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ANALYSIS OF THE GAP BETWEEN DEMAND AND SUPPLY OF VERTICAL HOUSING IN MAGELANG CITY, INDONESIA: AN SEM ANALYSIS

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Abstract

The growing population has led to increased demand for housing in Magelang City, Indonesia, especially for the low-income society. Despite the efforts of the local government to provide housing aid through vertical housing, the demand for vertical houses is still relatively low, as indicated by the low occupancy level of the currently available vertical houses. This paper applies the SEM to analyze the gap between the demand and supply of vertical housing in Magelang City, Indonesia. The data is collected using questionnaires distributed to respondents eligible for housing aid in Magelang City. The analysis is conducted using four latent variables: socioeconomic, perception, promotion, decision, and applying Confirmatory Factor Analysis (CFA) with three additional variables on the supply side: price, facilities, and occupancy. This paper shows that from the demand side, the decision to choose a vertical house is affected mainly by the perception of the vertical house. Meanwhile, from the supply side, facilities play a crucial role in determining the occupancy level of the currently available vertical houses. These two variables explain the gap between demand and supply of vertical housing in Magelang City. The result also suggests that promotion might be a valuable tool to correct society's perception.

Keywords: Housing Policy, Housing Management, Public Housing, Vertical Housing

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1. Introduction

Due to the rapid population growth and land scarcity, most developing countries are affected by the global housing crisis. The housing shortage has led to a sharp increase in housing prices beyond the affordability of low-income households. Over the past decade, governments of many countries have turned to public housing to increase the supply of affordable housing for disadvantaged residents.[3] Developing countries have started adopting vertical housing/apartments lately, and it has gained more popularity ever since.[4] Subsidized vertical housing is intended to help low-income households.

Most governments in Asian countries also follow the strategy to achieve the global goal of adequate housing for all. Sri Lankan government launched the Million Houses Programmes (MHP) in 1983-1994, although the program was terminated after a change of government.[5] In Hong Kong, large-scale constructions of both public rental housing and homeownership scheme flats are being planned to expand under the Long Term Housing Strategy, which was first released in 1987, followed by a series of subsidized housing schemes to increase the housing supply for middle- to low-income households (Li, 2016). In China, semi-commercial homeownership was designed for middle-income households, and the price is controlled by the government; public rental housing (PRH) will be provided, which is expected to benefit middle- to low-income families (Qian et al., 2019).

Despite governments' attempts to solve the housing problem, evidence shows that not all the programs were entirely successful in providing feasible housing for the poor. One possible explanation is that the supply does not meet the demand. Many countries have had public-sector low-income rental housing programs that supply subsidized apartments. Still, the supply is usually too small to meet the demand, and the type of provided housing often does not match the preference of the poor households. As Yap (2015) discusses, despite the attempts of the governments of Southeast Asian countries to regulate the supply of low-income housing by allowing developers to build housing conditional on providing a minimum number of low-cost houses, the challenges remain. For example, Yap (2015) mentions the city of Kuala Lumpur, in which many units intended for low-income households are still too costly for the poor or of low quality, and Jakarta, in which related law enforcement is not yet effective. Moreover, Yap (2015) claims that while being hosts to innovations, many urban areas fail to accommodate millions of urban poor who live without adequate housing; because land values rise rapidly and policies to optimize land use do not appear to be in line with the attempt to secure land for housing the urban poor.

[3] In developed countries, the term "public housing" is commonly understood as subsidized rental housing provided by the government to low-income households unable to afford minimum standard housing at market rental rates (Sim et al., 2003).

[4] The term vertical housing is similar to the ‘multi-storey housing’ claimed by Towers (2000). Goody et al. (2010, p. 67 and p. 95) categorize height limitation of 1 to 5 floors as low-rise housing, together with the type of row house, while 5 to 15 storeys belong to medium rise.

[5] Despite the termination, the MHP remains the benchmark for aided self-help housing (Joshi and Khan, 2010).

While issues arising from the low supply are common and typical in some countries, low demand appears to be the primary housing problem in some other countries. According to Phang (2013), the Singapore government launched housing policy innovation in 1964; the housing development board would build and offer public housing flats for sale on 99-year leases under a Home Ownership Scheme (HOS). However, the Asian Financial Crisis of 1998 caused declining prices, leaving more than 17,500 unsold new flats in early 2002, and led to a decision to build flats only when there was sufficient demand. Phang (2013) more specifically claims that real estate markets in Singapore exhibit cyclical behaviour and are responsive to the global economic situation, such as the Asian financial crisis, Bali bombers, SARS, and global financial crisis.

