

The Impact of Dwelling and Neighborhood Quality Aspects on the Estimation of the Income Elasticity of Demand for Rental Housing in Jeddah, Saudi Arabia

MOHAMMAD MAATOUG GANDIL
Department of Economics
King Abdul-Aziz University

I. INTRODUCTION

The estimation of income elasticity of demand for housing has been the prime concern of many empirical studies in the housing market literature. This is because such estimation is important to assist in the formulation and implementation of government housing policy issues.

In most of the past applications, multiple regression analysis has been employed to estimate housing demand equations. The examination of the relationship between demand, as often measured in some terms of rent (in the case of renter-occupied dwellings) or price (in the case of owner-occupied dwellings), and income has drawn the main interest of such investigations. Based on the individual parameter values and the functional forms of estimated equations, measures of income and other demand elasticities for housing can be provided. A major conclusion to be drawn from the available applied studies is that the range of the estimated values of the income elasticity is quite large. This can be mainly attributed to considerable differences between studies in the measurement of income, nature of data, and sampling techniques employed.

This study provides empirical evidence on the literature of housing demand for renter-occupied dwellings in the city of Jeddah, Saudi Arabia. Owing to lack of a systematic collection of data on housing in Saudi Arabia, a two-stage disproportional stratified cluster sampling technique was developed and then employed to obtain the required information. This was done by means of individual interviews with 401 households. Full details of the sampling procedure are given in section III of this paper. There are three features of this research which make it of

special interest from the point of view of housing demand analysis. First, it mainly focuses on the importance of both dwelling and neighborhood quality aspects on the estimation of the income elasticity. In this particular respect, it seeks to contribute to the debate on housing demand analysis. Second, it addresses the effect of nationality on the evaluation of housing demand elasticities. For this purpose, stratified housing demand equations for Saudi households are provided separately. Finally, our income elasticity estimates are based on an appropriate measure of permanent income, individual data, and restricted to households who had recently moved. These considerations, as we shall discuss in section II, are believed to increase the degree of confidence in the measurement of housing demand elasticities.

The organization of this paper is as follows. Section II presents a review of past studies. Section III deals with the description of our sampling technique and method of estimation. Section IV provides and analyzes the empirical results. Finally, section V sums up the major conclusions to be drawn from our analysis.

II. REVIEW OF PREVIOUS STUDIES

Table 1 presents estimated values of the income elasticity of demand for housing from a survey of 19 past empirical investigations. The selection of the studies, was made to raise basic controversial issues associated with the estimation of the income elasticity. Two fundamental challenges are usually recognized in the literature of housing demand, and these are as follows:

(i) The Measure of Income

The first controversial issue in such studies is attributed to the choice of the most proper measure of income to be used in the calculation of the income elasticity. While all studies listed in table 1 have provided estimates on the basis of one or more measures of permanent income, Kain and Quigley (1976) and Ingram (1981) have, on the other hand, restricted their estimates to current income only.

Since purchasing or renting a dwelling is often considered to be a household long-run decision, it ought to be linked to permanent income. This is because permanent income is based on long-run anticipated income which considers previous as well as future expectations of earnings. Following this argument, housing expenditure (rental values or prices) is not expected to be related to current income because it includes transitory income. Thus, an income elasticity of demand for housing is expected to have a downward bias if calculated on the basis of current income. Mayo (1981) argues that the downward bias relies on the ratio of variances of permanent income to current income, which includes the sum of variances of both types of income. Mayo continues to argue that the extent of this bias depends on how much the variance of transitory income

is relative to that of permanent income.. If we restrict our examination of table 1 to the studies which provide both current and permanent income elasticities, a support for this argument can be found. With the exception of Goodman (1988) the empirical results of Lee and Kong (1977), Mayo (1977), Follain et al. (1980), Jimenez and Keare (1984), and Horioka (1988) may be said to back this argument. However, the debate over what should be the most appropriate measure of permanent income is still not yet resolved. Six measures of permanent income are usually recognized.

