TENURE CHOICE AND HOMEOWNERSHIP : AN APPLICATION TO JEDDAH HOUSING MARKET

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INTRODUCTION

The distinction between the housing consumption of homeowners and renters is well known. Housing generally accounts for the largest item of consumption for households; for homeowners, housing is usually the household's largest asset. Given the importance of housing as a consumption commodity and as an asset, an explanation of housing tenure status will be presented.

This paper is concerned with specifying and estimating the probability of homeownership. The basic data source for this study has been collected from 253 randomly sampled individual households in the city of Jeddah, Saudi Arabia. The resultant model fits the data quite well, and the majority of explanatory variables enter with the correct signs and high significant levels.

THEORETICAL BASIS

Previous research in the housing market has focused on housing outcomes, but recently, attention has been directed to the processes producing these outcomes via developing models for tenure choice. Here, an initiative explanation as well as an investigation of the analytical framework will be presented.

AN INITIATIVE EXPLANATION

Real-estate agents usually search for both buyers and sellers of housing units. An agent tries to find sellers who will list with him and then tries to match buyers with listings. When a match is achieved, the real-estate agent receives a commission and pays the cost of completing this match. However, a real-estate agent seeks to maximize his expected income (that is,

his total commissions minus his search and showing costs), through two channels : (1) increasing his commission, and (2) reducing his search and showing costs.

But since the first channel is expensive to the broker (leads to the loss of some sellers and therefore makes it less likely to make a match with buyers), the second channel is the one the real-estate agent usually follows, that is, reducing search and showing costs. They can achieve this by showing the long-listed properties less frequently because of the unit's revealed inability to attract a bid acceptable to the seller. Agents may show relatively new listings since the marginal benefit of showing these exceeds that of showing old listings. [1]

ANALYTICAL FRAMEWORK

Several studies are usually referred to as providing a theoretical basis for homeownership. These models can take either of two equivalent forms : search process models, and tenure mode choice models. Here, both models will be discussed.

Search Process Model : Cornin (1982) developed a model of the household's search for housing. According to his model, the household will relocate if, in so doing, it expects to be made better off. Thus, the household faces the problem of maximizing its utility subject to a standard budget constraint. That is [(2)] :

Maximize $U = U(H, X)$ ..... (1)

Subject to $Y = P_h H + P_x X$ ..... (2)

Where

1. J. Yinger, "A Search of Real Estate Broker Behavior," American Economic Review, Vol. 71, No. 4, 1981, pp. 593 - 598.
2. P. Cornin, "Efficiency of Housing Search," Southern Economic Journal, Vol. 48, 1982, p. 1017.

H = housing services

X = all other goods and services

Y = income of the household

P_h = price per unit of housing service

P_x = price per unit of other goods.

The resulting set of first order conditions

$$U_h / U_x = P_h / P_x \quad \text{..... (3)}$$

implies an optimal commodity bundle, (H*, X*), given by

$$H^* = f(Y, P_h, P_x)$$

$$X^* = (Y - P_h H^*) p_x \quad \text{..... (4)}$$

Cornin argues that equations (1) - (4) permit the derivation of the household's potential gain from relocation. The optimal gain from moving, the equivalent consumer's surplus, is the amount of additional income (Ye-Y) that would make the household as well off with its current level of housing consumption as it would be if it were to relocate and consume its optimal quantity of housing services. [3] That is,

$$U [H, (Y_e - P_h H) / P_x] = [(H^* - P_h H^*) / P_x] \quad \text{..... (5)}$$

where H is the present level of housing consumption.

