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ANALYSIS OF COMMUTE CHARATERISTICS AND RESIDENTIAL LOCATION CHOICE OF IIUM GOMBAK CAMPUS EMPLOYEES OF MALAYSIA

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Abstract
Higher learning institutions, particularly universities, are important nodes which can help in decentralizing the monocentric stigma of urban areas by encouraging employment and housing growth in metropolitan areas. The case study Gombak Campus of International Islamic University Malaysia (IIUM), located 15 kilometres to the north-west of Kuala Lumpur City, is currently an employment node in the Klang Valley region. Being a node of employment, it is expected to generate residential development in the vicinity of its location by supporting the determining two factors of residential location - commuting cost and rent. Although there are certain truths that rent and commute cost are important determinants in households' residential location, other factors also influence residential location decision making. This paper, therefore, attempts to identify an array of factors and the extent to which these factors influence commute and residential attributes of the employees of IIUM Gombak Campus. Findings of this study reveal that there is a significant relationship between commute behaviour and residential characteristics and a number of other factors normally overlooked by the mainstream residential location choice models.
Keywords: Residential location, Commute cost, Rent, Workplace, IIUM, Socio-Economic Factors

INTRODUCTION

Studies on residential location choice mainly consider two factors – friction or distance from the work place, and rent (Alonso, 1964; Muth, 1969). Others include the variable or factor of the size of the housing unit as a determining factor of residential location as manifested in the access-space trade-off model (Maclennan, 1982). In both cases, however, modern location theories cast the economic behaviour of households in a

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Urban simulation models have been developed in the land use and transportation planning by applying the gravity model which states that the level of human interaction tend to vary inversely with distance. Lowrey's (1964) model of the metropolis based on the assumption that the place of basic employment determines the place of residence is a pioneering work on the gravity model. Wilson (1973) and Puttman (1983) developed the practical use of the gravity model for residential location predictions for metropolitan planning, primarily for transportation planning. Goldner (1968, 1972) successfully implemented Lowrey's framework in an operational forecasting model and developed the Projective Land Use Model (PLUM). This model was later modified by Putman (1976) as DRAM (Disaggregated Residential Allocation Model). Wilson (1973) reformulated the Lowrey model by using the entrophy framework to find the most probable distribution of home-to-work trips. Other researchers who operationalised the Lowrey model are, Garin (1966), and Batty (1971). The most significant extensions and operational applications of the Lowrey type of gravity models is the disaggregated model of the Integrated Transportation and Land Use Package (ITLUP) by Putman (1980, 1983), which predicts employment location based on a lagged distribution of workers, access to residents and a set of workplace attractiveness variables. Despite these developments, the basic criticism of the gravity type of model to date has been the lack of a theoretical foundation for its implementation and its simplistic use of an analogy drawn from physics.

Waddel (1997) used a multinomial and nested logit model to examine the spatial aspects of labour supply, housing demand and transportation service demand for white, black and Hispanic workers. The MEPLAN model was constructed using three economic concepts – input-output model, price function and random utility (Echenique, et al., 1990). The METROSIM model of Anas (1994) embodies the discrete choice method with economically specified behaviour and a market clearing mechanism. The model iterates between three markets – labour market (job assignment), housing and commercial space market (location equilibrium) and the transportation service market (equilibrium of transportation flows). UrbanSim (Waddel et. al., 2001), a GIS based model, takes two key inputs from external model system – a macro economic model to predict future population and employment by sector, and travel demand model system to predict travel conditions such as congested times and composite utilities of travel between zones. The common feature of all the models discussed so far is that these are all virtually land use demand allocation models and the demand is determined by taking input of regional forecast of various variables such as population, employment, travel demand, etc from external model system. Therefore, the very notion of the formation of urban spatial pattern as a result of interactions among various land use distributions within an urban area is ignored in these models.

