Government Regulation Sub-Factors and Housing Supply: A Conceptual Framework

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Abstract: Government regulation is one of the additional factors when examining the influence of land regulations by local authorities on the housing supply. Specifically, this factor is taken into consideration to investigate the effect of city-specific factors on housing supply elasticities. Some government regulation sub-factors usually proxied by index value obtained from the Wharton Residential Land Use Regulation Index (WRLURI). However, the index value is limited to a specific year and not distributed on short term or long-term basis due to data unavailability. This paper reviews the effect of government regulation sub-factors examined by the previous studies to develop a conceptual framework using time series data when the data is available. The findings of this analysis revealed that new studies should explore times series data for sub-factors such as number of restrictions, number of governing bodies, duration for subdivision approval, and the number of growth management policies.

Keywords: Government, regulation, housing, supply

1. Introduction

Malaysia is among ASEAN countries that have had the largest change in house prices (CEIC, 2018). House prices in Malaysia rose high since 2009 and recorded the highest record in 2013 (Chee Yin et al., 2017). The median house price in Kuala Lumpur city in 2016 was at RM620,000 which is far above the estimated maximum affordable house price of RM454,000 based on the Housing Cost Burden (HCB) approach (Bank Negara Malaysia, 2018). This situation shows that the actual house prices of major cities in Malaysia were beyond the affordability of households. A large increase in house prices has caused relative inaccessibility to housing among middle-income earners (Abd Aziz et al., 2009). It was against the aim of the United Nation to make cities and human settlements inclusive, safe, resilient, and sustainable, as stated in the Sustainable Development Goals (SDG) 11 (Asroun et al., 2020).

House price dynamics or changes in house price during an economic boom and bust could affect the household and the economy at large (Granziera & Kozicki, 2015). The significant changes in house prices against housing supply changes will contribute to an inelastic supply condition. Otherwise, if changes in house prices are lower than housing supply changes, the city or location could have an elastic housing supply.

Many factors and sub-factors could influence the housing supply condition. Previous empirical studies mostly followed the main theoretical framework established by DiPasquale & Wheaton (1992), who argue that the model determining the level of housing supply should include housing price level, construction costs, and the interest rate. Specifically, Government regulation or land regulation is an additional factor to the model when the study is purposely to examine the effect of city-specific factors on housing supply. In theory, government regulation can reduce the motivation of firms to start housing construction. There is a strong correlation of land use regulation with higher house prices and lesser housing construction based on the results of many past studies. However, similar studies show that government regulation could increase the housing supply.

The price elasticity of housing supply in Malaysia was inelastic because the country has a more restrictive regulatory environment (Mayo & Malpezzi, 1997; Mayo & Sheppard, 1996). These studies have concluded that Malaysia practices strict regulation on housing development based on their general view of the regulatory practice of the country without justifying it with any government regulation dataset. Determining the significance of government regulation, in general, is aimless when there are many forms of government regulation practised by the local authorities. Although the regulation involves the government controls on housing development at the local level but it is significant to identify the effect of a specific regulation on housing supply. This paper reviews the influence of several government regulation sub-factors used in previous studies and other sub-factors that remain understudied. In the past, some sub-factors were index values established based on the Wharton Residential Land Use Regulation Index (WRLURI) when periodic data was unavailable. Thus, this paper aims to develop a conceptual framework on the influence of government regulation sub-factors on housing supply by using time series data when the data is made available.

2. Effect of Government Regulation on Housing Supply

Previous studies use terms either government regulation or land use regulation to refer to the rules and regulations imposed by local authorities in the planning process. By theoretical considerations, the government rules and regulations can reduce the motivation of firms to start housing construction. Regulatory practices restricting new housing supply include green belts or urban growth boundaries, height and lot restrictions, development moratoria and zoning restrictions, and historical preservation rules (Kim et al., 2012). Data on government regulation sub-factors, including the number of regulation policies, the number of governing bodies, duration for subdivision approval, and the number of growth management policies by a local authority or a development fee, were used to create a summary measure of the stringency of the local regulatory environment in each community named as the Wharton Residential Land Use Regulation Index (WRLURI) (Gyourko et al., 2008).