Assuming households would not consider a unit which produces less utility than their current unit, households are able to compute a distribution of gains f (G), while the cost of searching for one unit is constant (SC). At any stage of the search process, the expected value of the household's gain

3. Ibid, P. 1013

from search is

$$G = \max \begin{cases} G_o \\ - SC + E (G / G > Go) + Go\ F\ (Go) \end{cases} \quad \ldots\ldots\ldots\ldots (6)$$

where G_o is the gain associated with the best unit found, while the second line of the right hand side is the expected gain after one more search. A rational household stops searching (buys the unit) when the first line of the right - hand side of (6) is greater than or equal to the second line. That is, when

$$SC = \int_{G_e\ (G\ max,\ G_o)}^{G\ max} (G - G_o) f (G)\ dg \quad \ldots\ldots\ldots\ldots (7)$$

Here, the expected gain from additional search is equal to the costs of that search.

Tenure Mode Choice Model : Another class of models used as a theoretical basis for homeownership, tenure mode choice, is the one proposed by Handerson and Ioannides (1986). Given the household income Y, its utility function U (H, X), and the price of all other goods P_x, the household i solves the maximization problem :

Maximize $\quad Ui\ (Hi, Xi)$

Subject to $\quad Yi = P_h\ Hi + P_x\ Xi$

The indirect utility function for owner would be [4]

$$Voi = V\ (P_{oi}, \quad P_X\ , \quad Y_i\ , \quad e_{oi}) \quad \ldots\ldots\ldots\ldots (8)$$

4. J. Henderson and Y. Ioannides, "Tenure Choice and the Demand for Housing" Economica, Vol. 52, No. 210, 1986, P. 2533.

while if the household chooses to be a renter instead, its indirect utility function would be

$$Vri = V\ (P_{ri},\quad P_x,\quad V_i,\quad e_{ri}) \qquad \ldots\ldots\ldots\ldots\ (9)$$

where

V_{oi}, V_{ri} = the owner and renter indirect utility functions respectively.

P_{oi}, P_{ri} = the net price of owning and renting respectively.

P_X = the price of all other goods.

ei = the disturbance term.

The household chooses to be and owner - occupant if [5]

$$V_{oi} > V_{ri}$$

Given the error terms specified in the indirect utility functions, for any family we have a probability (P_i) that it will want to own, where

$$P_i = P_r\ (V_{oi} - V_{ri} > 0) \qquad \ldots\ldots\ldots\ldots\ (10)$$

where P is referred to as the tenure choice function.

In equation (10) if $e_{oi} = e_{ri}$ then $P_i = P_r\ (V_{oi} - V_{ri} > 0)$ depends on whether $P_r - P_{oi} > 0$. If $e_{ei} \# e_{ri}$, in general, then $P_i = P_r\ (V_{oi} - V_{ri} > e_{ri} - e_{oi})$ where $Vji = V\ (P_{ji},\ P_x,\ Y_i)$ is the measured indirect utility. [6]

REVIEW OF EMPIRICAL LITERATURE

Several studies were published to obtain statistical estimates of the determinants of homeownership. Here, a representative sample of some recent studies that appeared in the literature will be given.

Li (1977) employed the logit model for the analysis of homeownership. [7]

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5. A similar model has been published by Brownstone, England, and Persson (1985).
6. J. Henderson and Y. Ioamides, " Tenure Choice and the Demand for Housing, " Economica, Vol. 52. No. 210, 1986, P. 234.
7. M. Li, "A Logit Model of Homeownership," Econometrica, Vol. 45, No. 5, 1977, P. 1083.

In his study of the Boston and Baltimore housing markets, the relative frequency of homeowners was regressed against income, family, size, age of head, and race of head. Li found that the probability of homeownership for family above two persons is .063 in Boston and .104 in Baltimore, while the probability for blacks with otherwise identical characteristics is .021 in Boston and .035 in Baltimore. Moreover, the estimated probability of homeownership for a white family is .726 in Boston and .814 in Baltimore, whereas the probability for an identical black family is only .457 and .580 in Boston and Baltimore respectively. Finally, the results show that the probability of homeownership goes up as family size increases, but then declines as family size exceeds five persons. [8]

Rosen, Rosen, and Holtz - Eakin (1984) investigated the effects of price uncertainty on the tenure choice decision based on annual U.S. data for 1956 to 1979. [9] The aggregate proportion of homeowners was determined by the expected price of owner - occupation, the difference in the forecast error variance of the price of owning and renting, and current consumption as a proxy for permanent income.

