In Search of a Conventional Urban Model for Explaining Factors Determining Residential Property Rentals and Prices in Lae City, Papua New Guinea

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Abstract

This paper reviews the literature on some conventional urban models that mirror existing patterns of residential property rentals and prices in cities, using Lae City in Papua New Guinea as a case study.The main purpose of the study is to identify which of the conventional models mirror the reality on the ground reflecting the decisions of residential tenants and landlords to live where they are in the city. There are serious concerns relating to spiralingresidential property rentals and prices in Lae City that tend to push middle-income and low-income residents to go and live inthe squatter settlements surrounding the city where rents are affordable.Using stratified random sampling technique, arepresentative sample of Lae City residents consisting of 218 landlords and tenants was interviewed in conformity with Covid-19 pandemic restrictions in six (6) different residential districts of the city. These are China Town, Market, Top Town, Cassowary Road, Eriku and Kamkumung, in addition to selected real estate brokersof three popular real estate agencies operating in the city, urban planners working for Lae Municipality and the Department of Lands and Physical Planning (DLPP). The sample represents a mixture of residents in both the formal residential areas and the informal settlements around the city. Survey findings indicate that a plurality of social, economic, cultural and behavioural factors, rather than the overt influence of any conventional urban model of city structure play an overarching role in influencing residential tenants' and landlords' behaviour when searching for residence within the city to the extent that many of them now prefer to live in squatter settlements. As confirmed by three tested hypotheses, the study indicates that social factors like security and safety of lives and property, as well as economic factors like inflation and affordability concerns, are the major determinants of residential choice in the city. Recommendations, including policy implications of the study,are put forward regarding measures that need to be thoughtfully implemented in real time by city stakeholders toimprove standards of city liveability, sustainability, housing affordability and livelihoods around the country.

Keywords: Housing affordability, rentals, prices, conventional urban models, Lae City, PNG

1. Introduction

This paper reviews the literature on some of the conventional theoretical models that mirror residential property rentals and values in urban areas, using Lae City in Papua New Guinea as a case study. There is a curiosity among city researchers and city managers to understand to what extent some common models of city structurecanexplain the factors behind the patterns of residential property rentals and values in cities. This paper, therefore, is an attempt at linking theory and practice by reinforcing the common saying that theory and practice are mutually supportive. In answering this question for our case study, we will be on track to linking the typical city structure with mainstream literature on sustainable urban property markets and urban governance.Figure 1 indicates a map of the study area that provided access

to the primary and secondary data analysed in this paper as part of a recent larger study on Lae City.

Figure 1: The Study Area in Lae City [*Source: Google Map, 2020*]

Figure 1 was extracted from the PNG Geographic Map of Lae in which the selected districts were mapped as different residential zones. These districts consist of Kamkumung, Eriku, Cassowary Road, CBD, China Town and Market, and they were selected according to different groups of people in different environmental settings to define why they like staying in their present locations and how social, economic and cultural factors around them affect and drive their rental housing choices.

It must be noted that the combined study area is a composite of fairly homogenic residential districts because most of the residents are PNG citizens with similar socio-cultural characteristics (e.g. ability to speak Tok Pisin, which is the second Lingua Franca after English Language), even though their economic characteristics range from low income to high income. This may serve as an indication that the anticipated findings from the hypotheses tested in this study may in fact mimic the realities of Lae City's socio-cultural similarities from a Melanesian perspective. It would be strange to see the reverse being the case.

The City of Lae (Figure 1) is in Morobe Province and is Papua New Guinea's second largest City. The city is known as the industrial hub of the country, which caters for many different economic activities. Lae Port is one of the biggest ports that dock many ships transporting cargoes to and from different foreign countries and PNG provinces to Lae City for trading purposes. The city is a gateway to the Highlands Region of Papua New Guinea by road, Momase Region by road and other provinces by airplane. Air transportation is very dominant

in PNG as a result of the country's rugged terrain due to many mountains that make road transport infeasible. Cash crops like cocoa, coffee and other cash crops are transported to Lae City and then exported. Products arriving from abroad are transported through to the main wharf and then distributed for intended purposes.

The total population of Lae back in 2011,according to the National Census, was 150,000 (JICA, 2010) and it is still increasing to date. Housing supply to cater for a growing urban population is still a major problem faced in the City of Lae; however, housing schemes that are springing up in the city are believed to be capable of bringing a good relief to the economy (Lae Chambers of Commerce, 2015).

2. Nature of the Problem, Research Question and Contributions to Knowledge

2.1 Nature of the Problem

Residential property rentals and prices have increased recently in the real estate market, but the increases have turned low-income earners towards the squatter settlements for rescue (Richardson and Doko, 2018). This has generally resulted in the expansion of illegal (squatter) settlements in PNG cities, while squatter settlements in LaeCity itself have increased twice their normal sizes (JICA, 2010). In view of the related problems that have eventuated due to problems of rising house prices, Soano (2020) advised during a recent Morobe Provincial Content Plan Workshop that Morobe Province is now facing a 20% fiscal gap annually despite its capability to hub many industrial activities for the nation.