This paper takes a particular case of subsidized vertical housing in Magelang City, Indonesia. The Indonesian government has been working on making public housing available to every resident in urban and rural areas. Magelang City in Central Java Province has received more attention as one of the most populated cities on Java Island. One of the housing projects of the regional government is the *Rusunawa* (Rental Vertical Houses) which is aimed at helping low-income families and people with physical disabilities. The Law of Republic of Indonesia No. 20 2011 about Vertical Housing explains that a vertical house is a multilevel building in an area, divided into several parts and functionally structured in a vertical or horizontal direction, and consists of units that can be owned and used separately, especially as a shelter, equipped with shared facilities and land. Currently, two vertical houses are available, and three others are being planned to be built three years ahead. According to the Ministry of Public Works Letter, each vertical house can accommodate 280 persons. However, both available vertical houses offered by the city government are not yet utilized optimally since the occupancy level is still below the target.

Magelang City is the third most populous yet also the smallest city in Central Java Province from a demographic perspective. According to Statistics Indonesia, about 8.79 percent of the population is low-income. This group of societies is usually unable to obtain a decent house. This fact is proven by the Susenas survey in 2011-2016, which claims that only about 67.23 percent of the households live in their own houses, while the rest live in rented houses.[6] This data implies a high need for housing, especially for the households who do not yet have their own houses.

That the available vertical houses are not fully occupied indicates that the demand for housing is far below the supply. The target group of societies has not yet responded as expected to the government's offer for livable houses. Even though the low-income societies cannot afford a decent vertical house, they still decide not to live in the provided vertical houses. Because vertical housing has been an urgent need

[6] According to the Ministry of Health of the Republic of Indonesia, the ideal extent of floor per person is a minimum of 8 meters square. Meanwhile, according to the World Health Organization (WHO) and American Public Health Organization (APHA), using an adjusted standard for Indonesian, the minimum extent of floor per person is 10 meters square (BPS Indonesia, 2015). According to the Susenas (2013-2016), the average percentage of societies in Magelang City living in unideal houses amounts to 9.7% following the Ministry of Health standard and 15,84% following the WHO/APHA standards.

for Magelang City, the supply-demand gap could result from misperception among the society, which leads to a low demand despite the actual high need.

This paper takes the case of vertical housing in Magelang City, Indonesia, to investigate the gap between vertical housing demand and supply. This study applies the Structural Equation Model (SEM) to analyze the data collected using questionnaires distributed to 100 respondents as the target of housing aid in Magelang City.[7] The analysis is conducted by using four latent variables (socioeconomic, perception, promotion, and decision) and applying Confirmatory Factor Analysis (CFA) with three additional variables (price, facilities, and occupancy) on the supply side.

The analysis shows that on the demand side, the consumers' decision to receive the offer of living in a vertical house is determined by their perception of vertical housing. On the supply side, the occupancy level of the currently available vertical houses is mainly determined by the availability of facilities. In short, misperception among consumers appears to be the primary explanation behind the demand-supply gap in vertical housing in Magelang city. Further analysis suggests that promotion might be a possible solution to correct the consumers' perception.

2. Literature Review

Public housing policies have been implemented in European countries, the United States, and Israel since the 20th century. However, the implementation and the design of the policies were different, such that they were based on primary goal and target population, project size, location, the form of subsidies, level, and method of maintenance.[8]

The issue of housing for low-income households is an inseparable aspect of urban planning and development. Anacker (2019) discusses the challenges of affordable housing which may affect households' budgets, reducing allocation for other crucial expenditure posts, leading to a decrease in opportunity and quality of life. Lee and Ngai-ming (2006) find a positive relationship between public housing, life chances, and economic opportunities in Hong Kong's urban history, particularly during 1960s-1980s.

Arku (2006) collects housing literature in the opposite direction and discusses the economic significance of housing in developing countries. Arku (2006) points out that policymakers in those countries often prioritize investment in sectors that encourage economic growth and tend to perceive housing as a passive element in economic development. Other literature has also shown that housing policy often has a strong political decisions tendency (e.g., Kohl, 2015), such as a decline in public

[7] While posing a potential issue of subjectivity, the use of questionnaires to acquire respondents' responses reveals much information, especially related to public perception, that might not be necessarily available in secondary data.
[8] See, e.g. Lundqvis (1992), Houard (2011), and Whitehead and Scanlon (2007).

expenditures for housing subsidies (Hodkinson et al., 2013), social market economy (Rhodes and Mullins, 2009) and unique role of non-profit housing providers.

The substantial increase in demand for public housing becomes evident in developing countries as their cities experience massive growth. The appearance of slum areas is unarguably a big concern for governments. The problem becomes more complex as the housing supply responds more slowly than the demand increase. Hammam (2013) discusses several factors affecting the supply of housing, especially in developing countries, including the supply of service, developable land, land and housing regulations, profitability, and the availability of supporting infrastructure. Moreover, Hammam (2013) also points out the superiority of demand-side subsidies over supply-side subsidies in assisting low-income households to obtain proper housing.

In general, determinants of housing demand include affordability, confidence (speculative demand), interest rate, population, mortgage ability, economic growth, real income, and rental costs (Pettinger, 2019). Oktay et al. (2014) study determinants of demand for housing in the Erzurum province, Turkey, highlighting the critical role of households` demographic, socioeconomic and socio-psychological characteristics.