As shown in Table 1, previous empirical works show mixed results on the effects of government regulation on housing supply. This might be due to different regulatory practices between countries. Studies by Hwang & Quigley (2006), Ihlanfeldt & Mayock (2014), Quigley & Raphael (2005), Saks (2008), Wang et al. (2012) suggest that there is a strong correlation between land use regulation with higher house prices and lesser housing construction. This is indicated by the negative coefficient of government regulation factors. However, government regulation also can reduce both housing supply and house prices (Green et al., 2005), increase the supply and reduce the price (Oikarinen et al., 2015), and increase both supply and price (Saiz, 2010).

Table 1 - Significance effect of government regulation on housing supply of recent empirical studies

Variables	Government regulation coefficient	Price coefficient	Country & Period	Source
Zoning	0.196* (std deviation 0.095)	-0.805 (std deviation 0.574)	Finland 1987 – 2011	Oikarinen, Peltola, & Valtonen (2015)
Planning expenditures	-1.52e-07*** (std error 5.61e-08)	2.07 (std deviation 2.02)	United States 1990 – 2010	Ihlanfeldt &Mayock (2014)
Minimum lot size	-0.876*** (std error 0.321)			
Green ratio	- 30.78* (t-stats 1.90)	0.30 (t-stats 0.07)	China 1998 – 2009	Wang, Chan, & Xu (2012)
Government regulation	0.268*** (std error 0.068)	1.54	United States 1970 – 2000	Saiz (2010)
Government regulation	-0.027* (std error 0.016)	0.120 (std error 0.099)	United States 1980 – 2002	Saks (2008)

Government regulation	-0.015 (t-ratio 1.63)	0.094 (t-ratio 13.57)	United States 1987 – 1999	Hwang & Quigley (2006)
Government regulation	-0.08 (std error 0.04)	-0.904 (std error 0.5)	United States 1979 – 1996	(Green et al., 2005)
Number of restrictions	-0.0031 (std error 0.0017)	0.106 (std error 0.003)	United States 1990 – 2000	(J. M. Quigley & Raphael, 2005)
Duration for subdivision approval	-0.127 (std error 0.017)			
Number of growth management policies by the local authority	-0.062 (std error 0.031)	3.42 (std error 0.48)	United States 1985 – 1996	Mayer & Somerville, 2000)
Development fees	-0.131 (std error 0.094)	3.42 (std error 0.31)		

In some studies, the government regulation factor is proxied by sub-factors. For instance, Ihlanfeldt & Mayock (2014) used planning expenditures and minimum lot size sub-factors to represent government regulation to examine the housing supply in 63 Florida counties in the US from 1990 to 2010. Both sub-factors are negative and statistically significant based on the regression results. Other sub-factor used is a green ratio that is defined as the average ratio of greenbelt to urban built-up areas. When the green ratio increases, lesser land will be available for housing development, and hence, housing supply drops (Wang et al., 2012). The number of restrictions is negatively correlated with growth in the aggregate housing stock and single-family units, with the results increasing marginally when the change in the relevant price index is added to the specification (Quigley & Raphael, 2005). In a study on 44 metro areas in the US between 1985 and 1996 by (Mayer & Somerville, 2000), the development fees have little effect on new construction. However, the duration for subdivision approval and the number of growth management policies significantly reducing the volume of new supply.

3. Research Methodology

For the review purpose, related academic papers were identified through a multi-step filtering process with independent validation in each step. The search criteria were based on both initial and expanded by excluding papers with titles that were not related to the topic of study. After the search and filtering process, overlapping and duplicating papers acquired from other sources were manually sorted out. The full text of papers was further checked and validated by manual cross-checking of the text analysis to select only full papers that are relevant to the purpose of this study. At the end of this stage, a total of 23 academic papers are selected consists of 17 journal articles, 4 book chapters, one proceeding paper, and one working paper. Nine of the papers were published between the years 2012 and 2021.

The selected articles contribute to the theoretical framework of the influence of government regulation on housing supply through literature reviews or empirical evidence of the study. At the beginning of the review, the house price dynamics issue is explained at the price elasticity of supply viewpoint when developers can influence the house price and housing supply. Then, the author shows the significant influences of government regulation on housing supply based on a few past studies. The review is continued with the analysis of sub-factors by way of the grouping of sub-factors according to a common definition. At this stage, the authors found that studies on government regulation as sub-factors remained understudied. This help the authors to develop a conceptual framework that shows the influence of few government regulation sub-factors (independent variables) on housing supply (dependent variable).