According to an interview conducted with an official of the *Professional Real Estate Valuers*in September 2020, concerning the observed increases in residential property rentals and prices to see if there is any adverse effect on the current market cycle, it was observed that there is oversupply of residential properties in Lae City; therefore, most property owners are encountering losses. It was also observed that the lower end of the market consisting of informal residential properties has increased in size while the upper end has stifled. Consequently, many landlords have consulted a lot of real estate agents to sell off their property so they can venture into other businesses.

Given the deep anxieties and concerns about the uncertainty pervading the residential property market and its adverse effects on the economy, this research is designed to identify and analyse the social, economic and cultural factors that have shaped the residential property market Lae City within the last ten years. Factors involved in shaping the residential property market are addressed and possible solutions are drawn from the findings, followed by thoughtful recommendations aimed at guiding policy makers in designing appropriate measures for curbing the dilemma. This study is the first known attempt aimed at analysing the structure of residential property market of a Provincial capital that also serves as the industrial hub of Papua New Guinea.

2.2 Research Question and Contributions to Knowledge

The central thesis addressed in this paper is that conventional models of city structure drive and inform residence choice that is contingent upon affordability of residential property rentals and prices. Hence, our research question is as follows: *What conventional model of city structure best explains the rationale behind the patterns of residential property rentals and prices in Lae City?*

The answer to this research question should assist us in framing our response to the bigger picture: How do conventional urban models shape and drive sustainable city structure and urban governance and vice versa, if theory and practice are truly mutually supportive? Do the politicians and urban policy makers glean from or pay attention to urban theories when making their decisions? Is there any correlation between city policies and urban models? In this paper, we attempt to answer theseconceptual and philosophical questions with regards to the central thesis of this paper and our field experience of living and working in the City of Lae for some years. We also hope that this paper will contribute to the wider knowledge of urban forms, real estate markets and urban management for purposes of enriching the discourse on city sustainability and city liveability.

3. Theoretical Underpinnings

At this juncture, we need to review some conventional models of city structure to see if we can get one that best fits the situational context of Lae City, our case study. Some of these conventional models are as follows:

3.1 The concentric zone model

Park, Burgess, and McKenzie (1925) have argued that city structures are made up of several rings radiating from the central business district (CBD) and having different social groups planted in each ring (Figure 2). These rings include the Central Business District, Transition Zone, Working Class Zone, Residential Zone and Commuter Zone (Figure 2). Some key features of the five rings are as follows:

(i) *Central Business District:* This is the sector that comprises mainly commercial activities that cater for such land uses as commercial shopping and office properties, civic and public amenities. Many old and disused properties can be found here. As distance increases away from the CBD towards the periphery, land rentals and values decrease proportionately. Mixed-use developments are commonly found here to enable land developers to trade-off land shortage with high land prices.
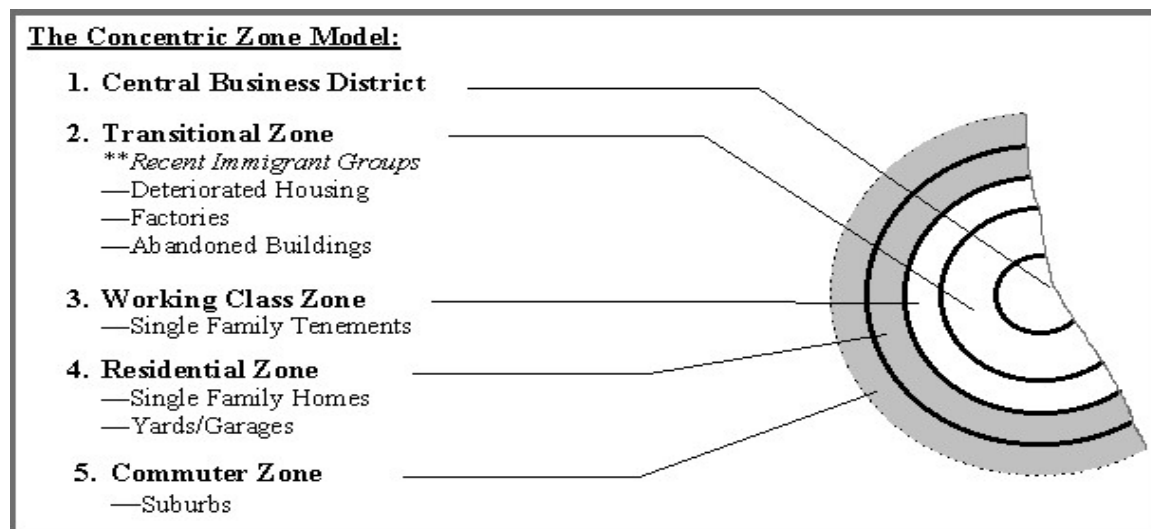

Figure 2: The Concentric Zone Model [*Source: www.crimeandplaceashleypick.weebly.com*]

(ii) *Zone of transition:* This zone comprises low-income housing. It is vulnerable to change due to declining manufacturing and industrial activities as manufacturers seek peripheral city locations to expand their businesses where there is abundance of land (Babarinde, 1995).