Several previous studies have investigated personal choice and public housing. Woo et al. (2019) analyze determinants of the housing decision of older people and find that they care about location, monthly rent, and high security. Estiri (2005) uses an SEM analysis to study the effects of several households' characteristics on the residency status in public housing and shows that, among the interesting results, white or non-Hispanic households tend to have higher socioeconomic status and are more likely to reside in newer homes (built after 2000). One of the works of literature closely related to this study is Hui and Zheng (2010). They analyze customer satisfaction of one residential property in Hong Kong using an SEM with two latent variables. Hui and Zheng (2010) find that service and management quality has a significant positive effect on customer satisfaction. Service quality appears to be a crucial latent variable such that its effect is higher than management quality.

The remainder of this section discusses definitions and related literature of the variables involved in the analysis of this study. On the demand side, there are four latent variables: socioeconomic, perception, promotion, and decision. On the supply side, three variables are considered: price, facilities, and occupancy.

The socioeconomic variable refers to the socioeconomic status of target consumers of public housing, who become the respondents of this study. As economic growth affects macro-level demand for housing (Pettinger, 2019), a household's socioeconomic status also directly affects the household's decision on whether to invest in housing. Oktay et al. (2014) use occupation, car ownership, monthly income, education, and the number of household individuals as socioeconomic indicators.

The perception variable quantifies the respondents' perception of public housing development in Magelang city. The importance of public perception in the housing sector, especially in public housing, is

discussed in many studies. De Decker and Pannecoucke (2004) analyze public perceptions in the housing sector and point out the reality of social residualization. They show that living in public housing entails a negative perception due to its association with the concentration of low-income and unemployed households, leading to stigmatization and social labeling of public tenants. This perception may affect an individual's decision in choosing whether to live in public housing. Moreover, an individual's perception of vertical housing might not be compatible with reality, as the point shown in this paper.

The decision variable is a variable referring to households' demand for housing. In this paper, it measures respondents' willingness to live in a vertical house and participate in its organization. Using the logistic model, Oktay et al. (2014) measure demand for housing by a binary response to the prospect of housing, referring to households' choice on whether to invest in buying a house.

The literature suggests that the main factors that influence the occupancy of public housing are neighborhood environment (Miller et al., 1980; Huang, 2015), public facilities, and housing characteristics (Heinrich et al., 2007). This study involves price, promotion, and facilities as the main determinants of vertical housing occupancy. Price is a variable referring to the monthly/yearly rent charged by the vertical housing management. The promotion variable refers to the socialization of vertical housing attempted by the local government. The facilities variable measures the sufficiency of facilities provided by the vertical housing management.

Hypotheses in this paper are:

(1) Socioeconomic and perception have positive and significant effects on societies' decisions over whether to choose a vertical house to live in.

(2) Price, promotion, and facilities factors significantly affect the occupancy level of the currently available vertical houses.

(3) Occupancy level has a positive and significant effect on the societies' decision to choose a vertical house to live in.

3. Research Method

The population of this study is the low-income group of societies in Magelang City, which is the target recipient of the housing aid. According to the Statistics Magelang City (BPS Kota Magelang), the city's total population in 2019 was 122,111 persons, about 7.46 percent of which fell below the regional poverty line.[9] This data makes the total population of this study 9,109 persons.

This research uses 100 samples obtained using the *random sampling* method. The instrument used to acquire the primary data from respondents is questionnaires. This sample is the minimum requirement

[9] According to the Statistics Magelang city, the city's regional poverty line in 2019 was Rp 481,282 (roughly US$ 34.77, using the July 2019 exchange rate of US$1=Rp14,000) per month.

of SEM analysis suggested by Boomsma (1982) in Wolf et al. (2013).[10] This sample also satisfies the sampling requirement suggested by Bentler and Chou (1987), who claim that a sample of 5- or 10-times estimated parameter would be sufficient.

We conducted a Perception on Vertical Housing survey, using questionnaires as an instrument to acquire the primary data from respondents. The questionnaire was used as a guide in structured interviews with the respondents. The methods used in this study are quantitative and qualitative. The data collected through the questionnaire is analyzed using the *Structural Equation Model (SEM)*. The structural model is illustrated in Figure 1.