4. Discussion

4.1 Government Regulation Sub-Factors

As previously mentioned, the results of past studies show the significant effect of a few government regulation sub-factors on housing supply included zoning, planning expenditures, minimum lot size, green ratio, number of restrictions, the duration for subdivision approval, number of growth management policies, and development fees. Similar sub-factors were also available in the other works, namely green belts or urban growth boundaries, height and lot restrictions, development moratoria and zoning restrictions, historical preservation rules, number of regulation policies, and number of governing bodies. Upon comparison between these studies, the sub-factors are grouped into a few sub-factors and their status is determined whether they have been studied empirically or remain understudied (see Table 2).

Table 2 - Status of government regulation sub-factors in past studies

Sub-factor	Source	Examined in empirical studies	Data used for empirical analysis	Method of data analysis
Zoning/development moratoria and zoning restrictions	(Kim et al., 2012; Oikarinen et al., 2015)	Yes	Index value	Structural approach, VECM, Cross-section analysis using OLS
Planning expenditures/ development fees	(Gyourko et al., 2008; Ihlanfeldt & Mayock, 2014; Mayer & Somerville, 2000)	Yes	County's expenditures on comprehensive planning reported annually to the Florida Department of Financial Services (Ihlanfeldt & Mayock, 2014), Index value (Mayer & Somerville, 2000)	Stock adjustment model, OLS (Ihlanfeldt & Mayock, 2014), OLS, GLS, PCSE, IV quasi differ. (Mayer & Somerville, 2000)
Minimum lot size/height and lot restrictions	(Ihlanfeldt & Mayock, 2014; Kim et al., 2012)	Yes	The minimum lot size is equal to the total acreage of undeveloped residential land by Florida Department of Revenue in the 2011 tax roll divided by the total number of housing units allowed under future land use map.	Stock adjustment model, OLS
Green ratio/green belt or urban growth boundaries	(Kim et al., 2012; Wang et al., 2012)	Yes	The average ratio of green belt to urban built-up areas between 1998 and 2009 was extracted from various issues of the China City Statistical Yearbook.	Stock adjustment model
Number of restrictions/ numbers of regulation policies	(Gyourko et al., 2008; J. M. Quigley & Raphael, 2005)	Yes	Growth-control regulation index based on a survey of California land-use officials.	Bivariate regression, OLS
Historical preservation rules	(Kim et al., 2012)	No	N/A	N/A
Number of governing bodies	(Gyourko et al., 2008)	No	N/A	N/A
Duration for subdivision approval	(Gyourko et al., 2008; Mayer & Somerville, 2000; J. Quigley & Rosenthal, 2005)	Yes	Index value	OLS, GLS, PCSE, IV quasi differ.
Number of growth management policies by the local authority	(Gyourko et al., 2008; Mayer & Somerville, 2000; J. Quigley & Rosenthal, 2005)	Yes	Index value	OLS, GLS, PCSE, IV quasi differ.

Note: VECM - Vector error-correction model, OLS – Ordinary least square, GLS – Generalized least square, PCSE – Panel-corrected standard errors, IV quasi differ. – Independent variables quasi differenced

Few sub-factors of different sources are grouped when they are similarly defined. The green ratio is interchangeably referred to as the green belt. The green ratio is part of the urban development policy (Wang et al.,

2012) whereas the green belt is a policy and land use zone designated to retain areas of largely undeveloped land, wildland, or agricultural land located in surrounding urban areas. The main goal of the green belt is to keep the land from urban sprawl and maintain the designated area for forestry, agriculture, and provide a home to wildlife (Ramesh & Nijagunappa, 2014). The average green ratio and its different show the evenness of green space distribution (Li et al., 2011). The duration of subdivision approval is the period from submission of the subdivision application until the issuance of an approval letter from the land office. All applications about land development will be received by the land office and then forwarded to the state authority for approval purposes.

Growth management is defined as government policies, plans, investments, incentives, and regulations to guide type, amount, location, timing, and cost of development to meet a responsible balance between protection of the natural environment and the development to support growth (Randolph, 2004). The number of growth management policies by the local authority is a dynamic of public policies in the local authority's comprehensive plan. The comprehensive plan that includes land-use regulations represents the community's policy for future growth. The plan supports the management of the city or county by providing policies to guide decision-making (Yukubousky, 2017).