(iii) *Working class residential:* This zone is where city dwellers prefer to live so that they can commute to and from their workplaces by walking. Distances to workplaces are fairly in proximity, which means that houses in this area will be relatively more expensive than those in the medium class residential zone.

(iv) *Medium class residential:* This is where single family homes abound. House rentalsand prices are higher here than in the working-class residential zone.

(v) *Commuter zone:* This zone is where some rich people live in expensive and spaciousbungalows where opportunities exist for site expansion, subject to planning permission by the municipality. Mixed land uses are common in this zone.

3.2 The Bid Rent Model

The bid rent model (Alonso, 1964) describes the relationships between land rentals and distances between city locations and the central business district (CBD). Land rentals generally decrease as distance from the CBD increases and vice versa due to decreasing accessibility. The most desirable parts of the city with availability of public amenities and greater accessibility are very expensive compared to those areas that are far removed from the CBD, with lack of adequate public services and amenities. For example, Eriku is a suburb of Lae City in its own right. Houses within this area are charged highly because they are very desirable and are located very close to shops and other public amenities. Conversely, locations like 2 Mile and houses within that location are charged at lower rents because those places are located away from the City's CBD but enjoy limited access to public services that some property owners are willing, ready and able to provide for themselves at their own expense, such as through private electricity generators and water boreholes.
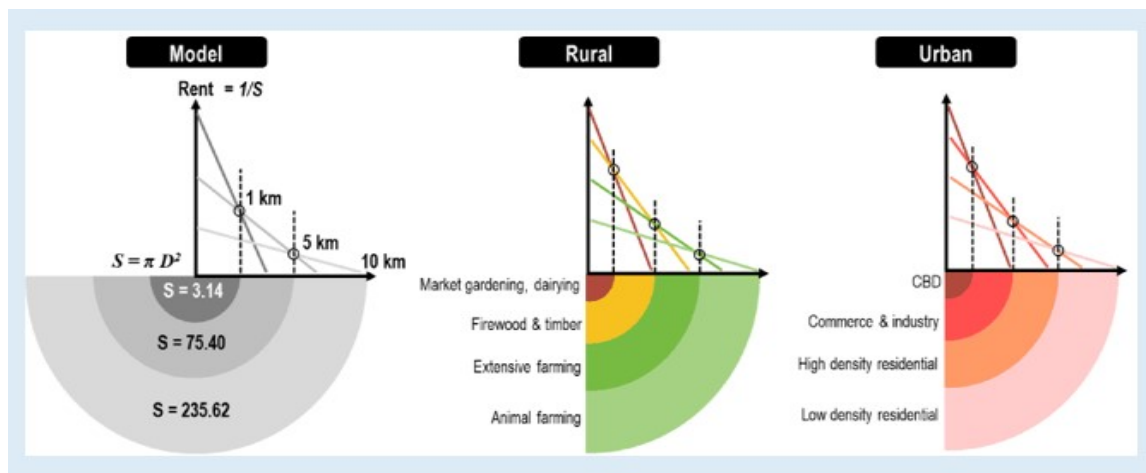

Figure 3: Land Rent Theory and Rent Curve [*Source: Adapted from Paszto (2020)*]

Figure 3 (model on the left-hand side) describes clearly the relationship between distance (horizontal axis) and property rental (vertical axis). The graph in the middle describes the relationship between distance and land rental in a typical rural setting. The graph on the right-hand side describes the relationship between the price and distance in a typical urban setting. All combined, these graphs describe the structure of rentals against distance. Property value

or price is a product of net rent and a multiplier derived from an appropriate yield that is applicable to the type of property being assessed or valued by the valuer (Enever and Isaac, 2002; Millington, 2013).

3.3. The Neo-Classical Model

Neo-classical model (Figure 4) as laid out by Smith (1723-1790) and Ricardo (1772-1823) is a behavioural theory, which describes the total marginalised output as a result of rational decision making. An integral part of decision-making is a good assessment of anything one prefers to purchase, making comparison with other goods or services and choosing the one that offers the best return. When consumers or buyers make good decisions, maximum marginalised output is produced that brings high level of satisfaction. Individuals involved in a decision can make final choices depending on how they want to ensure that they enjoy the output of the best choice they made. Figure 4 illustrates this behavioural process. The same process applies to market transactions between buyers and sellers of residential property.
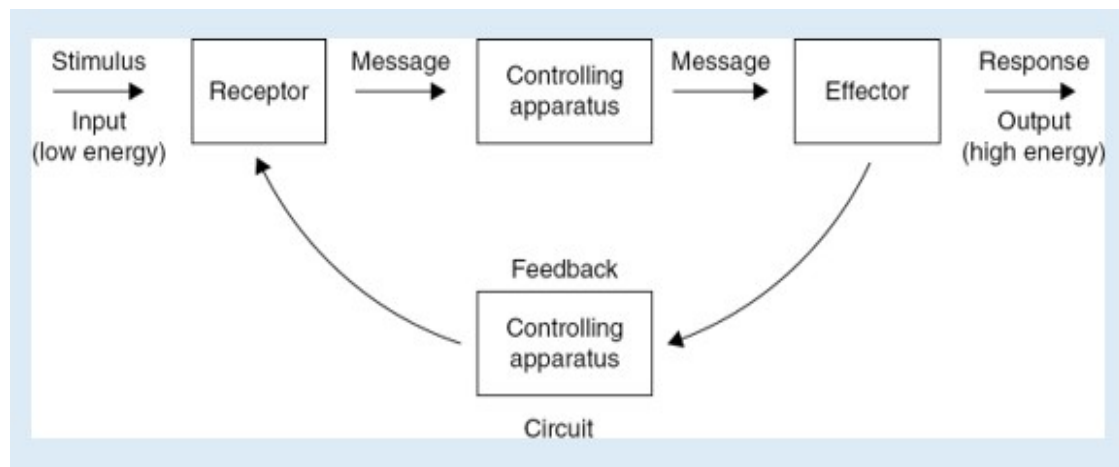