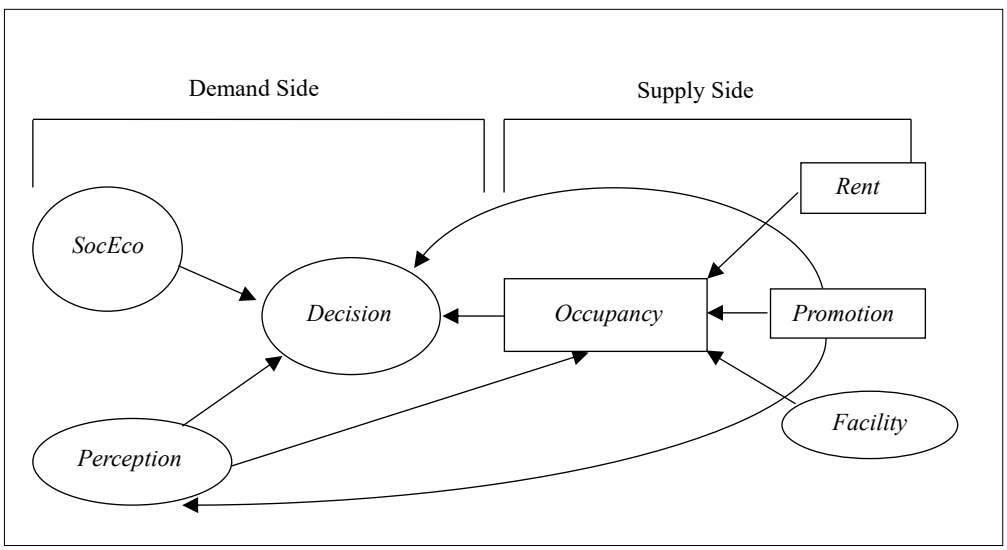

Figure 1. The Structural Model

Source: Authors' Illustration

The model is constructed based mainly on the existing literature with some adjustments as necessary. The use of socioeconomic variables as one of the determinants of demand for housing has been implemented by, among others, Oktay et al. (2014). Public perception has also been pointed out as an essential aspect of demand for public housing, as discussed by, e.g., De Decker and Pannecoucke (2004). On the supply side, the use of rent price, public facilities, and housing characteristics as the main factors influencing the occupancy of public housing have previously been conducted by, e.g., Miller et al. (1980), Huang (2015), and Heinrich et al. (2007). The promotion variable, which affects perception, decision, and occupancy variables altogether, is a new variable explicitly employed for the purpose of this paper to highlight the importance of providing society with appropriate information through socialization.

[10] Wolf et al. (2013) more specifically suggest that the range of sample size requirement is from 30 to 460 cases.

The *Structural Equation Model* is hence given by:

$$Decision = \alpha_0 + \alpha_1 SocEco + \alpha_2 Perception + \alpha_3 Occupancy + \alpha_4 Promotion + \varepsilon_1 \quad (1)$$

$$Occupancy = \beta_0 + \beta_1 Rent + \beta_2 Promotion + \beta_3 Facility + \beta_4 Perception + \varepsilon_2 \quad (2)$$

$$Perception = \gamma_0 + \gamma_1 Promotion + \varepsilon_3 \quad (3)$$

Recalling the definition of the variables in the previous section, $Decision$ refers to the respondent's decision on the offer to live in a vertical house[11]; $SocEco$ is a variable for respondent's socioeconomic status; $Perception$ denotes respondent's perception of living in a vertical housing; $Promotion$ is the efforts attempted by the city housing department in promoting the vertical houses; $Occupancy$is the occupancy level of the available vertical housing when the survey was conducted; $Rent$ is the prevailing rent price for vertical housing set by the city government; and $Facility$ is a measure of the sufficiency of facilities available in the currently available vertical houses. Parameters α_0, β_0, and γ_0 are constants; α_i, β_i, and γ_i are coefficients of the corresponding variables; and ε_1,ε_2, and ε_3 are the error terms.

4. Research Method

4.1 Description of Magelang City and Respondents

Magelang City is located in the Province of Central Java, Indonesia. The total population in 2019 was 122,111 persons, with a population growth of around 0.20 percent based on the BPS data. The total area of Magelang City is 18,120 km^2, and the region is divided into three districts: South Magelang, Central Magelang, and North Magelang.

Compared to other regions in the Province of Central Java, Magelang City is the third most populous region, according to the Welfare Indicator of Magelang City in 2016, with a population density of 5,515 per km^2. The most populous district in Magelang city is Central Magelang, followed by South Magelang and North Magelang. Table 1 describes changes in the population of Magelang City in the 2013-2018 periods.

Table 1. The population of Magelang City in 2013-2018

Year	Total Population of Magelang City	Population per District		
		South Magelang	Central Magelang	North Magelang
2013	120,158	40,324	43,740	36,094
2014	120,615	40,477	43,903	36,235
2015	120,952	40,591	44,022	36,339
2016	121,293	40,704	44,144	36,445
2017	121, 673	40,831	44,279	36,563
2018	121, 992	40,939	44,390	36,663

Source: Statistics Magelang City (2019)

[11]Technically, it is a hypothetical question on their decision (binary choice of disagreeing or agreeing) to live in a vertical house if they were given the offer.

Of the 100 respondents involved in the Perception on Vertical Housing survey, 66 percent are in the low-income category with a family income of lower than Rp 2,000,000 per month; and about 76 percent have a monthly family expenditure of less than Rp 2,000,000. On average, each respondent has 3.14 dependants. Most of them, namely 36 percent, live in relatives' or inherited houses, 22 percent occupy rented houses, and only 31 percent have self-owned houses. About 61 percent of them have been living in their current houses for seven years or more, and nearly 75 percent of them have family-owned wells as the source of drinking water.