Their findings show that the proportion of owner - occupiers decreases as the expected excess of the price of owning over renting increases. The elasticity of homeowner's proportion with respect to the excess of price owning over renting is - 0.053. The results also show that the elasticity of homeowner's proportion with respect to the difference in the forecast error variance of the cost of owning and renting is - 0.188, while the elasticity of homeowner's proportion with respect to consumption is equal to 0.707 which indicates a positive relationship between real per capita permanent

8. Ibid, p. 1085.
9. H. Rosen, K. Rosen, and D. Holtz - Eakin, " Housing Tenure, Uncertainty, and Taxation," Review of Economics and Statistics, Vol. LXVI, No. 3, 1984, p. 407.

income and the tendency to choose owner - occupier status. [10]

In their paper of 1988, Zuehlke and Rasmussen estimated the significance of housing and neighborhood attributes, time on the market, availability of assumable mortgage, and occupancy status on the housing probability of sale. [11] They used data for 290 single-family detached residential properties, 138 of which had sold from the December 1981 - February 1982 Multiple Listing Service Book of Tallahassee, Florida.

Using the maximum likelihood technique, Zuehlke and Rasmussen found that the majority of variables were significant and had the expected sign. The results show that age decreases the unit mean value offer by about $ 438 a year, while lot size and floor area give an increase of $ 146 per thousand square feet and $ 37.39 a square foot respectively for a house with 3 bedrooms and 1788 square feet on average. In addition, the presence of a garage or a carport and a paved front road increase mean offers by $7.957 and $ 10.512 respectively. Among neighborhood variables, a $ 1000 increase in median family income results in an increase of $ 876 in mean offer, while, even though insignificant, a percentage increase in minorities increases mean offers by $ 121. Finally, the availability of assumable financing has the unexpected sign and is insignificant. This may be due to the fact that new structures were offered for sale with more favorable financing than existing structures with assumable mortgages. [12]

THE MODEL

In this section, a model of household tenure choice is developed. The analytical dimensions of the model are specified viz the assumptions, the

10. Ibid, P. 412.
11. T. Zuehlke and D. Rasmussen, "A Search Model of Housing Market Transactions," Southern Economic Journal, Vol. 54, No. 3, 1988, P. 624
12. Ibid, pp. 626 - 627

specifications and the data.

Assumptions :

The household tenure choice (owning vs renting) is based on the following assumptions regarding the individual's utility, the housing commodity, the market, and the household socio - economic characteristics. These assumptions are as follows :

1. The individual's utility depends upon his consumption of housing services and a composite of all other goods.
2. Housing services are assumed available in either of two mutually exclusive modes : renting or owing. They are modelled as distinct commodities with characteristics which may differ.
3. There is sufficient variation in the characteristics vector so that the housing price function is continuous and twice differentiable.
4. The local housing market is assumed to be in a short-run equilibrium state.
5. Owning a housing unit depxends inter alia upon socio-economic characteristics, accessibility variables, household characteristics, the availability of public utility services and government interest-free financing.

Model Specification :

In the housing market, households move either when their job changes (by a sufficient commuting distance) or when they undergo some other change (in income, family members, etc.) that makes their current house inadequate. [13] Therefore, choosing between owning and renting involves a

13. W. Weaton, "Vacamcy, Search, and Prices in a Housing Market Matching Model, " Journal of Political Economy, Vol, 98, No. 6, p. 1274.

comparison of the prices of owning and renting. As a result, one would expect some variables to be significant in determining the probability of homeownership. To be able to find out why some people own housing units while others do not, the following probability model will be constructed. In this model, a housing unit takes the value of one (zero) if it is owned (rented).

There are several reasons, based on previous research, which could affect the probability of homeownership. Table 1 lists the variables and their definitions. These variables include : socio - economic variables, accessibility variables, household characteristics, public utility services and government interest-free financing.