Figure 4: Behavioral Theory of Neoclassical Economics [*Sources: Adapted from Smith (1723-1790) and Ricardo (1772-1823)*]

3.4 Theory of Demand and Supply

Slowman (2016) describes the theory of demand and supply (Figure 5) in a way that shows that, an increase in demand for an item will have an impact on the supply of the item or other variables correspondingly. This is demonstrated using the demand and supply curves in Figure 5. When price decreases along the demand curve from 10-7, there will be an extension along the demand curve as shown below (55-75). However, when there is an increase in price from 10-12, there will be a contraction along the demand curve (55-40).

Figure 5 also describes the relationship along the demand and supply curves. The figure on the left describes that when there is a decrease in prices from 10-7 along the demand curve, demand will increase. However, when price increases from 10-12 along the demand curve, demand decreases. The figure on the right also describes the same concept based on the quantity of houses supplied and the relationships with rents and prices. It indicates that when quantity of houses supplied on market decreases, house price increases, demand decreases and vice versa.
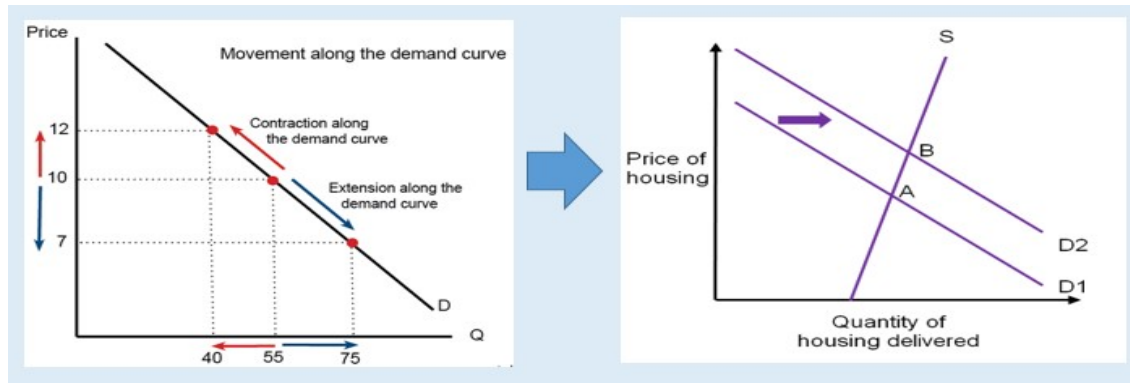
Figure 5: Demand and Supply Curves Mode [*Source: Slowman (2016)*]

3.5 Keynesian Model

Keynes (1940) argues that for economic growth to be achieved, it requires government intervention (Figure 6). This is as free market economy is governed by the law of supply and demand, rational decision-making is very fundamental. Government intervention is needed as it oversees the economy and it has the capability to control the market cycle. This theory was developed in the 1940's when so much economic crisis was ravaging the world. Below are the main reasons why government must intervene to control the market economy in order to arrive at the objectives of the Keynesian model:

i.   When there is economic recession, the theory urges government to lower interest rates to encourage people to borrow money, which will help investors to boost output of activities carried out.

ii. When there is recession, governments are urged to lower tax rates on individual business. This is purposely to assist private investors to have enough capital that can be invested to boost projects which can drive forward the economy.