From the above table, a few government regulation sub-factors remain understudied, such as historical preservation rules and the number of governing bodies. Historical preservation rule is usually used to protect heritage sites through the preservation of the original building façade, prohibition building demolition, and limit new construction within the area zoned as a heritage site. The standardised number of land preservation and conservation-related initiatives put on the ballot by communities are used to form the local political pressure index (Gyourko et al., 2008).

The number of governing bodies refers to the local authority and other relevant authorities involved in the planning process to ensure the housing development provides a comfortable and safe living environment. The authorities will verify and give comments on the submitted plans and other documents, check the amended plans and documents, issue permits, and verify the progress of the project until a certificate of completion and compliance is issued. The requirements for authorities to review and approve a new project that does not need rezoning such as local planning commission, local councils, managers and commissioners, a county board of commissioners, environmental review board, public health office, and design review board are requested in the survey on residential land use regulation (Gyourko et al., 2008).

## 4.2 Sources of Government Regulation Data

The data related to government regulation used in the past works mostly sourced from WRLURI surveys. Index value in WRLURI is formed by data collected from the surveys sent to municipalities targeted for planning directors or chief administrative officers of respective municipalities. The respondents were required to inform and to give their view on the current land regulatory process, rules of residential land use regulation, and specific characteristics of land use regulation. In the studies by (Ihlanfeldt & Mayock, 2014; Wang et al., 2012), the regulation data is taken from periodicals that provide time-series data. Few variables were used as a proxy for government stringency on land use when the regulation index is not constructed (Wang et al., 2012).

Each index with a low value indicates a less restrictive or more laissez-faire approach in regulating the housing market (Gyourko et al., 2008). In the study by (Gyourko et al., 2008), light-regulated areas are those in the bottom quartile of the distribution of WRLURI values (WRLURI<-0.55), modest regulated are those in the interquartile range (-0.55<WRLURI <0.74); and highly regulated areas are defined as those with WRLURI index values (WRLURI>0.74) in the top quartile. About time series data, (Ihlanfeldt & Mayock, 2014) have used periodicals to measure the stringency of land use regulation. They have adopted the county's expenditures on comprehensive planning to know annual spending for land use planning and enforcement of the regulation, whilst future land use maps were used to determine the minimum lot size for each county.

4.3 Conceptual Framework

Determining the significance of government regulation, in general, is not realistic to mitigate the house price dynamic issue. Although the regulation involves the government controls on housing development at the local level, but it is significant to identify the effect of a specific regulation on housing supply elasticity. The effect of a specific regulation is perhaps significant or not significant to influence housing supply and house price.