Table 1

Variable Definitions

	Variable Definition	Expected sign	Mean	Standard Deviation
	DEPENDENT VARIABLE			
Y	Housing unit owned = 1, not owned = 0		.498	.4925
	INDEPENDENT VARIABLES			
	Socio - economic Variable :			
Xi	The natural logarithm of median family income.		11.161	.7802
	Accessibility Variables			
X2	Travelling time to CBD	-	24.671	7.0512
X3	Travelling time to Corniche	-	24.745	7.922
	Household Characteristics			
X4	Family size	+	6.0556	3.1009
X5	Education of head	+	10.431	4.9523
	Public Utilities			
X6	Telephone present = 1, Otherwise = 0	+	.6944	.4716
	Availability of Finance *			
X7	Loan present = 1 Otherwise = 0	+	3120	.4635

* The government provides (through the Real Estate Development Fund, REDF), interest - free financing, with additional discounts (in the case of early payments) to Saudi households who seek to build private homes.

Based on this perspective, a model for tenure choice of homeownership is constructed. The independent variables include :

1. Median family income.
2. Travelling time to CBD.
3. Travelling time to the Corniche.
4. Family size.
5. Education of the housedhold's head.
6. Telephone service, and
7. Government financing.

Formally,

$$Y_i = \alpha + X_i \beta \qquad \text{..... (11)}$$

where :

Y_i = a vector of dichotomous variable representing whether the unit is owned.

α, β = a secular and parameters.

X_i = a set of independent variables listed in Table 1.

Differentiating the Y function, we find expected results

$$\frac{\partial Y i}{\partial X i} = \beta \gtrless 0 \qquad \text{..... (12)}$$

The first partial derivatives of the probability of homeownership with respect to the variables included in the model are assumed to be positive, except for accessibility variables; a unit is more likely to be owned if the variables have the expected signs.

Assuming that random errors in homeownership behavior are responsible for the deviation of the probability with zero mean and fixed variance, we

can rewrite equation (11) as follows :

$$Y_i = \alpha + X_i \beta + U_i \quad \text{..... (13)}$$

where :

U_i = a stochastic disturbance term with $N(0, \sigma^2)$

The Market

The housing market in this study comprises the whole metropolitan area of Jeddah, which covers about 984 square kilometers from the Red Sea in the west to Hai Al-Amir Fawaz in the east, and from Abhur in the north to Al-Mahjar district in the south. The total number of districts (48) was classified into five major areas, each of which belongs to specific socio-economic characteristics and dwelling types.

The Data

The data used for the estimation of the probability of homeownership is based on a survey of a random sample of on equal number of observations from the five areas in the city of Jeddah, Saudi Arabia during April - September 1987 and February - July 1988. The total number of the observations is 253, of which 126 units are owned while the remaining are rented.

ESTIMATION RESULTS

A detailed explanation for the empirical results of the variables affecting the probability of homeownership is presented. Two econometric techniques were used : a simple OLS, and log-likelihood. The results are given in Tables 2 and 3 respectively.

ORDINARY LEAST SQUARE ANALYSIS [14]

The empirical results of the model test under the OLS technique are given in Table 2. The first regression presents results of the basic full model, while the second presents results after omitting insignificant variables from the basic model.

14. Since in this case we have a linear probability model, the assumption of normality for the disturbance term U_i is no longer tenable because, like Y, U_i takes on two values. That is, $U_i = 1 - \alpha - \beta X_i$ and $U_i = - \alpha - \beta_i X_i$ when Y = 1 and 0 respectively. But since our sample is large, U_i is assumed to be normally distributed (Central Limit Theorem). Therefore, the statistical inference of this model follows the usual OLS procedure under the normality assumptions.