iii. Where there is recession, government should increase household spending. This is done to stimulate jobs which should help productivity in the economy while the economy is at a low ebb during the recession
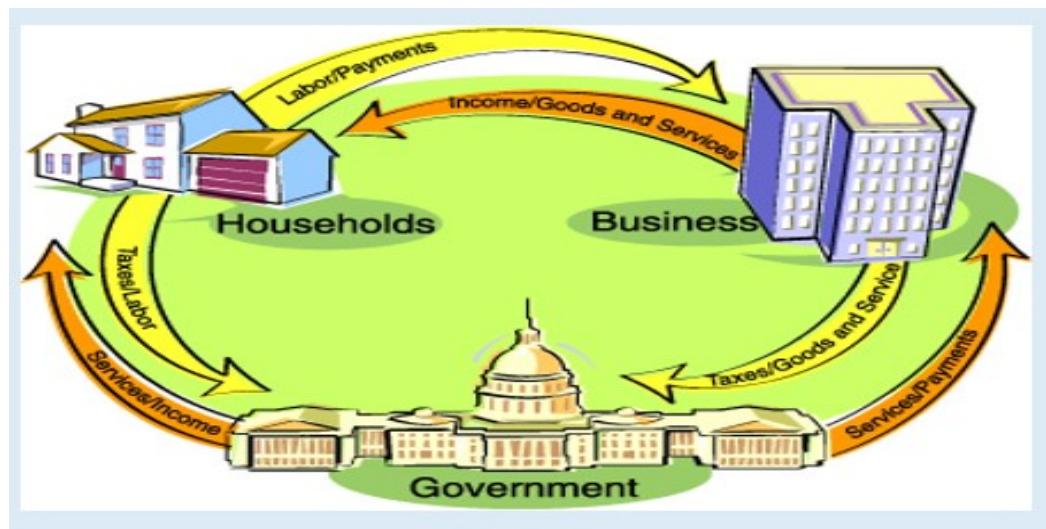

Figure 6: Keynesian Model [*Source: Keynes (1940)*]

4. Literature Review: Patterns of Residential Property Rentals and Prices in Cities

Residential land use is predominantly dominated by residential properties, which are very important as they play various significant roles in sustaining livelihood and economic development in cities (Kolscheen, 2018), while all livelihoods revolve around residential properties. Residential properties also provide places of comfort and an environment that is liveable for local and international employees to reside in, enjoy and work to benefit the country. As observed by Kolscheen, housing is an important driver of economic growth, which generates the nation's GDP.

In view of the steady increases in residential property prices and rentals in Lae City, low-income earners have continued to switch to squatter settlements for residential accommodation, which has resulted in the expansion of illegal settlements or slums. According to JICA (2010), Lae squatter settlements have increased as twice as their old sizes in the previous five years as the level of the GDP continues to drop annually at fiscal monetary gap of 20% as discussed by Honourable Ginson Saonu during the Morobe Provincial Content Plan (Owa, 2020).Further to that, the UN-Habitat (2010) indicated that 45% of tax payers are homeless just as about 30-50% of the urban population have been accommodated in the squatter settlements.

As concerns have continued to be raised, the National Housing Corporation was forced to develop 40,000 affordable housing units last year in 2019 under the PNG Government's Housing Scheme to increase the supply and affordability of low-cost and medium-cost housing. Despite the introduction of this housing scheme, housing problems persist (Chambers of Commerce, 2020) in the major cities of PNG. Consequently, the economy requires greater efforts directed at finding measures that can curb the spike in house prices that is seen as a prolonged trending issue badly affecting the economy at large (Owa, 2020).

With concerns about housing problems not abating and no control in sight over prices and rentals (Luma, 2020), several researches were carried out to investigate suitable measures to guide policy makers in effectively addressing the issue. Yet, no detailed specific research has been conducted to analyse the three key market elements that have been driving prices up in a cyclical fashion in the real estate market. These market elements include economic, social and cultural factors that have been weakening the strength of the property market in PNG. Most researches done in the past have mainly focused on the social relationships affecting commercial and industrial property prices and other related issues. For example, Ezebilo (2017) only evaluated measures to curb rising rentals and prices of all types of properties; he did not examine precisely the very important economic assets in form of residential properties that are the backbone of livelihoods. Also, no detailed research has been undertaken to investigate the most significant properties that have been transacted by buyers and sellers in the market, such as duplexes, bedsitters, split-level units, and standalone townhouses. The need to fill these gaps in knowledge have motivated the researchers to undertake the present study.

5. Research Methods

The main data capturing strategy used for the study is questionnaire survey, which elicited responses and perceptions from survey participants through field interviews. This study concentrates on the formal real estate market in Lae. The sampling frame consists of residential properties at six (6) different locations in the city, including the CBD, Eriku, China Town, Market, Cassowary Road and Kamkumung.

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Out of these six locations, a sample size of 310 respondents (Table 1) was targeted to participate in the study, but only 300 questionnaires could be distributed through stratified random sampling to the tenants, landlords, real estate agents and urban planners. Out of the 300 questionnaires distributed, 218 questionnaires were successfully completed and returned to the researcher, while 92 questionnaires could not be collected back due to the Covid-19 restrictions being enforced in Lae City by the government during the survey period in 2020. Sales and rental data collection were made possible largely by the kind support and cooperation of the three estate agency firms in Lae City, namely Arthur Strachan, Professionals and Huon Real Estate. The data collected were successfully collated, analysed and interpreted to predict residential property market trends in Lae Cityfor the larger study of which this paper is an offshoot. Table 1 indicates the target population, sample size and completed questionnaires received from the respondents.