The first is a "median measure" of permanent income. Based on table1, the studies of Maisel et al. (1971), Muth (1974), Rosen (1979), and Polinsky and Ellwood (1979) have employed this measure in their calculations of the income elasticity. However, this measure is often criticized because of the use of aggregated (grouped) data. All observations in the same group are supposed to be homogeneous in all respects, thus individual variations are obscured. Polinsky and Ellwood (1979) argue that an upward bias in the value of the income elasticity is to be expected as a result of employing this measure of income. They continue to argue that the extent of this bias increases when specification error exist. It should be pointed out that all remaining five measures of permanent income are based on individual observations.

TABLE 1
Estimates of Income Elasticities of Housing
Demand from Past Studies

Author (Year)	Income Elasticity Estimate ^(a)	Measure of Income Used ^(b)	Type of Data Employed ^(c)	Households Sampled ^(d)
(1)	(2)	(3)	(4)	(5)
1. Maisel et al. (1971)	O = 0.45 O = 0.72	PY	I-D A-D	R-M
2. Carliner (1973)	O = 0.63 R = 0.52 O = 0.50 R = 0.44	PY CY	I-D	MIXED
3. Muth (1974)	O = 0.71	PY	A-D	R-M

Table 1 (continued)

4. Kain and Quigley (1976)	O=0.21 R=0.08	CY	I-D	MIXED
5. Lee and Kong (1977)	O=0.86 R=0.69 O=0.61 R=0.35	PY CY	I-D	MIXED
6. Mayo (1977)	R=0.37-0.46 R=0.27	PY CY	I-D	MIXED
7. Rosen (1979)	O=0.35 R=0.45	PY	I-D A-D	R-M
8. Polinsky and Ellwood (1979)	O=0.547 O=0.39	PY	A-D I-D	R-M
9. Follain et al. (1980)	O=0.21 R=0.12 O=0.62 R=0.42	CY PY	I-D	MIXED
10. Friedman and Weinberg (1981)	R=0.36	PY	I-D	R-M
11. Ihlanfeldt (1981)	O=0.68 R=0.38 O=1.03 R=0.45	PY	I-D	N-M R-M
12. Ingram (1981)	O=0.73-0.75 R=0.47-0.67	CY	I-D	MIXED
13. Jimenez and Keare (1984)	O=0.45-1.1 R=0.26-0.64 O=0.65-0.93 R=0.28-0.54	PY CY	I-D	MIXED
14. Dynarski (1985)	R=0.77 R=0.50 O=0.81 R=0.47	PY	I-D	N-M R-M

Table 1 (continued)

15. Goodman (1988)	O=0.21 R=0.13 O=0.28 R=0.19	PY CY	I-D	MIXED
16. Grootaert and Dubois (1988)	R=0.60-0.64	PY	I-D	MIXED
17. Harmon (1988)	O=0.71-0.80 O=0.72-0.81 O=0.94-1.10	PY	I-D	MIXED N-M R-M
18. Horioka (1988)	O=1.40 O=0.90	PY CY	I-D	MIXED
19. Glennon (1989)	O=1.21	PY	I-D	MIXED

(a) O = Owners; R = Renters

(b) PY = Permanent Income; CY = Current Income

(c) A-D = Aggregated Data; I-D = Individual Data

(d) N-M = Nonmovers: Households who had not moved within the past 2 years.

R-M = Recent movers: Households who had moved within the past 2 years.

Mixed = Includes movers and nonmovers.

The second measure of permanent income is called an "effective income". This income measure is provided in the United States by FHA (Federal Housing Administration). Since FHA data does not consider income tax earnings or search and record fees by owners, a deflation in the income elasticity estimate is expected to emerge. Both Maisel et al. (1971) and Rosen (1979) have adopted this measure in their estimations. To account for this downward bias, an early suggestion by De leeuw (1971) was made to adjust income elasticity estimates, based on this measure, upward by as much as 40 or 50 percent.