Other empirical studies to explain the underlying factors determining household location decisions within an urban area cover wide-ranging aspects. Linneman and Graves (1983) found that job search and residence decisions are intimately intertwined over both short and long distances. Wienberg (1979) observed that individuals can adjust accessibility by adjusting workplace location or residence location or both. Although individuals do not make simultaneous decisions regarding their residence and workplace locations (Gordon and Vickerman, 1982), some individuals will make workplace decisions based on predetermined residence location while others make residence decisions on the basis of predetermined workplace locations. Beesley and Dalvi (1974) argued that residential choice is primarily the decision of the household head, with the likely implication that secondary workers in the household choose their workplace on the basis of a predetermined residential location. Homeowners face higher relocation costs than renters and are likely than renters to choose their workplace on the basis of their residential location. Blacks face discrimination in housing choice, their residential location opportunities are restricted and they are more likely to be forced to choose a job based on their residential location. Schwartz (1973) found that more educated workers adopt a larger job search radius, confirming that higher socioeconomic status confers greater flexibility in the choice of both residential and workplace location. Smersh (2003) explored the role of transportation, large-scale development, employment nodes, existing patterns of development and regulation on the spatial pattern of residential development in Alachua County in Florida, USA. Mootaz (2008) studied the residential location factors of IIUM employees and found variables such as monthly commute cost, type of transport used, employment in the family, house tenure and duration of job as predictors to the dependent variable - commute distance between residence and work place. Wan Nurul Mardia (2005) studied residential locations of ICT sector employees of Kuala Lumpur in her teleworking perception study.

The above review of literature on the factors determining residential location encompassing theories, models and empirical studies indicates that a host of variables are related to the process. These variables may be grouped as economic, social, cultural and political. Although existing studies, particularly the models focus more on economic determinants, less attention has been paid to the social, cultural and political determinants of the process. The choice of a job given the location of the firms, the choice of residence location given the spatial distribution of housing supply, the choice of housing tenure and the choice of travel mode to work are all related decisions made by employed households (Waddel, 1997, p.2). Therefore, the present paper intends to focus on the behavioural aspects of residential location decisions from the social, economic and cultural perspectives.

SOCIO-ECONOMIC, RESIDENTIAL, TRANSPORT AND COMMUTE CHARACTERISTICS OF IIUM STAFF

Analysis of demographic and social-economic characteristics of IIUM staff presented in Table-A1 in appendix-A shows clear differences by academic and non-academic categories. Mean age, educational qualifications, service length and gross monthly income of academic staff are higher than the non-academic staff. On the contrary, female staff, singles or unmarried, secondary employment and multiple employment are higher among non-academics. Housing characteristics presented in Table-2A in Appendix-A shows that while large percentage of academics own houses, large percentage of non-academics live in the rented accommodation. Whereas non-academics dominate in owning apartments/flats, detached and semi-detached houses are largely owned by the academics. Both mean housing rents and mean monthly housing instalments paid by the academics are higher than the non-academics. While only 15 percent of non-academics own houses priced above RM 250,000 (US$78,200), percentage of academics owning similarly priced houses are 45.5. Moreover, academics appear to have longer period of occupation in their present residences (mean: 8.5 years) than the non-academics in which case the mean is 7.0 years. Transport and commute characteristics of IIUM staff have been analyzed in Table-3A in appendix-A, where it can be seen that mean commute distance travelled by the academics between residence and the university is slightly higher (13.2 KM) that the non-academics in which case it is 12.6 KM. However, the noticeable thing is that the spatial dispersion of residence location from IIUM is higher in case of academics than non-academics (Figures 2 & 3).