Table 1: Achieved Sample Size for the Study

Respondents	Type of Information	Expected	Successful	Unsuccessful
Tenants	Social, Economic & Cultural Factors	150	121	29
Landlords		150	87	63
Property Managers	Rentals & Prices	3	3	0
Valuers	Market Commentary	3	3	0
Leasing Agents	Market Commentary	3	3	0
Urban Planner	Development Plans	1	1	0
Total		**310**	**218**	**92**

There were hindrances encountered during the process of data collection. Due to the global Covid-19 pandemic and social distancing restrictions being enforced during the field work for this study by the PNG National Government, most highly qualified individuals and expatriates did not allow close contact with our field assistants fearing the contagious COVID-19 infections. However, we managed to get through much of the survey areas by using established local and clan networks through which we were able to talk to most of the tenants and landlords to collect the data we needed. As for other tenants, we distributed the questionnaires and managed to collect them back, but they were delayed for almost between 2 and 4 weeks.

6. Findings and Discussion

As indicated earlier in this paper, five (5) conventional urban models were adopted to operationalise the research questionand guide data analysis in this study, namely: (i) the concentric zone model (ii) the bid rent model (iii) the neo-classical model (iv) the demand-supply curves model; and (v) the Keynesian model. Let us examine the contributions of these five models in turn:

(i) Concentric Zone Model
It is not surprising to discover from our data analysis that the concentric zone model does not have an overtlyrelevantimpact on where residential property owners and renters wish

to live in Lae City. Rather, survey results indicate the overarching dominance of behavioural, social, economic, and cultural factors in determining house developers', buyers' and renters' decisions as independent market actors and stakeholders. In other words, households' housing choicesare largely personal decisionsthat depend on housing *affordability*around the city, which is also contingent on severalsignificant social, economic and cultural factors (Table 2).

Table 2: Landlords' Housing Characteristics in the Study Area

Landlords' Housing Characteristics	Variables	Percent
Why owning Properties and Working	Insufficient Income	7.1
	High Costs of Living	44
	All the above	47.6
	Others	1.2
Need a Fortnightly Income	K500-K1000	9.5
	K1000-K1,500	16.6
	Above K1,500	28.6
	Others	45.2
Employment Status	Unemployed	9.5
	Self Employed	35.7
	Private Sector	28.6
	Government/Public Sector	26.9

As indicated in Table 2, 47.6 of the landlords have decided to own properties while still working and earning salaries, due to insufficient income and high costs of living in Lae.

Table3: Tenants' Housing Characteristics in the Study Area

Tenants' Housing characteristics	Variable	Percent
Rented Accommodation	Self-Contained	29.8
	Standalone House	19.1
	1-2 Bedroom units	18.3
	Others	32.8
	Private	60.3
Type of Employment	Government/Public	35.1
	Self Employed	3.8
	Unemployed	0.8
Rentals Per Fortnight	K100-K200	15.3
	K201-K500	19.1
	K501-K800	22.9

	K801-K1000	39.7
	K100 & more	3.1
	Employer	46.6
Source of Rental Payments	Own Salary	51.1
	Own Business	2.3

As indicated in Table 3, majority of the tenants are low-income earners working for the government and using their salaries to pay their rents.These striking findingsare consistent with observations from our literature review confirming that with the increasing trends in residential property prices and rentals in Lae City (and other big cities in the country), low-income earners have no choice other than searching for or relocating residence in squatter settlements for affordable residential accommodation, which has resulted in the expansion of illegal settlements or slums in Lae City.

(ii) The bid rent model

Similarly, it may be argued that the bid rent model only has an indirect impact on residential landlords' and tenants' location choices. Most tenants would rather base their housing location decisions on affordability considerations, while landlords would also be forced to locate their housing projects in areas of the city where they can afford the costs and get tenants to occupy their premises at affordable rents. In other words, personal considerations outweigh any need to live close to the CBD as rigidly postulated by the bid rent model. In any case, the bid rent model is mainly applicable to commercial properties that usually prefer locations that are near the CBD where they can make higher profits from their businesses.

(iii) The Neo-classical model

From a behavioural theory perspective, we argue that the neo-classical theory is comparatively relevant to landlords' and tenants' housing decisions in Lae City. The model describes the total marginalised output as a result of rational decision making, involving a rational assessment of the housing type or location that one prefers to develop, purchase or rent, making comparison with competing goods or services, and choosing the one that offers the best return. When consumers or buyers make good decisions, maximum marginalised output is produced that brings a high level of satisfaction. Figure 4 illustrates this behavioural process, which equally applies to market transactions between buyers/renters and sellers/landlords of residential property.

(iv) The Demand-Supply curves model

Obviously, the demand-supply curves model is highly relevant to the housing issues examined in this paper. The universality of this model holds sway in this paper because there is a strong correlation between the quantity of houses supplied and the relationships with rents and prices. It indicates that when quantity of houses supplied on the market decreases, house price increases, demand decreases and vice versa. Hence, there is a perfect fit between this model and the research question answered in this paper.

