.40)	-0.03(-0.29)		-0.05(-0.46)	-0.04(-0.38)
Walk-up apartment	0.11(0.87)	0.18(1.4)		0.10(0.83)	0.12(0.97)
Elevator building with fewer than 10 floors	0.12(0.94)	0.32**(2.5)		0.14(1.1)	0.14(1.1)
Elevator building with more than 11 floors	0.23*(1.7)	0.4***(3.04)		0.24*(1.9)	0.21*(1.9)
Age of home	-0.01(-0.49)	-0.01**(-2.2)		-0.01(-0.82)	-0.01(-0.49)
Security facilities	0.03(0.46)	0.09(1.6)		0.04(0.67)	0.03(0.52)
Perception of the neighboring facilities and environment					
Parks and green fields near home	0.09**(2.1)	0.12***(2.9)	0.11**(2.5)		0.09**(2.1)
Sports fields near home	-0.01(-0.03)	0.02(0.50)	0.01(0.01)		-0.01(-0.04)
Libraries or cultural centers near home	0.11***(3.0)	0.14***(3.9)	0.11***(3.1)		0.11***(3.1)
Level of satisfaction with environment beautification, management, and maintenance near home	0.06**(2.0)	0.06**(2.3)	0.06**(2.2)		0.05(1.6)
Level of satisfaction with views and landscapes near home	0.07**(2.6)	0.05*(1.8)	0.08***(2.9)		0.07**(2.4)

(*Continued…*)

(Table 3 Continued)

Variable	Model 1 Coefficient (t value)	Model 2 Coefficient (t value)	Model 3 Coefficient (t value)	Model 4 Coefficient (t value)	Model 5 Coefficient (t value)
Housing Environment Improvement					
Frequency of traffic accidents needs to be reduced	0.09(1.1)	0.12(1.5)	0.09(1.1)	0.07(0.89)	
Outdoor accessibility ramps need to be increased	0.23**(2.0)	0.30***(2.6)	0.27*(2.4)	0.20*(1.8)	
Privacy needs to be increased	-0.12(-0.69)	-0.04(-0.21)	-0.12(-0.64)	-0.18(-0.97)	
Frequency of theft needs to be reduced	0.01(0.06)	-0.01(0.03)	-0.01(-0.13)	-0.02(-0.27)	
Noise interference needs to be reduced	0.1**(2.4)	0.14***(3.3)	0.12***(2.7)	0.06(1.5)	
Community and neighborhood interactions need to be increased	0.27**(2.4)	0.30***(2.6)	0.29**(2.4)	0.24**(2.1)	
Region (Areas outside six municipalities as the benchmark group)					
Taipei City	0.22***(3.2)	0.34***(5.1)	0.33***(5.4)	0.27***(4.0)	0.22***(3.2)
New Taipei City	-0.20***(-3.6)	-0.18***(-3.3)	-0.08(-1.6)	-0.19***(-3.4)	-0.20***(-3.6)
Taoyuan City	0.01(0.07)	0.02(0.32)	0.06(1.0)	0.02(0.30)	0.01(0.23)
Taichung City	0.33***(5.9)	0.37***(6.6)	0.39***(7.0)	0.37***(6.6)	0.33***(5.9)
Tainan City	0.2***(3.4)	0.22***(3.7)	0.21***(3.4)	0.21***(3.5)	0.20***(3.3)
Kaohsiung City	0.1*(1.9)	0.14***(2.6)	0.14***(2.6)	0.16***(3.0)	0.09*(1.7)
Threshold value 1	-1.50	-2.23	-1.43	-2.01	-1.55
Threshold value 2	-0.26	-0.99	-0.19	-0.77	-0.31
Threshold value 3	1.07	0.31	1.14	0.56	1.02
Threshold value 4	2.65	1.86	2.71	2.13	2.59
Number of Obs.	14275	14275	14275	14275	14275
Log likelihood	-20301.1	-20489.6	-20316.2	-20335.1	-20310.5
AIC	40690.1	41033.2	40708.4	40748.2	40697.1
BIC	41023.1	41237.5	40995.9	41043.3	40984.6

Note: *, **, and *** represent significance levels of 10%, 5%, and 1%, respectively.

but reducing the frequency of traffic accidents, increasing privacy, and reducing the frequency of theft do not have a significant impact on social housing approval. Using areas outside of the six municipalities as the benchmark group for the regional variables, it is found that approval of social housing reaches a significant level in Taipei City, Taichung City, Tainan City, and Kaohsiung City. However, New Taipei City shows a negative coefficient value, while a significant level of impact is not found in Taoyuan City.