Table 2

Parameter Estimates of Homeownership

(OLS Analysis) *

Variable	Parameter Estimate (1)	Parameter Estimate (2)
Intercept	.3220 (3.0636)	.3418 (4.0466)
The natural logarithm of median family income	.2145 (8.5411)	.2145 (9.2672)
Travelling time to CBD	-.000653 (-.2336)	
Travelling time to Corniche	-.00586 (-2.3449)	.00602 (-2.5366)
Family size	.00681 (1.0166)	
Education of head	.01185 (3.1209)	.0122 (3.2241)
Telephone	.0838 (2.0702)	.0949 (2.4393)
Government financing	.7839 (18.404)	.7901 (18.775)
R-Square	.7231	.7216
F-Ratio	77.583	108.865

* T - statistics in parentheses.

As can be seen, the exclamation of the insignificant variables (travelling time to CBD, and family size) from the original model has a negligible effect on the overall performance of the model. [15] The value of R-square, T-ratio, and parameter estimates are roughly the same, which explains that these variables are superfluous in determining homeownership in the city of Jeddah. [16] Here the overall performance of model 2 will be discussed, and secondly the individual's coefficient estimates will be examined.

Explanatory Power :

Two measures of explanatory power will be discussed to find whether or not the model makes sense. These statistics are : R^2 and F-statistics.

The R^2 value is equal to .7216 which indicates that 72.16 percent of the variation in homeownership is explained by the model. The F-test, shows that the observed relationship is significant at. 001 level. That is, we reject the hypothesis that the multiple correlation is due to chance.

Examining Individual Coefficients

Regression two of Table 2 shows that the majority of variables in the model are significant at the 1 percent level (2-tailed test) and have the expected signs. Here, the coefficient estimates will be fully explained.

The natural logarithm of median family income : The coefficient is .2145 which indicates that, on average, if median family income increases by one percent, the probability of homeownership increases by approximately .2145.

Travelling Time to Corniche : The coefficient indicates that the probability of homeownership decreases by .0602 for each ten minutes

15. The statistical insignificance of the mentioned variables is not due to the existence of multicollinearity (See Appendix 2).
16. P. Rao and R. Miller, Applied Econometrics, Wadsworth Publishing Company Inc., Belmont, 1971, p. 36.

increase in time between the housing unit and the corniche.

Education of Head : The coefficient estimate indicates, as expected, a positive relationship between the education level of the head and homeownership. Therefore, homeownership increases by .0122 for each extra year in the level of education.

Telephone Service : The coefficient estimate is .09473 which indicates that the existence of a telephone service, as a proxy for public utility services, increases the probability of homeownership, on average, by approximately .0949.

Government Financing : The coefficient estimate is equal to .7901 which indicates that the probability of homeownership increases by approximately .7901 if interest-free financing is provided by the government to the household.

It is important at this point, however, to mention that the coefficient estimates, although unbiased, are not efficient; that is, they do not have the minimum variance. This is due to the fact that the variance of (U_i) is heteroskedastic because it depends on the conditional expectation of the dependent variable (Y) which depends on the value taken by the independent variables. [17]

DIFFICULTIES WITH OLS

The application of the standard OLS to a model with a binary dependent variable, as is the case here, leads to several problems. One of these problems is that the probabilities are not ensured to be between 0 and 1; they

17. R. Pindyck and D. Rubinfeld, Econometric Models and Economic Forecasts, McGraw Hill Book Company, N. Y., 1981, P. 292.

can take values greater than one or less than zero. [18] Second, even if the probability is confined to the unit interval, predictions outside the unit interval can be produced for the value of the independent variables outside the sample range, even if the coefficient estimates are derived by minimizing the sum of squared residuals subject to the condition that within - sample predictions lie in the unit interval. [19] Finally, the fitted relationship is very sensitive to the values taken by the independent variables.

Log - Likelihood Analysis

An approach that is correct for these problems noted above is the log-likelihood technique. The empirical results of the model are given in Table 3. The exclusion of insignificant variables of the basic model has no impact on the value of the likelihood functions on the basis of Chisquare test. Moreover, the results of model two (parameter estimates and t-ratios) are roughly similar to those of the basic model.