Regarding the perception of vertical housing, 27 percent of the respondents do not have sufficient information about the currently available vertical houses in the city. While 34 percent of the respondents agree that the current rent prices of the vertical houses are moderate; to 46 percent of them, the prices are relatively low. Moreover, 84 percent of the respondents perceive the comfort level of the vertical houses to be between comfortable and moderate. Despite the relatively easy administration process for housing registration, as most respondents perceive, 89 percent of them agree that the implementation of vertical housing has not yet met the expected goal to help the poor obtain decent housing.

4.2 Analysis

The SEM analysis comprises two parts: the measurement model and the structural model. In the measurement part, we conduct factor analysis on the latent factors measured by observed variables. This part aims to obtain the best model to proceed to the structural part. In the structural part, we run a full regression on the model from the measurement part.

Measurement Model

This study employs a structural model and examines model fit indices, which are absolute fit measures. Absolute fit measures directly measure how well the research model fits the sample data. Indices being considered in absolute fit measures include Goodness of Fit Index (GFI), (Standardized) Root Mean Square Residual (SRMR), and Root Mean Square Error of Approximation (RMSEA). Hu and Bentler (1999) propose criteria for an indication of good model-data fit using these indicators: the value of GFI is greater than 0 and smaller than one, (Standardized) Root Mean Square Residual (SRMR) is smaller than 0.08, and Root Mean Square Error of Approximation (RMSEA) is smaller than 0.10.

The measurement part starts with the GOF test and proceeds with the CFA. Using the Confirmatory Factor Analysis (CFA), we examine four constructs as latent variables: socioeconomic, perception, promotion, and decision. The result of the GOF test for each latent variable is shown in Table 2.

Table 2. The Goodness of Fit Measurement of Latent Variables

GOF indicator	Recommended level of GOF	Estimated Value of GOF			
		Socio-Economic	Perception	Promotion	Decision
SRMR	<0.08 indicates the most acceptable model	0.014	0.157	0.159	0.00
GFI	0 (Not fit) to 1 (perfectly fit)	0.653	0.647	0.665	1.00
RMSEA	<0.10 indicates the most acceptable model	0.238	0.297	0.383	0.00

Source: Analysis of the data from the Perception on Vertical Housing survey conducted by the authors

The socioeconomic variable is a latent variable referring to the socioeconomic status of respondents as measured by seven observables: household's monthly income and expenditure, number of dependants, house ownership, duration of occupancy, electricity usage, and drinking-water source. As shown in Table 2, the socioeconomic variable can be considered proper based on the criteria of the GFI and SRMR.

The perception variable is a latent variable measured by six observables: acquired information about vertical housing; the number of relative(s) living in and in need of a vertical house; opinions on development plans and rent (price) of vertical housing; and their involvement in the development process; comfort level; easiness of the administration process, and vertical-house targeting. As shown in Table 2, the GOF of the perception variable is considered fit, which is shown by the reasonably high GFI value, i.e., 0.647.

The promotion variable is a latent variable measured by five observables: socialization about the upcoming vertical house on the plan, societies' involvement in the vertical house development, government socialization, frequency of socialization, and type of promotion. The promotion variable is considered fit based on its GFI value.

The following three observables measure the decision variable: willingness to live in a vertical house, obey the housing rule and engage in housing development. As shown in Table 2, the Goodness of Fit measurement shows a perfect fit model.

The measurement model then continues with the CFA. The results for the measurement components of our model using the CFA are provided in the Appendix. The results comprise the standardized parameter estimates, which represent the loading factors between the latent constructs and the observed indicators; the *R-square* values, which indicate how much the factors explain the variance of the dependent variable; and the *p-value*, which indicates how significant the observed variables explain the latent variable. A higher value of standardized estimate in the measurement model suggests a better indication of the observed variable in estimating the corresponding latent variable.

The results of the CFA are summarized as follows. Since the income variable has the highest standardized estimate, as confirmed by the significant *p-value*, household income is the best predictor for the latent socioeconomic variable among the observables. Meanwhile, the electricity usage variable appears to be the least significant in explaining the latent socioeconomic variable among the observables. CFA of the perception shows that the information variable appears to have the most significant *p-value* and the vertical-house targeting variable is the least. Based on the CFA on the promotion variable, all the *p-values* are significant. Hence, we can conclude that all the provided observables for the promotion variable can estimate the latent variable reasonably well. Finally, the result of the CFA on the decision variable indicates that all the observed variables have significant *p-values*.

Structural Equation Model

Since the GOF test and the CFA indicate that the model is proper, we use all the proposed variables in the measurement part. Then, we have two exogenous latent variables (Socio-economic and Promotion),

two endogenous latent variables (Decision and Perception), two observed exogenous variables (Price and Facilities), and one observed endogenous variable (Occupancy). In this part, we run a full regression on all the models. As shown by the complete regression estimates in Table 3, according to the RMSEA measure, the GOF of the full model is at a good fit level.