4.2   Marginal Effect of the Significant Factors

As ordered logistic regression is nonlinear modeling, it is estimated that the coefficients can only determine the direction of impact on the approval rating of each independent variable; a marginal effect is required to understand the impact of the changes in the independent variables on the dependent variable. The degree of approval in this paper is divided into five levels, and ordered logistic regression is used to estimate the impact of these five levels. Here, impact refers to probability, and the sum of the marginal effects for the degree of approval for all five levels is 0. When the probability of approval increases for one level, the probability of approval for the other levels will decrease. If the coefficient is positive, this represents a rightward shift for the entire distribution, which means an increase in the probability towards the direction of approval. If it is estimated that the coefficient can show when all of the other variable settings are at an average value, changes in the independent variable will show the directional change of the dependent variable. If the independent variable is a continuous variable, a unit shift in the marginal effect of the independent variable is the probability of the impact on the approval of all five groups. If the independent variable is a virtual variable, the impact resulting from changes in the independent variable must be compared to the benchmark group to see how the probability of approval of all of the groups changes in contrast to the benchmark group.

Table 4 shows the marginal effect of public approval for the construction of social rental housing based on Model 1 of Table 3. In terms of family attributes, families who have members with disabilities show a larger ratio of approve and strongly approve of 3.02% (0.67% + 2.35%). Families with a child under 18 show a smaller ratio of approve and strongly approve of 0.77%. Families who own their home show a smaller ratio of approve and strongly approve of 10.94%. For every NT$20,000 (US$667) increase in the average regular monthly income of a household, and 1 year and 1 level increase in the age and education of the primary provider, the average ratio of approve and strongly approve increases by 1.80%, 0.74%, and 3.35%, respectively. If the occupation of the primary provider is administrative support, service and sales, or craft-related, the ratio of approve and strongly approve increases by 4.44%, 3.32%, and 3.85%, respectively. In the housing-type variable, the ratio of approve and strongly approve of residents in elevator buildings with more than 11 floors is 4.66% in comparison to those who live in traditional homes.

Table 4   Marginal Effect of the Significant Factors

	Level of Approval				
	Strongly Disapprove	Disapprove	Neither Approve nor Disapprove	Approve	Strongly Approve
Family Attribute					
Disadvantaged group					
Family member with a disability	-0.56	-1	-1.45	0.67	2.35
Family with child under 18	0.15	0.26	0.36	-0.19	-0.58
Home residence is self-owned	1.91	3.50	5.53	-1.64	-9.30
Average regular monthly income	-0.35	-0.61	-0.84	0.45	1.35
Age of the primary provider	-0.04	-0.08	-0.11	0.57	0.17
Education level of the primary provider	-0.65	-1.14	-1.57	0.83	2.52
Occupation of the primary provider (using unemployment as the benchmark group)					
Classified as medium-income occupation					
Administrative support staff	-0.81	-1.46	-2.17	0.89	3.55
Service and sales staff	-0.62	-1.11	-1.59	0.75	2.57
Craft-related worker	-0.7	-1.27	-1.87	0.80	3.05
Housing Attributes					
Housing Type (using traditional homes as the benchmark group)					
Elevator building with more than 11 floors	-0.86	-1.54	-2.26	0.98	3.68
Perception of the neighboring facilities and environment					
Parks and green fields near home	-0.42	-0.75	-1.02	0.57	1.63
Libraries or cultural centers near home	-0.49	-0.87	-1.2	0.64	1.93

(*Continued…*)