The third measure of permanent income is a "household consumption expenditure on all items". This measure is usually used as a proxy for permanent income in less-developed countries to cope with problems related to data limitations. While Grootaert and Dubois (1988) have based their permanent income elasticity estimates on this measure, Jimenez and Keare (1984) have considered its use in addition to other measures.

Based on the previous argument concerning the relation between housing expenditure and current income, we believe that estimates are biased if calculated using this measure. This is because a household consumption expenditure on all items at a given year is also dependent on transitory income, thus the extent of bias may be said to be related to the strength of this link. Jimenez and Keare (1984) have also pointed to the possibility of correlation between transitory consumption of housing and transitory income because of various capital market imperfections in under-developed economies.

The fourth measure of permanent income is an instrumental variable in the form of "a fitted value from a regression of lagged current income". While Lee and Kong (1977) have relied on this measure for the provision of their estimates, Jimenez and Keare (1984) and Harmon (1988), on the other hand, have considered its employment along with other measures. However, Mayo (1981) argues that because housing consumption does not respond quickly to changes in demand, an upward simultaneity bias in elasticity estimates is to be expected between the error term and this instrumental variable.

The fifth measure of permanent income is "a simple average of past current incomes". Although Carliner (1973), Friedman and Weinberg (1981), and Dynarski (1985) have based their estimates on this measure, Mayo (1977), Jimenez and Keare (1984), and Harmon (1988) have recognized its utilization along with other measures. Harmon (1988) argues that this measure appears to be realistic because it is based on the assumption that past values of current income may adequately represent annual life-time earnings. Harmon also argues that this measure suffers from its failure to capture future changes in household current income.

The sixth measure of permanent income is an instrumental variable in the form of "a fitted value from a regression of current income on its related determinants" such as education, age, occupation,....etc. Similarly, Harmon (1988) considers this measure to be realistic because it is linked with concepts that affect productivity and consequently, a household life-time earnings. In this respect, however, this measure can also be said to suffer from its failure to account for future changes in these factors on such earnings.

(ii) The Recognition of Transaction Costs

The second basic issue of concern in measuring income elasticities of housing demand is associated with the influence of transaction costs on housing consumption decisions. A household movement from one dwelling to another is expensive in terms of time, money, and psychic costs. An

implication of this is that households may not respond frequently to changes in their desired levels of housing consumption and thus, adjustment lags in moving decisions are to emerge. Thus, a downward bias in the value of the income elasticity estimate is more likely to result if calculated from a sample of households with mixed duration. This is because the sample will include households whose socio-economic characteristics might have changed since the time of their movements. If this occurs, measurement errors in explanatory variables of housing demand equations should consequently lead to biased elasticity estimates.

Income elasticity estimates reported by both Ihlanfeldt (1981) and Harmon (1988) support this argument. Their estimates were found to be higher for recent movers as compared to nonmovers or those with mixed duration (see table 1). But, as table 1 also indicates, Dynarski (1985) has found that the variations in income elasticity estimates were not significant and thus, a vigorous support for this argument can not be based on his findings. However, to cope with a possible source of bias, Maisel et al. (1971), Muth (1974), Rosen (1979), Polinsky and Ellwood (1979), and Friedman and Weinberg (1981) have confined their estimates of income elasticity to samples of recent movers.

At this junction, we should also point out that most authors in table 1 have used the double-log form for their housing demand equations (15 of the listed 19), although the linear and semi-log forms were also employed. There appears to be a general consensus among writers, however, that elasticity estimates do not vary significantly according to the functional forms employed. However, the log-linear form has the added advantage that its estimates of income elasticity remain constant over its whole range, and is, therefore, equal to the estimated income variable's parameter.

The debate over how to deal with the effect of demographic characteristics in housing demand equations has received a similar concern as that associated with the selection of functional forms. Demographic variables such as household size, the age of the head of the household, and household race were usually included as dummy variables and not as stratification factors in most previous investigations. This has led to diverse conclusions with regard to the effects of such factors on housing demand. For the formulation of efficient housing policies, relative preferences for groups of different demographic characteristics should be tested. Consequently, this issue must receive more attention.