Table 3. The Goodness of Fit Measurement of the Full Model

GOF indicator	Recommended level of GOF	Estimated Value of GOF
SRMR	<0.08 indicates the most acceptable model	0.179
GFI	0 (Not fit) to 1 (perfectly fit)	0.379
RMSEA	<0.10 indicates the most acceptable model	0.01

Source: Analysis of the data from the Perception on Vertical Housing survey conducted by the authors

Based on the GOF indicator of the full model, we can conclude that the model specification is acceptable, as indicated by the RMSEA value.

We turn to the SEM regression model based on the specification in equations (1) - (3). The result of the SEM regression estimation of the full model is shown in Table 4.

Table 4. Regression Estimation of the Full Model

Outcome Variable	Explanatory Variable	Estimation Value	P-value
Decision	Socio-Economic	0.175	0.288
Decision	Perception	1.943**	0.020
Decision	Occupancy	-0.265	0.168
Decision	Promotion	0.650	0.117
Occupancy	Perception	-0.789	0.449
Occupancy	Price	-0.002	0.915
Occupancy	Promotion	0.005	0.887
Occupancy	Facility	0.657***	0.000
Perception	Promotion	0.744***	0.008

Notes: Dependent variable on the demand side is Decision, on the supply side, Occupation. Perception is affected by the latent explanatory variable Promotion. *p < 0.1; **p < 0.05; ***p < 0. 01.

Source: Estimation Output of the SEM Analysis on the Full Model Conducted by the Authors

As shown by the estimation result in the table above, on the demand side, the perception variable has a positive and significant effect on societies' decisions over whether to choose a vertical house to live in. In fact, among the explanatory variables, perception is the only variable that significantly affects the societies' decision in choosing a vertical house. These perceptions were mainly formed through the information they acquired about vertical housing, their opinions on development plans and rent (price) of vertical houses, and their involvement in the development process. When societies have a positive perception of vertical houses, they are likely to choose to accept the offer to live in a vertical house. Hence, providing society with appropriate information and involving them in the development process of vertical houses could be among the appropriate solutions to overcome the problem of vertical house over-supply.

Interestingly, their decisions are not affected by their socioeconomic status or occupancy and promotion, as proven by the insignificant effects of the associated variables on decisions. Thus, households' decisions in choosing vertical houses were not driven by their socioeconomic conditions,

which were measured mainly by how much they earn and spend monthly. Meanwhile, occupancy level also has an insignificant effect on the societies' decision to choose a vertical house to live in. It implies that the societies' willingness to live in a vertical house is not affected by how many persons live in the available vertical house. Similarly, the attempted promotions by the local government do not seem to affect the decision of the society. The latter might also suggest that the number of attempted promotions is yet insufficient to attract potential tenants or that the promotions do not yet cover the necessary information for society.

On the supply side, based on the estimation result, the facility significantly affects the occupancy level of the available vertical houses. The positive coefficient of the facility variable indicates that the more complete a vertical house's facilities are, the more likely people will choose to accept the offer of living in the vertical house.[12] Conversely, rent prices, perception, and promotion attempted by the local government do not affect the occupancy level of the currently available vertical houses.

Finally, regressing the perception on the promotion variables results in a positive and significant coefficient. It implies that the promotions attempted by the local government significantly improve the societies' perception of vertical housing. This result agrees with the previous claim associated with perception on the demand side that the government should provide sufficient information related to vertical houses. The government may then use promotions as an instrument to alter the societies' perception of vertical housing and to encourage their engagement in the development process of vertical houses.

The results are summarized as follows. From the demand side, the societies' decision in choosing a vertical house is affected by their perception of vertical housing. Meanwhile, from the supply side, the occupancy level of a vertical house is affected by the provided facilities. These two variables explain the gap between demand and supply of vertical housing in Magelang city. The government has conducted many efforts to optimize the use of vertical houses, including setting reasonable rent prices, providing facilities, and doing promotions. However, the societies' decision in choosing whether to live in a vertical house is mainly driven by their perception. Hence, the low demand for vertical housing might have been caused by the societies' misperception of vertical housing. As a policy implication, the significant and positive effect of promotion on perception suggests that promotion could be a solution to correct the societies' perception of vertical housing. Promotions can be done by providing society with sufficient necessary information related to vertical housing and inviting them to engage in the development process of vertical houses.

Detached from other irrelevant parties, this study is conducted for research purposes only. The recorded responses obtained through the questionnaires could inevitably be affected by respondents' psychological conditions. In its subjectivity, the qualitatively obtained information may reveal a truthful

[12]It is also proven by the information obtained from the management of the vertical housing that the one with better facilities has more tenants than the others.

public perception of public housing in the city and hence, serve as a reference for government agencies when making related housing policies.