Examining Individual Coefficient

Table 3 shows the log - likelihood estimates of the probability of homeownership. Most coefficients are significant and have the expected signs. Here, the likelihood estimates will be fully explained. [20]

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18. M. Intriligator, Econometric Models, Techniques and Applications, Prentice Hall Inc., Englewood Cliffs, N. J., 1978, P. 147.
19. G. Judge, W. Griffiths, R. Hill, and T. Lee, The Theory and Practice of Econometrics, John Wiley & Sons, N.Y., 1980, p. 587.
20. The interpretation of the individual coefficients must be done with care, since Y is in the logarithm of the odds of choice, not the actual probability. Therefore, to interpret the effect of the change in X on the probability of homeownership, one should solve for the change in the probability Pi that is :

    $$\text{Long } \frac{P_i}{1 - P_i} \beta X, \text{ assuming } X = 1, \text{ then } P_i = \beta [P_i (1 - Pi)]$$

    See M. Li, A Logit Model of Homeownership, Econometrica, Vol. 45, No. 5, 1977, p. 1081.

Table 3

Parameter Estimates for Homeownership

(Log Likelihood Analysis) *

Variable	Parameter Estimate	Change in** Probability	Parameter Estimate	Change in** Probability
Intercept	-.9209 (-.6139)	-.2302	-.9364 (-.7753)	-.2341
The natural logarithm of median family income	2.6208 (4.1171)	.6552	2.5465 (4.1861)	.6366
Travelling time to CBD	-.0208 (-.5200)	-.0521		
Travelling time to Corniche	-.0491 (-2.3934)	-.0123	-.0549 (-1.9692)	-.0137
Family size	.0686 (.6317)	.0172		
Education of head	.1245 (2.2267)	.0311	.1296 (2.3045)	.0324
Telephone	.9142 (1.2742)	.2286		
Government financing	28.927 (3.0493)	7.2318	28.957 (2.9436)	7.2392
Log - Likelihood function	-12.3661		-12.7129	

* T - Statistics in parentheses.

** Estimated at the 50 percent.

The Natural Logarithm of Median Family Income : The coefficient is equal to 2.5465, which indicates that an increase of one percent in median family income leads to a proportional increase of .25465 in the logarithm of the odds that a household owns a house. The probability associated with median family income is equal to .6366. Thus, we predict that median family income will change the probability of homeownership by .6366.

Travelling Time to Corniche : The coefficient estimated is equal to -.0549 which shows that each increase of ten minutes in travelling time to the Corniche leads to a proportional decrease of .549 in the logarithm of the odds that a unit is owned. Moreover, we predict that the probability of homeownership decreases by .137 for each ten minutes increase in travelling time to the Corniche.

Education of Head : The coefficient estimate is equal to .1296 which indicates that an increase in education level by one year leads to a proportional increase in the logarithm of the odds of homeownership by .1296. However, the change in probability, which is equal to .0324, shows that homeownership probability increases by .0324 for each extra year's increase in the level of education.

Government Financing : Interest - free loans provided by the government turned out to be a very significant variable in determining the probability of homeownership. The coefficient estimate is equal to 28.957, which indicates that the availability of financing leads to a proportional increase in the logarithm of the odds of homeownership by 29. The probability associated with financang is equal to 7.2392 which shows that the probability of homeownership increases by 7.2392 if the unit is built with the provision of government financing.

CONCLUDING REMARKS

The results reported here are encouraging. The differences between the ordinary least squares and the maximum likelihood estimates are quite small. In both analyses, the prediction performance of homeownership is quite good and consistent with previous research. The findings about the quality of the estimates are summarized here :

1. The resultant model fits the data quite well. Both techniques succeed in accounting for much of the observed variation in the probability of homeownership.

2. The majority of coefficient estimates are highly significant and are consistent with our a priori belief. For example, the estimates of the coefficients of median family income, education of head and government financing are positive, while it is negative for travelling time to the Corniche.