Two main conclusions are to be drawn from our review of past studies. First, there seems to be no single estimate of the income elasticity, and estimates for owners are generally higher than those for renters. As table 1

shows, the range of estimates is rather large, extending from 0.21 to 1.4 for owners and from 0.08 to 0.69 for renters. This can be mainly related to differences between studies with regard to the measure of income employed, specification and sampling techniques used, and the various needs and aspirations of households at different housing markets. Second, there seems to be a general agreement among writers, however, that the income elasticity of demand for housing is less than one. As table 1 indicates, the majority of estimates range from 0.45 to 0.81 for owners and from 0.35 to 0.54 for renters. This implies that the housing commodity is a "necessity".

III. DATA BASE AND ESTIMATION METHOD

Before proceeding to the description of our sampling technique, it is worth pointing out that the rapid economic expansion following the oil boom of the 1970's brought with it a dramatic increase in employment opportunities and, consequently, a rapid population and urban growth to the city of Jeddah. For example, the 1980 socio-economic survey carried out by Sert Jackson International Company had reported a 53.68 percent change in population size during the 1974-78 period (from 595,900 in 1974 to 915,800 in 1978). This can be mainly related to immigration from overseas, although an internal migration into the city had occurred as well during the same period. The dramatic migration into the city must have continued as the present official figure by government indicates a population size of nearly 2 million inhabitants for Jeddah. Thus, the city can be said to be one of the most rapidly growing urban areas in the world. This had led to the formation of new houses and districts (23 of the current 49). Consequently, obvious differences in quality between dwellings and neighborhoods had emerged as one major distinctive feature of the housing market of Jeddah.

On the other hand, casual observations to the newly developed districts strongly suggest that rented flats continue to comprise the highest proportion of the present total housing stock of Jeddah as it was the case in 1980 (The Jackson survey indicates that 54.3 percent of the 1980 total housing stock were flats). Unlike other dwelling types (Shaabi, Villas, and Palaces), rented flats differ, to a great extent, in quality and are very well distributed over the urban area of Jeddah. This allows us to examine the influence of various characteristics of both dwelling and neighborhood on the estimation of the income elasticity. Furthermore, residents of flats represent more diversified socio-economic groups. This also permits us to examine the impact of nationality on the calculation of demand elasticities. On the basis of all previous reasons, our sample was confined to

households who had recently moved (during the past 12 months before the interviews) to rented flats.

This empirical analysis of housing demand in Jeddah is carried out on the basis of information collected by means of individual interviews with 401 households. These households were living in rented flats at various locations of the city during January-February, 1994. A simple survey data was necessary because a systematic collection of information on housing stock and neighborhoods are simply not available. In developed countries, even when published data on housing and its related factors are available, however, they usually suffer from different limitations and can not provide all information a researcher wishes to consider with regard to addressing particular issues.

In this study, however, the types of rented flats sampled can be classified according to our suggested quality aspects as poor, fair, and super. A rented flat was considered "poor" if it had defects or weaknesses in its outside or inside structure such as damaged windows or doors. For a "fair" flat, defects or weaknesses in its outside or inside structure did not exist, but it was, however, built using lower quality construction materials and luxury services than those associated with a super flat. Finally, a "super" flat was one without any defects and built using the most permanent and highest quality construction materials such as enforced concrete, marble, mahogany doors, high quality ceramics and tiles..., etc. Furthermore, a super flat was one which had luxury services such as installed central airconditioning and a private bath to its master bedroom.

To obtain the required data, a 1990 map of Jeddah by Farsi, Z. (1990) was utilized as the sampling frame of this study. According to the map, it is quite easy for those who are familiar with Jeddah to be able to classify its neighborhoods, according to quality, into poor, fair, and super. A neighborhood was considered "poor" if it had narrow local streets which provide less access to both main roads and parking spaces to its residents, a majority of old dwellings, and mostly occupied by lower income groups. A neighborhood was considered "fair" if considerable numbers of dwellings of different ages were to be found, local streets were generally wider as compared to those of poor neighborhoods to allow for more access to both main roads and parking spaces, older shopping centers as compared to those of super neighborhoods, and were mostly occupied by middle income households. Finally, a neighborhood was considered "super" if it generally had wider local streets as compared to those of fair neighborhoods to allow for more access to both parking

spaces and main roads to their residents, a majority of new dwellings, modern shopping centers, play spaces for children, and were mostly occupied by higher income groups.