(Table 4 Continued)

	Level of Approval				
	Strongly Disapprove	Disapprove	Neither Approve nor Disapprove	Approve	Strongly Approve
Perception of the neighboring facilities and environment					
Level of satisfaction with environment beautification, management, and maintenance near home	-0.26	-0.45	-0.62	0.33	1.00
Level of satisfaction with views and landscapes near home	-0.34	-0.60	-0.82	0.44	1.32
Housing Environment Improvement					
Outdoor accessibility ramps need improvement	-0.97	-1.77	-2.70	1.00	4.44
Noise interference needs to be reduced	-0.47	-0.83	-1.18	0.57	1.91
Community and neighborhood interaction needs to be increased	-1.15	-2.10	-3.25	1.1	5.39
Region					
Taipei City	-0.93	-1.69	-2.52	1.01	4.13
New Taipei City	0.99	1.71	2.19	-1.40	-3.50
Taichung City	-1.37	-2.51	-3.88	1.32	6.44
Tainan City	-0.88	-1.58	-2.36	0.96	3.86
Kaohsiung City	-0.46	-0.82	-1.17	0.55	1.89

In terms of the perception of the neighboring facilities and environment, the ratio of those with a home near parks or libraries, and cultural centers approve and strongly approve increases by 2.2% and 2.57%, respectively. For every increase in level of satisfaction with environment beautification and management/maintenance near the home, there is an increase of 1.33% for the ratio of approve and strongly approve. For every increase in level of satisfaction with views and landscapes near the home, there is an increase of 1.76% for the ratio of both approve and strongly approve. In terms of housing environment improvements, those who require more outdoor accessibility ramps, less noise interference, and increased community or neighborhood interaction increase the ratio of approve and strongly approve by 5.44%, 2.48%, and 6.49%, respectively. When the aforementioned variables are controlled, social housing approval in Taipei City, Taichung City, Tainan City, and Kaohsiung City is higher than in areas outside of the six municipalities by 5.14%, 7.76%, 4.82%, and 2.44%, respectively. Approval of social housing in New Taipei City is 4.9% lower than in areas outside of the six municipalities.

4.3   Discussion of Empirical Results

Social housing can improve the housing environment of disadvantaged groups and create many potential external benefits, making it an important aspect of residence justice and social mixing (Currie and Yelowitz, 2000; Forrest and Yip, 2014; Pareja-Eastaway and Sánchez-Martínez, 2017; Verdugo and Toma, 2018; Costarelli et al., 2019). However, the construction of social housing is still facing a great deal of opposition from the public, especially in areas with high homeownership rates and housing prices. This study examines the determinants of the attitude of the public towards the construction of social housing. In addition to supporting the opinions of some of the previous studies, our empirical results also reveal many new interesting findings which are very useful for the housing policy decision making of governments.

First, if the family home is self-owned or there is a child under 18 in the family, a significantly negative impact on approval for social housing construction can be observed. This shows that while most of the public approve of social housing construction to accommodate the disadvantaged groups, they worry about declining housing prices and the safety of their children under 18 if social housing projects are located next to their home. This might show that there is a NIMBY effect (Nguyen et al., 2013; Matthews et al., 2015). In addition to providing an objective research analysis for this aspect (Huang et al., 2017), we suggest creating more opportunities for communication and interaction between social housing tenants and nearby residents through the use of public spaces, daily life services, and events (such as childcare, senior care, learning job skills, or club activities) of social housing projects. The government itself should also strengthen communication with the public and offer public education to discourage potential NIMBY perspectives around social housing. This represents one of the best ways to remove negative labels so that society

as a whole can be receptive to social housing and help to achieve its intended function.

Secondly, when the level of satisfaction of local residents with their nearby environment is higher (especially with respect to parks, libraries, or cultural centers, environment beautification and management, and views and landscapes) or when residents expect that there would be housing environment improvements (especially increased outdoor accessibility ramps, reductions to noise interference, and increased community and neighborhood interactions), approval of social housing increases. Furthermore, families who have members with a disability have a significantly positive impact on attitudes towards social housing construction. This might reflect the importance of "empathy" in attitudes and can be facilitated by creating community awareness so that social housing can mutually prosper with their neighbors.