Index value had contributed to comprehensive land use regulation data when the periodical data was unavailable. The index value is based on the viewpoint of respondents at a specific time when a survey is implemented. However, the data is limited to a specific year and not distributed on short term or long-term basis. Therefore, it is necessary to conduct new studies to measure the short-term and long-term effects of understudied and ever studied government regulation sub-factors using the time series data in a housing supply model (see Figure 1).
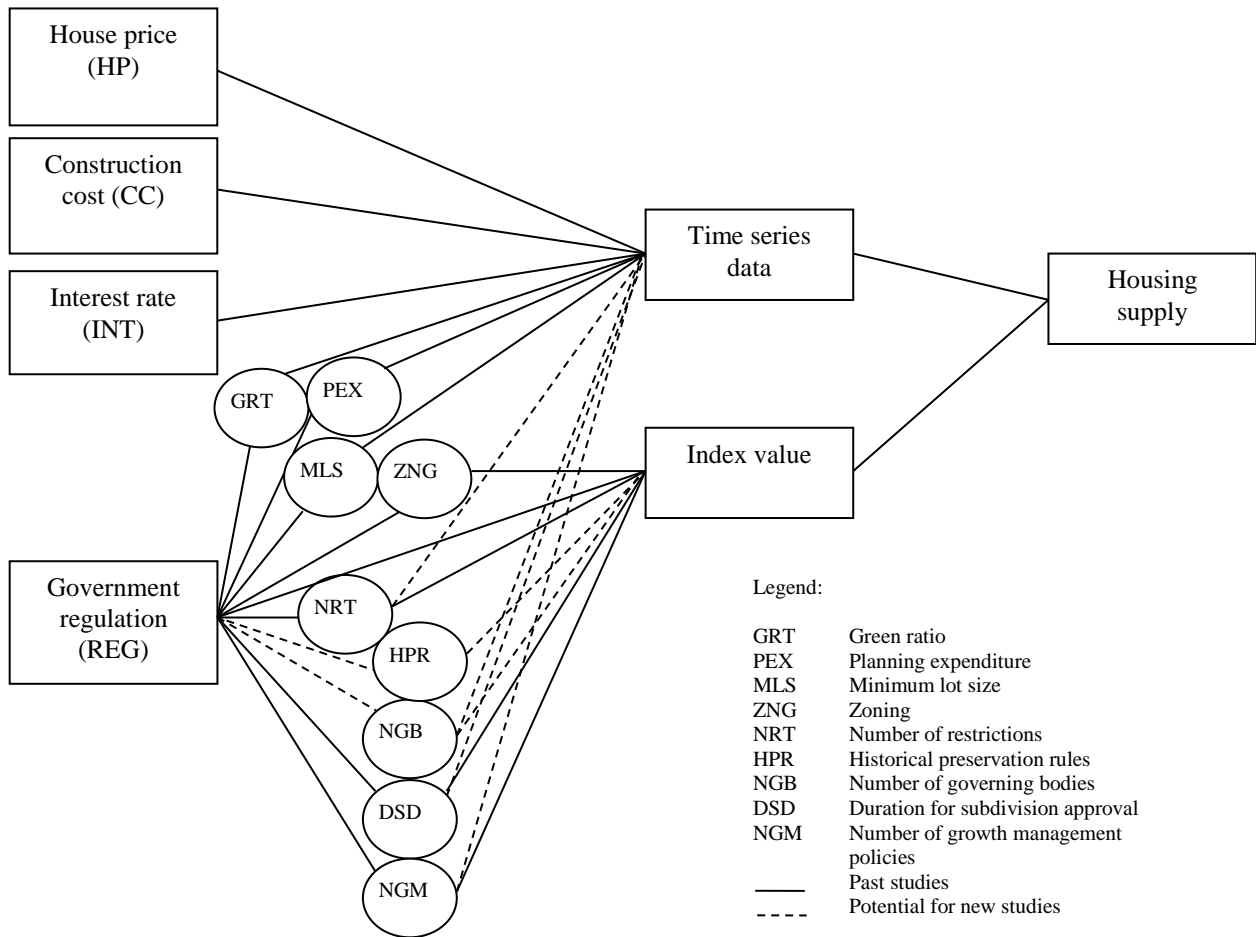
Fig. 1 - Conceptual framework

As shown in Fig. 1, there is a potential to use times series data for the number of restrictions, the number of governing bodies, duration for subdivision approval, and the number of growth management policies sub-factors, although they are part of WRLURI components. It can happen when the World Bank is started to publish annual reports that comprise land use regulation measures between countries.

The government regulation sub-factors will be included in a housing supply model as independent variables with an association of other independent variables like house price, construction cost, and interest rate that influence housing supply (dependent variable). The model should be supported by a multicollinearity test to ensure the absence of high intercorrelations among two or more independent variables in the model.

Panel data modelling will be an appropriate method for the new studies to analyse cross-sectional time-series data. A panel data set has multiple entities, each of which has repeated measurements at different periods that may give individual (group) effect or time effect, or both (Park, 2011). It is vital to prove the effectiveness of a specific regulation on housing supply for different major cities or locations in future studies by using robustness tests.

5. Conclusion

Government regulation is one of the additional factors in the housing supply model when examining the effect of city-specific factors on housing supply elasticity. Thus, it is significant to identify the effect of a specific regulation on housing supply elasticity. Most past studies obtained the regulation data through surveys to establish index value when periodic data was not available. However, the index value is limited to a specific year and not distributed on short term or long-term basis. After a few analyses, this paper revealed a potential for new studies to use times series data to represent the government regulation sub-factors such as the number of restrictions, the number of governing bodies, duration for subdivision approval, and number of growth management policies sub-factors to show the effect of a specific regulation. Panel data modelling will be an appropriate method for the new studies to analyse cross-sectional time-series data.

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