However, all districts on the map were grouped according to the three measures of neighborhood quality previously defined. Each neighborhood type can be viewed as a stratum composed of homogenous districts, which were treated as clusters. Consequently, a two-stage disproportional stratified cluster sampling technique was then employed to withdraw our random sample of households from these clusters. It is worth pointing out that similar sampling procedures to this one were developed by the same author for two earlier housing studies of different analytical purposes. However, in this present study, as it was the case in each of our two previous applications, sampled dwellings were selected from different localities.

In the first stage of this study, 5 clusters from each stratum were chosen. The selection of each sample of clusters was carefully made to raise adequacy of what could be a representative cluster to each stratum. It should be pointed out that these clusters are of various degrees of variability to the three different quality types of rented flats selected for sampling. Table 2 summarizes the first stage of our sampling technique. The table shows that 30.61 percent (15/49) of all districts in the city were sampled.

TABLE 2
Sampling Technique in the First Stage

Stratum	Clusters in Map		Clusters in Sample			Main Concentrated Quality Types of Rented Flats
	No.	% of total	No.	% of total	% of total sampled	
Poor	15	30.61	5 ⁽¹⁾	33.33	33.33	Poor. Fair
Fair	11	22.45	5 ⁽²⁾	45.45	33.33	Poor. Fair, Super
Super	23	46.94	5 ⁽³⁾	21.74	33.33	Fair, Super
	N = 49		n = 15			

(1) Waziriah, Shuhadaa, Ghulil, Nazla yamaniah, and Kundarah.

(2) Nazla Shargiah, Baghdadiyah Shargiah, Sharafiah, Rawabi, and Mashrafah.

(3) Sulaimania, Shati, Khaldia, Rawadah, and Safa.

As can be shown from the last column of table 2, two or three subsamples should be drawn in accordance with the degree of variability of the main quality types of concentration in each stratum. In the second stage, however, 70 households from each subsample were intended to be interviewed. The choice of this size was made to obtain representative subsamples of reasonable sizes. Table 3 summarizes both structure of target and achieved samples that had resulted from the two stages.

TABLE 3
Sampling Technique in the Second Stage

Stratum	Target Sample Structure				Achieved Sample Structure							
	Poor	Fair	Super	Total	Poor		Fair		Super		Total	
	No.	No.	No.	No.	No.	% Non Response	No.	% Non Response	No.	% Non Response	No.	% Non Response
Poor	70	70	-	140	62	11.43	55	21.43	-	-	117	16.43
Fair	70	70	70	210	52	20	59	15.72	61	12.86	172	18.10
Super	-	70	70	140	-	-	57	18.57	55	21.43	112	20.00
All Strata	140	210	140	490	114	18.57	171	18.57	116	17.14	401	18.16

As table 3 shows, the degree of response in each of our subsamples are very high. Thus, in this survey for Jeddah, response errors are left with a minimal influence, if any, to affect the accuracy of our estimates. An examination of table 3 indicates that the overall achieved sampling units form 81.84 percent (401) from the total targeted (490).

Since housing is a highly heterogenous commodity, the measurement of units of housing presents considerable problems. In most housing demand studies, the use of an expenditure (rental value or price) measure to express quantity is generally adopted on the assumption that price per unit of housing is constant for the whole sample. It should be noted that four functional forms for our housing demand equation were attempted. These were linear, double-log, semi-log, and exponential. Our selection of a double logarithmic (for dependent and independent variables) form was simply because it provided the best fit. However, logarithmic forms also have proved to reduce heteroscedasticity in cross-sectional analysis.