Thirdly, the empirical results show that a significantly positive impact on approval of social housing construction can be observed for variables such as average regular monthly income, and the age and education level of the primary provider. This might due to higher income, education, and age, which are conducive to social fairness and justice, and increased willingness to help disadvantaged groups. Furthermore, when individuals live in highly developed residential buildings, they are more inclined to approve of social housing construction. This might be due to the emphasis on community management and sharing of public spaces with other residents in such highly developed residential buildings and communities. In terms of the future communication strategies of the government with those who endorse social housing, the government could prioritize communication with them and utilize them as a bridge to communicate with other members of the public.

Finally, we speculate that the New Taipei City and Taoyuan City residents who express a lower degree of approval towards social housing compared to the other residents outside the six municipalities might be due to the large number of residents in those two cities who have migrated from Taipei City as first-time homebuyers or those who desire a larger home. This group of people commonly improve their housing quality through their own efforts and are rarely recipients of housing subsidies from the government; therefore, they would not be too receptive of social housing. This is also an aspect that requires more communication from the government and their awareness. Furthermore, the process of promoting social housing will encounter many financial challenges and public opposition (Scally and Tighe, 2015; Matthews et al., 2015). We suggest that combining the resources of public and private organizations (Yuan et al., 2017), utilizing a good design and construction quality to meet the housing requirements of different groups, combining housing with assisted living services, and charging reasonable rents and allowing for reasonable length of rental periods (Fitzpatrick and Watts, 2017; Yuan et al., 2017) should be implemented so that disadvantaged groups are given the opportunity and environment to integrate and learn.

5.   Conclusion and Suggestions

This study examines the determinants of the attitude of the public towards the construction of social housing. The following conclusions, which are both important and interesting, can be used in many countries for the promotion of social housing. Firstly, home ownership and being a family with a child under 18 are two of the most influential variables that have significantly negative influences on the approval of social housing construction. The results reveal a strong NIMBY effect of social housing in a high home ownership environment. Conversely, renters and people with physical and mental disabilities, representing potential tenants of social housing, are more supportive of social housing.

Secondly, when people are satisfied with their neighborhood environment, this has a positive impact on approval of social housing construction. This shows that most members of the public might have empathy. When they are satisfied with their own residential environment, they are more willing to help the disadvantaged groups.

Thirdly, residents who live in buildings with high development intensity and densely populated cities, are more inclined to approve of the construction of social housing. This result reveals that social mixing or social integration is more acceptable when people are highly interactive and share public space with others.

Finally, satellite city or metropolitan region residents are less supportive of social housing construction, which shows a regional difference in the approval of social housing construction. Governments should therefore distribute limited housing resources more equally in the future.

This paper provides a good overview on the upcoming challenges of the elements that affect the attitude of the public towards social housing construction and methods for addressing these issues, and can be regarded as a reference for others with its conceptual intention. Based on the empirical findings, we offer some suggestions to governments. First, individuals with a higher income, who are older in age, and have a higher education level are more likely to approve of social housing. Governments should therefore prioritize communication with these groups and utilize them as a bridge to communicate with other members of the public. Secondly, we would suggest that governments showcase visits and experience sharing of successful social housing communities to gradually reduce the stereotypical bias and prejudice towards social housing. Thirdly, since people who are satisfied with their residential environment are more willing to help disadvantaged groups, it would be thus worthwhile for governments to enhance neighborhood environments, local lifestyles, and cultures. Conversely, social housing projects can also offer public space, facilities, and activities to contribute to the well being of local

areas. Therefore, a strategy that promotes the benefits of social housing construction could be mutually beneficial for the residents in social housing projects and their nearby communities. Finally, we suggest that governments promote social housing construction by combining the resources of public and private organizations, thus meeting the housing requirements of different groups in the planning of social housing, combining housing with assisted living services, and providing reasonable rent and rental periods.

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