(v) The Keynesian model

Finally, although the Keynesian model (Keynes, 1940) focuses on economic growth, which requires government intervention in the economy, the housing market in Lae City and most other cities also requires government intervention to protect the low-income earners from the sharp practices of shylock landlords who are fond of increasing rents indiscriminately. Even though housing service in a free market economy is governed by the law of supply and demand, rational decision- making is very fundamental and government intervention is needed to oversee and control the economy, citizens' welfare and the property market cycle to forestall economic crisis and a possible recession. This theory was developed in the 1940's when so much economic crisis was ravaging the world.

(vi) Rational-Behavioural Models

Thus far, survey findings indicate that residential property market actors in Lae make rational social, economic and cultural decisions that are guided by demand-supply interactions regarding where to locate their residence for optimum benefits that are largely personal in nature, subject to planning permission being granted by the Lae City Planning Authority. As indicated in Table 4, we have computed the Pearson Correlation coefficients of three surrogates representing three different groups of rational-behavioural variables (social, economic and cultural) and then analysed their impacts on residential property rents and prices in Lae City (Tables 5, 6 and 7).

Table 4: Parameters for Hypotheses Testing

Hypothesis ID Number	Factor Category	One Significant Key Variable as Surrogate	Pearson Correlation Coefficient (r)	Rationale for Selection of the Variable
H_1	Social Factors	Security and Safety (Table 5)	0.043*	Critical requirement of house buyers and renters in all cities
H_2	Economic Factors	Inflation (Table 6)	0.113*	Critical determinant of housing affordability in all cities
H_3	Cultural Factors	Number of Dependants (Table 7)	0.058*	Critical factor in the Melanesian *Wantok* culture of PNG and the Pacific Region

*Correlation is significant at 0.05 levels (2-tailed).

a) *Social relationship between safety or security of premises and residential property rentals and prices*

In this first scenario, we hypothesise that facilities which enhance 24-7 security and safety of premises significantly affect residential property prices and rentals (Table 5).

Table 5: Effects of Security and Safety on Residential Property Rents and Prices

Rentals Per Fortnight	Security and safety		Total	$\chi^2(8)$	P
	No	Yes			
Less than K500	11	9	20	7.670[a]	.466
K500-K1000	14	11	25		
K1000-K1,500	20	12	32		
More than K1,500	24	40	64		
Total	69(86%)	72 (11%)	131		

a. 7 cells (46.7%) have expected count less than 5. The minimum expected count is .03.

With 3 degrees of freedom, the chi-square value is 7.670[a], which gives a P value of 0.466 (near 50%) that is statistically significant, albeit weak but positive. We, therefore, accept the first hypothesis. The Chi-Square distribution table indicates that a P value of 0.466 is close to 0.50 or 50%. This means that there are about 50% chances of this combined cultural factor (security and safety of the premises being rented or bought) being a determinant of house prices and rental values when observed. In Lae City, as in most cities around the world, most tenants and landlords are very concerned about security and safety of lives and property. Where there is good security, most people would want to rent or own their residential property there, as the rent and value of the property will be enhanced (Odubiyi, 2019).

b) *Economic relationship between inflation and residential property prices and rentals*

In the second scenario, we hypothesise that inflation significantly affects residential property prices and rentals (Table 6).

Table 6: Effects of Inflation on residential property rentals and prices

Rentals Per Fortnight	Inflation			Total	$\chi^2(6)$	P
	Affects Rental Greatly	Does not affect rentals	Does not have any effect			
Less than K500	14	1	0	15	5.146[a]	.525
K500-K1000	13	0	1	14		
K1000-K1,500	12	3	0	15		
More than K1,500	33	5	2	40		
Total	72(86%)	9 (11%)	3 (3%)	84		

a. 8 cells (66.7%) have expected count less than 5. The minimum expected count is .50.

With 3 degrees of freedom, the chi-square value is 5.146 that gives a P value of 0.525 (52.5%), which is statistically significant, strong and positive. We, therefore, accept the second hypothesis. The Chi-Square distribution table indicates that a P value of 5.146 with P = 0.525 is about 53%. This means that there are about 53% chances of this economic factor (inflation) being a significant determinant of house prices and rental values. Most tenants and property owners/buyers are economically rational, they will tend to search for affordable rents and prices that their income can seamlessly support.Inflation is temporal meaning that it does not strike the economy every day but happens occasionally, although it may affect rental values and property prices significantly. Where there are chances of inflation taking place, prices and rentals are affected significantly.

c) Cultural relationship between number of dependants and residential property prices and rentals

Finally, in the third scenario, we hypothesise that the number of dependants living with a tenant or landlord significantly affects residential property prices and rentals (Table 7).