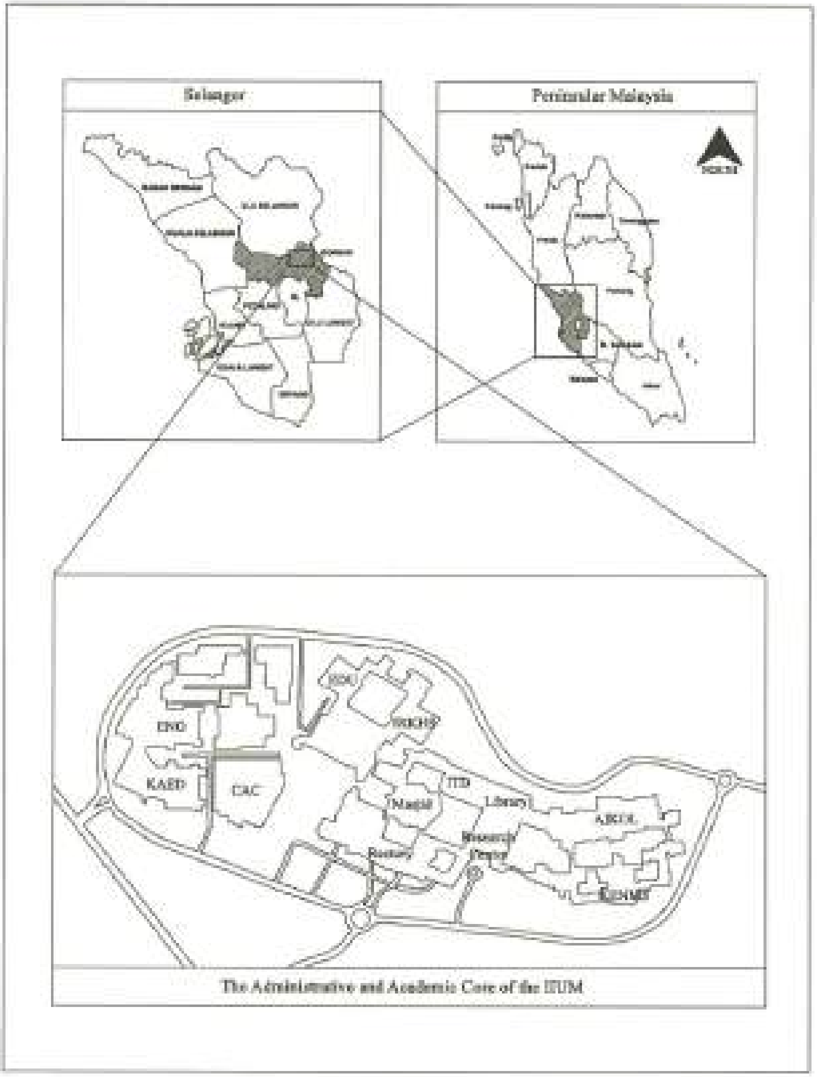

Figure 1: Location of IIUM Gombak Campus within Local, Regional and National Settings

A similar pattern is observed with commute times from residence to IIUM and from IIUM to residence, the only exception being that the spatial dispersion of the non-academics is higher than the academics. Monthly commute cost of non-academic staff is higher with wider dispersion than the academic staff of IIUM. The distribution of monthly commute expenditure as percentage of monthly income shows that whereas 96% of academic staff spends up to 15% of their monthly income on commuting

Location of Residence, Employment and Children's School

Existing literature claims that types of job, i.e., primary and secondary and location of children school influence residential location decisions. Therefore, we examined the distances between residence and job locations by primary and secondary employment and found that both mean and median distances between residence and primary employment is higher than the mean/ median distances between residence and secondary employment in the family (Table 2). This implies that spouse's job selection is influenced by residential location decisions.

Table 2: Distance between residence and locations of primary and secondary employment

Statistic	Distance between residence and location of primary employment	Distance between residence and location of secondary employment
Mean	26.4KM	10.8KM
Median	7.8KM	5.7KM

(Source: Analysis based on primary data)

Similarly, the location of the children's school(s) was also found to have an influence on residential location (Table 3). Both mean and median distances between residence and work place are higher than the mean and median distances between residence and children's school.

Table 3: Distance between residence and IIUM and children's school.

Statistic	Distance between place of residence and IIUM (KM)	Distance between place of residence and children's school (KM)
Mean	13.1	5.8
Median	5.9	3.0
Minimum	0.3	0.1
Maximum	120.0	50.0

(Source: Analysis based on primary data)

Commute to Work Place, Housing Characteristics and Employees Category

The relationships between staff category and commute behaviour and housing characteristics have been examined by using both Pearson correlation (r) and Spearman correlation (ρ) and the results have been presented in Table 4, where it is seen that both types of correlations have almost similar results.