5. Concluding Remarks

Through an SEM analysis of the gap between demand and supply of vertical housing in Magelang City, Indonesia, we find that perception plays a vital role on the demand side and facility on the supply side. On the demand side, perception significantly affects the societies' decision in choosing whether to live in a vertical house. From the supply side, the availability of facilities determines the occupancy level of a vertical house. Thus, we can conclude that the low demand for vertical housing, as shown by the low occupancy level of the currently available vertical houses, might be caused by a misperception of the societies on vertical housing. Despite the attempts made by the government in providing decent houses for its low-income societies, the target groups are still reluctant to live in a vertical house for what they perceive it to be. The positive and significant effect of promotion on perception suggests that promotion could be a solution to correct the societies' perceptions. From the analysis, we can imply that socialization and promotion are among the essential things the government should do to successfully implement vertical housing as a solution to the urban housing problem.

These results are expected to shed light on the vertical housing problem in developing countries, especially Indonesia. It is important to know whether vertical housing does solve housing problems for low-income societies. For the regional government of Magelang City, the results will be a reference in deciding whether they should continue the ongoing plans to build new vertical houses and suggests necessary attempts to utilize the vertical houses optimally. The finding might also be relevant to regional governments of other developing countries whose city characteristics (e.g., population density, economic growth, and, most importantly, housing problems) are comparable to those of Magelang City.

References

Anacker, K. B., 2019, "Introduction: Housing Affordability and Affordable Housing", *International Journal of Housing Policy*, 19 (1): 1-16.

Arku, G., 2006, "The Housing and Economic Development Debate Revisited: Economic Significance of Housing in Developing Countries", *Journal of Housing and the Built Environment*, 21: 377-395.

Bentler, P. M., and Chou, C. P., 1987, "Practical Issues in Structural Modeling", *Sociological methods & research*, 16(1): 78-117.

Boomsma, A., 1985, "Non-convergence, Improper Solutions, and Starting Values in LISREL Maximum Likelihood Estimation", *Psychometrika*, 50(2): 229-242.

De Decker, P., and Pannecoucke, I., 2004, "The Creation of the Incapable Social Tenant in Flanders,

Belgium. An Appraisal", *Journal of Housing and the Built Environment*, 19: 293-309.

Estiri, H., 2015, "Household Energy Consumption and Housing Choice in the U.S. Residential Sector", *Housing Policy Debate*, 26(1): 231-250.

Goody, J., Chandler, R., Clancy, J., Dixon, D., and Wooding, G., 2010, "Building Type Basics for Housing", Second Edition, Wiley: John Wiley and Sons.

Hammam, S., 2013, *Housing Matters*, USA: The World Bank.

Heinrich, K. M., Lee, R. E., Suminski, R. R., Regan, G. R., Reese-Smith, J. Y., Howard, H. H., and Ahluwalia, J. S., 2007. "Associations between the Built Environment and Physical Activity in Public Housing Residents", *International Journal of Behavioural Nutrition and Physical Activity*, 4(1): 56.

Hodkinson, S., Watt, P., and Mooney, G., 2013, "Neoliberal Housing Policy–Time for a Critical Re-Appraisal In", *Critical Social Policy*, 30(1): 3-16.

Houard, N., 2011, "The French Homelessness Strategy: Reforming Temporary Accommodation, and Access to Housing to Deliver 'Housing First': Continuum or Clean Break?", *European Journal of Homelessness*, 5(2): 83-98.

Hu, L. T., and Bentler, P. M., 1999, "Cut off Criteria for Fit Indexes in Covariance Structure Analysis: Conventional Criteria versus New Alternatives", *Structural Equation Modeling: A Multidisciplinary Journal*, 6(1): 1-55.

Huang, Z., and Du, X., 2015, "Assessment and Determinants of Residential Satisfaction with Public Housing in Hangzhou, China", *Habitat International*, 47: 218-230.

Hui, E. C. M., and Zheng, X., 2010, "Measuring Customer Satisfaction of FM Service in Housing Sector", *Facilities*, 28(5): 306-320.

Joshi, S., and Khan, M. S., 2010, "Aided Self-help: The Million Houses Programme—Revisiting the Issues", *Habitat International*, 34: 306-314.

Kohl, S., 2015, "The Power of Institutional Legacies: How Nineteenth-Century Housing Associations Shaped Twentieth-Century Housing Regime: Differences between Germany and The United States", *European Journal of Sociology*, 56(2): 271-306.

Lee, J., and Ngai-ming, Y., 2006, "Public Housing and Family Life in East Asia: Housing History and Social Change in Hong Kong, 1953-1990", *Journal of Family History*, 31(1): 66-82.

Li, V. J., 2016, "Housing Policies in Hong Kong, China and the People's Republic of China", *Governance and public sector management*, 566: 1-32.

Lundqvist, L. J., 1992, "Dislodging the Welfare State? Housing and Privatization in Four Europeans Nations", Delft: Delft University Press.

Miller, F. D., Tsemberis, S., Malia, G. P., and Grega, D., 1980, "Neighborhood Satisfaction among Urban Dwellers", *Journal of Social Issues*, 36(3): 101-117.