Table 7: Effects of Number of dependants on residential property rentals and prices

Rentals Per Fortnight	Number of Dependents			Total	$\chi^2(8)$	P
	1 dependent	2-5 dependents	6-10 dependents			
Less than K500	7	4	9	20	16.385[a]	.175
K500-K1000	11	5	9	25		
K1000-K1,500	8	17	5	30		
More than K1,500	22	17	12	51		
Missing	2	2	0	4		
Total	50(38%)	45 (34%)	35(26%)	131		

. a. 8 cells (40.0%) have expected count less than 5. The minimum expected count is .03

With 3 degrees of freedom, the chi-square value is 16.385, which gives a P value of 0.175 (17.5%) that is weak and positive, but statistically insignificant. We, therefore, do not accept the third hypothesis. The Chi-Square distribution table indicates that a chi-square value of 16.385 with P = 0.175 is about 17.5 %. This means that there are about 17.5 % chances of this cultural factor (number of dependants) being a non-significant determinant of house prices and rental values when observed. The result does not match our expected data, but this finding is consistent with the current reality of life in Lae City as most tenants are becoming wary of incurring high expenses when they accommodate relatives (*wantoks*) in their homes compared to previous years (Scot, 2005) when house rents and costs of living were much cheaper.

7. Conclusion and Policy Implications

In this paper, an attempt has been made to review some conventional theoretical models of city structure with a view to identifying the one that best fits Lae City, with regards to residential land use, which is predominantly comprised of housing of varying densities and

costs. With a total population of more than 150,000 according to the National Census (JICA, 2010), the population of the city is still increasing to date, and housing supply to cater for a growing urban population is still a major problem faced in the City of Lae. Residential property rentals and prices have increased recently in the real estate market; therefore, they have turned low-income earners towards the squatter settlements for rescue (Richardson and Doko, 2018). This has caused the expansion of illegal (squatter) settlements in PNG, while squatter settlements in Lae have increased twice its normal size (JICA, 2010).

Our deep concerns for the future sustainability of Lae City has spurred our curiosityto undertake this study. We are especially excited to identify which of the common model(s) of city structures best fits the configuration of Lae City in its situational context of being surrounded by squatter settlements that are expanding by the day due to rent affordability issues facing the city's residents who otherwise would prefer living in the formal residential areas of the city.

Following a review of five common models of city structure, it is obvious that the old Burgess' Concentric Zone Model does not fit Lae's current structure, while Alonso's bid rent model covertly fits the city's land use pattern in the sense that the Top Town (CBD) of Lae along with the emerging Eriku mini-CBD are the two prime commercial city centre locations in the city. However, residential locations in the city do not appear to follow this pattern. Instead, residential property developments have tended to be foot-loose that are strongly influenced by the locations of squatter settlements around the city where rentals and prices are affordable.

This justifies our further investigation of the factors determining property rentals and prices. Findings indicate that social, economic and cultural factors, as embedded in the behavioural models, rather than any rigid model of city structure, are better factors for a realistic description and explanation of Lae City's structure today. In specific terms, our research findings indicate as follows:

(i) In the group of social factors, there is a positive relationship between security of premises and rental payments. This means that where there is a sense of solid and reliable security and protection of tenants and premises, demand would be high compared to premises having no good security. Rents and prices in areas where security is very high would tend to be higher than in those areas with poor security.

(ii) With economic factors, there is a positive relationship between inflation and rental payment. Since it is a weak but positive relationship, it means that it is not evasive as inflation does not occur frequently. It depends on decisions, such rent control measures, designed to check the activities of shylock landlords, which will affect local and international businesses, which can impact the economy. However, afterwards, everything goes back to normal.

(iii) With cultural factors, the relationship between the number of dependants living with family members (in alignment with the Melanesian concept of *wantokism*) and property rentals and prices, is not a strong one, although it is positive.

In conclusion and in view of the above findings, we make the following recommendations for policy making purposes:

(i) That, future research efforts should be directed at deepening our understanding of the ever dynamic socio-economic, cultural and behavioural factors those determine and shape land use patterns in cities.

(ii) That it is high time that the squattersettlements surrounding Lae City, Port Moresby and other cities in PNG were either upgraded or redeveloped based on high standard urban planning designs, strategies andquality materials to promote city liveability and sustainability. In the process, more affordable houses that are fit for human habitation, with good quality security and safety measures, will become available to both the middle-income and low-income earners in PNG.

(iii) A conscious effort must be demonstrated by the various arms of government in PNG to speed up the release of customary land (now standing at about 86% of all lands in the country) into the mainstream alienated land tenure. If done, this will enable more customary land to be embedded in Declared Planning Areas across the country where physical planning and development control measures can be enforced for healthy living standards. It will also open opportunities for customary landowners to start using their registered lands for mortgage financing, which is currently not possible.

(iv) A realistic rent control policy is due for implementation in Lae City and other cities to stem the rising rental charges exacerbated by shylock landlords. Currently, there is no rent control policy in PNG. The COVID-19 pandemic has brought a lot of arguments over property rentals and prices and the hardships witnessed by thousands of people have displaced a lot of tenants from the formal market into the informal (squatter) settlements. Also, the problem of housing affordability has had prolonged adverse consequences on many low-income city residents with no hope in sight.The Covid-19 period should not be used under any guise as a cover by any landlord to unfairlyevict rent defaulters from rented homes.

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