Table 4: Pearson correlation (r) and Spearman correlation (ρ) between employment category and respondents' socio-economic variables.

Variable	Pearson (r)	Spearman (ρ)
Gender (N=97)	.29**	.29**
Age (N=94)	.43**	.42**
Marital status (N=96)	.34**	.35**
Level of education (N=96)	.83**	.85**
Kull/Unit (N=92)	-.36**	-.34**
Monthly income (N=96)	.69**	.71**
Monthly spouse income (N=96)	.40**	.44**
Type of employment (N=97)	-.44**	-.44**
Distance between residence and secondary employment (N=89)	-	-.24**
Monthly family income (N=55)	.34**	.34**
House tenure (N=97)	-.25*	-.25**
Monthly house loan repayment (N=38)	.40**	-.41**
House price(N=54)	.40**	.43**
Monthly housing expenditure(N=72)	.43**	.43**
Monthly house rent (N=34)	.35**	.37**
Mode of housing expenditure (N=77)	.30**	.30**
Type of transport used(N=96)	.30**	.30**
Transport mode used (N=97)	-.27**	-.33**
Commute cost % income(N=94)	-.33**	-.33**
Monthly commute expenditure % of income(N=93)	-.27**	-.23**
Distance between residence and school (Child-1) (N=85)	-.29**	-.42**
No. of school-going children (N=42)	.31**	.41**
Average monthly commute cost (N=96)	.24**	.27**

(Source: Analysis based on primary data)
*Notes: **Significant at .01 level; *Significant at .05 level.*

Variables such as gender, age, marital status, education, income, house loan, house price, housing expenditure, type of transport used, number of school-going children and average monthly commute cost, have significant positive correlations with staff category. Significant negative correlations are noticed in job unit, type of employment, distance between residence and secondary employment, house tenure, transport mode used, monthly commute expenditures as percentage of employees' or spouse incomes, distance between residence and children's schools.

Determining Factors of Residential Location

In order to determine the factors responsible for residential location decisions of IIUM staff, we run three multiple linear regression models. The first model used square root of daily commute cost as the dependent variable; the second one used square root of daily commute distance as the dependent variable; and the third one used square root of daily commute time (MCT) as the dependent variable. Of the three models, the last one is the best-fit, because it satisfies almost all the statistical requirements (see Table 5).

Table 5: Multiple Linear Regression (MLR) Model with Statistical Characteristics.

Model	R	R Square	Adjusted R Square	Std. Error of the Estimate	Durbin-Watson
Regression Model	.990	.979	.976	1.702	1.986

Regression Model	Unstandardized Coefficients		Beta values			Collinearirity Statistics (1-Ra^2 = 0.024)	
	B Error	Std.		t	Sig.	Tolerance	VIF
(Constant)	30.630	3.090		9.914	.000		
Commute time to work place (CTWP)	.385	.027	.608	14.444	.000	.138	7.230
Commute time from work place to residence (CTTR)	.221	.020	.451	11.223	.000	.152	6.573
Distance between place of residence and workplace (DRWP)	.004	.001	.092	2.916	.005	.244	4.104
Monthly commute cost (MCC)	.121	.058	.181	2.107	.038	.890	1.124
Monthly House rent (MHR)	.004	.001	.049	2.979	.004	.903	1.107
Length of service (LS)	-.078	.032	-.042	-2.438	.017	.818	1.222
Type of transport used (TTU)	-5.677	1.222	-.175	-4.647	.000	.173	5.794
Mode of transport used (MTU)	-1.572	.396	-.165	-3.966	.000	.142	7.059
Distance between residence and school (Chld-2) (DRS)	-.230	.076	-.048	-3.020	.003	.974	1.027
Commute distance (CD)	1.291	.492	.058	2.625	.010	.499	2.002
House tenure (HT)	-.705	.343	-.034	-2.054	.043	.893	1.120
DEPENDENT VARIABLE: SQRT OF DAILY COMMUTE TIME TO WORK PLACE AND RESIDENCE							