Oktay, E., Karaaslan, A., Alkan, Ö., and Çelik, A. K., 2014, "Determinants of housing demand in the Erzurum province, Turkey", *International Journal of Housing Markets and analysis*, 7(4): 586-602.

Pettinger, T., 2019, “Factors Affecting Supply and Demand of Housing”, Economics Help, https://www.economicshelp.org/blog/15390/housing/factors-affecting-supply-and-demand-of-housing/, (April 11, 2020).

Phang, S. Y., 2013, *Do Singaporeans Spend too Much on Housing?*, Singapore: Singapore Management University.

Qian, X., Chen, Y., and Cheung, E. S. L., 2019, “Changes and Trend of Public Housing Policy in Netherlands, Hong Kong, and Mainland China”, Conference Paper in the 2019 International Conference on Pedagogy, Communication and Sociology (ICPCS 2019), Atlantis Press.

Rhodes, M. L., and Mullins, D., 2009, “Market Concepts, Coordination Mechanisms and New Actors in Social Housing”, *European Journal of Housing Policy*, 9(2): 107-119.

Sim, L. L., Yu, S. M., and Han, S. S., 2003, “Public Housing and Ethnic Integration in Singapore”, *Habitat International*, 27: 293-307.

Statistics Indonesia (Badan Pusat Statistik-BPS Indonesia), 2015, Social and Population – Housing, https://www.bps.go.id, (July 3, 2019).

Statistics Magelang City (BPS Kota Magelang), 2019, Official Statistics Publication, https://magelangkota.bps.go.id, (July 1, 2019).

The Ministry of Public Works and Housing of Republic of Indonesia (PUPR), 2011, The Law of Republic of Indonesia No. 20, 2011 about Vertical Housing, https://pug-pupr.pu.go.id/_uploads/PP/UU.%20No.%2020%20Th.%202011.pdf, (June 14, 2019).

Towers, G., 2000, “Shelter is Not Enough: Transforming Multi-storey Housing”, Policy Press: Bristol University Press.

Whitehead, C. M. E., and Scanlon, K., 2007, “Social Housing in Europe”, In: Whitehead, Christine M. E., and Scanlon, Kathleen, (eds.) Social Housing in Europe. LSE London, London School of Economics and Political Science, London, 8-33.

Wolf, E. J., Harrington, K. M., Clark, S. L., and Miller, M. W., 2013, “Sample Size Requirements for Structural Equation Models: An Evaluation of Power, Bias, and Solution Propriety”, *Educational and Psychological Measurement*, 73(6): 913-934.

Woo, A., Cho, G-H., Kim. J., 2019, “Would You Share Your Home? The Multifaceted Determinants of Preference for Shared Housing among Young Adults”, *Applied Geography*, 103: 12-21.

Yap, K. S., 2015, “The Enabling Strategy and Its Discontent: Low-income Housing Policies and Practices in Asia”, *Habitat International*, 30: 1-7.

Appendix

Table 1A. The Loading Factors of Socio-Economic Variable

Variable	*Stand. Estimate*	*R-square*	*P-Value*
Socio-Economic			
Income	1.000	0.944	0.000
Expenditure	0.726	0.778	0.000
Number of dependant(s)	-0.228	0.052	0.024
House ownership	0.366	0.079	0.003
Duration of occupancy	-0.239	0.052	0.020
Electricity usage	0.035	0.011	0.291
Drinking water source	-0.272	0.052	0.021

Source: Analysis of the data from the Perception on Vertical Housing survey conducted by the authors.

Table 1B. The Loading Factors of Perception Variable

Variable	*Stand. Estimate*	*R square*	*P-Value*
Perception			
Information	0.981	*0.962*	0.000
Relative using vertical housing	*0.*874	*0.764*	0.000
Price	-0.221	*0.049*	0.028
Comfortable	0.280	*0.078*	0.003
Administration process	-0.226	*0.051*	0.023
Vertical house targeting	0.108	*0.012*	0.285

Source: Analysis of the data from the Perception on Vertical Housing survey conducted by the authors.

Table 1C. The Loading Factors of Promotion Variable

Variable	*Stand. Estimate*	*R square*	*P-Value*
	Promotion		
Government Planning	*0.974*	0.949	*0.000*
Involve	*0.880*	0.774	*0.000*
Government socialization	*-0.225*	0.051	*0.025*
Frequency of socialization	*0.282*	0.079	*0.003*
Type of Promotion	*-0.229*	0.053	*0.020*

Source: Analysis of the data from the Perception on Vertical Housing survey conducted by the authors.

Table 1D. The Loading Factors of Decision Variable

Variable	*Stand. Estimate*	*R square*	*P-Value*
	Decision		
Needs	*0.904*	*0.818*	*0.000*
Respond	*0.949*	*0.900*	*0.000*
Willingness	*-0.233*	*0.054*	*0.018*

Source: Analysis of the data from the Perception on Vertical Housing survey conducted by the authors.