3. The probability of homeownership increases with median family income, education of head and government financing, while it decreases with the travelling time to the Corniche.

CONCLUSION

This paper has developed a model that deals with the determinants of the probability of homeownership. Despite its simplicity, the model provides realistic explanations for the empirically observed behavior of households in the housing market. Consistent with previous research, our estimations explain how median family income, education of head, government financing and travelling time to the Corniche affect homeownership in the city of Jeddah, Saudi Arabia.

Even in its quite simple form, the model has the potential to address the following economic policy issues :

1. The Need to Continue Government Financing :

The empirical result indicates a significant positive relationship between interest-free financing and the probability of homeownership. Therefore, government policies should be continued to support the growth of owner-occupation since more financing leads to a better way of matching household's needs for homeownership. The provision of financing through the REDF is more likely to increase homeownership for Saudis who cannot pay for the total cost of units outright, or who wish to raise a mortgage.

2. The Need to Improve the Southern Corniche

Accessibility to the Corniche recreation area (located in the northwestern part of Jeddah) was found to be significant in determining the probability of homeownership. The importance of accessibility to the Corniche is due to the existence of entertainment facilities, shopping centers, hospitals, etc. To match the Saudi homeownership close to the

Corniche area, future government policies should be directed to improve the attractiveness and neighborhood of the southern shore of Jeddah by extending the Corniche recreation area and public services to cover these areas.

It is important, however, to mention that one should be careful in generalizing the findings of this study. Like any other empirical study, it depends on the nature of the data used. One may suspect that the findings could have been different, had the sample been larger or drawn from other families with different economic and social structures.

Using a quadratic form of the relationship between income and tenure choice, the data fit since homeownership increases with income at a decreasing rate. Aggregation across key factors such as family size and different races may obscure the importance of these factors in variation of the probability estimate of homeownership.

Despite these limitations, the study uncovered good areas of future research. It would be interesting to use permanent income instead of current income as used in this study. Furthermore, it would be worthwhile to further break out some variables into groups such as age of the household's head, and different races. These distinctions show the importance of these factors, at different levels, in determining homeownership in the city of Jeddah, Saudi Arabia.

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Appendix 1

STATISTICAL SUMMARY OF THE VARIABLES

Variable	Mean	Standard Deviation	Minimum	Maximum
Unit owned / not owned	.498	.492	00	1.00
The natural logarithm of median family income	11.161	.780	9.393	15.425
Travelling time to CBD	24.671	7.051	2.00	36.00
Travelling time to the Corniche	24.745	7.922	00	35.00
Family size	6.0556	3.101	1.00	20.00
Education of Head	10.431	4.952	00	18.00
Telephone	.6944	.4717	00	2.00
Government Financing	.3102	..4636	00	1.00

Appendix 2

CORRELATION COEFFICIENT MATRIX

Variable	X1	X2	X3	X4	X5	X6	X7
Natural logarithm of median family income (X1)	1.00						
Travelling time to CBD (X2)	-.202	1.00					
Travelling time to Corniche (X3)	-.302	.343	1.00				
Family size (X4)	.443	-.144	-.075	1.00			
Education of head (X5)	-.042	.057	.001	-.043	1.00		
Telephone (X6)	.328	-.202	-.325	.269	.053	1.00	
Government financing (X7)	.283	-.159	-.278	.159	-.249	.138	1.00

Appendix 3

QUESTIONNAIRE

District :

Address :

Median family income _ _ _ _ _ _ _ _ _

Housing Unit :	( )	owned
	Value	_ _ _ _ _ _ _ _
	( )	rented
	Yearly rent	_ _ _ _ _ _ _

If you own the unit, did you receive	( )	Yes
government loans ?	( )	No

Number of persons in the family	( )	Persons

Number of years spent in education by the family head	( )	Years

Telephone	( )	Yes
	( )	No

Travelling time to CBD	( )	Minutes

Travelling time to Corniche	( )	Minutes