Our double-log housing demand equation takes the following form

$$\text{Log}(TAE) = a_0 + a_1 \log(HPY) + a_2 \log(HHSIZE) + a_3 \log(AGEHDH)$$

Where a_1 , a_2 , and a_3 , are elasticities of housing demand with respect to permanent income, household size, and the age of the head of the household, respectively.

The dependent variable is the total annual expenses of each rented flat (TAE). This includes yearly rental value plus other expenses, if any, of maintenance, repairs, and security in Saudi Riyals. De leeuw (1971) argues that a separation between yearly rental values and annual expenses is to be considered because annual expenses suggest to represent a declining proportion of rental values as those values rise. Thus, estimates based on yearly rental payments need to be deflated if they are to be compared with estimates based on total annual expenses. In this respect, this study represents an improvement over many previous applications because it recognizes the distinction between yearly rental values and annual expenses as a measure of housing consumption. This study also recognizes the importance of transaction costs in housing consumption decisions and thus, the equilibrium assumption of cross-sectional demand analysis. Hence, our sample was restricted to households who had recently moved to their rented flats (movements should have occurred during the past 12 months before the interviews).

The first independent variable is the household permanent income (HPY) in Saudi Rials. Following a considerable number of past studies (see section II), our permanent income measure was calculated as a simple average of all members' estimated yearly current income for the past 5 years (1989-1993). This variable is expected to be positively related to housing demand. The second independent variable (HHSIZE) is the household size as reflected by the total number of its members. This variable is expected to have a positive relation with housing demand. This is because a household is usually expected to raise its level of housing consumption as the total number of its members increases. The third independent variable (AGEHDH) is the age of the head of the household. This variable is also expected to be positively related to housing demand. A reasonable explanation of this is that as the head of a household ages,

the positive wealth effect is being captured and hence, housing consumption increases.

Our estimation of housing demand elasticities are given in the next section. Section IV provides estimates on the basis of the full sample as well as on six stratified subsamples by means of ordinary least squares. Separate estimates are also presented for Saudi households.

IV. THE EMPIRICAL RESULTS

Table 4 provides the results to our estimation of the housing demand function for rental-occupied dwellings in Jeddah. This was done for the full sample as well as for six stratified subsamples. Four points may be drawn by examination of the estimated equations. First, each of the listed explanatory variables has its expected positive sign and passes at least one of the three levels of significance described by footnote b of table 4. Second, the significance of the independent variables depends, to a great extent, on their nature. The permanent income variable (HPY) was found to be the most highly significant, followed by the household size variable (HHSIZE) and the age of the head of the household variable (AGEHDH), respectively. In fact, all versions of the regression equations indicate that the permanent income variable is significant at 0.01 level. Third, the overall statistical significance of our estimated housing demand equations is quite satisfactory. The value of R^2 as a goodness of fit measurement are reasonable (range from 0.546 to 0.682), bearing in mind that our data are micro (individual) in nature and cross-sectional in character. Also, all values of F-statistics (as another goodness of fit measurement) are highly significant, allowing us to reject the hypothesis that in any equation all explanatory variable coefficients are jointly equal to zero. Thus, our selected explanatory variables can be said to account for a substantial amount of the variation in housing demand. Fourth, the demand for rental housing in Jeddah is found to be inelastic with respect to permanent income, household size, and the age of the head of the household. Because of the utilization of a double-log functional form, demand elasticities can be observed directly and are equal to the values of the parameter estimates.

TABLE 4
Renter Demand Regressions: All Households

Variables ^(a)	OLS Regression Coefficients (Standard Error) (t-statistic) ^(b)						
	Quality of Dwellings			Quality of Neighborhoods			
	Poor (1)	Fair (2)	Super (3)	Poor (4)	Fair (5)	Super (6)	All (7)
Constant	1.935 (0.223) (8.677)*	2.640 (0.218) (12.110)*	2.372 (0.249) (9.526)*	2.149 (0.324) (6.632)*	2.563 (0.157) (16.324)*	2.079 (0.246) (8.451)*	2.250 (0.144) (15.625)*
HPY	0.363 (0.038) (9.552)*	0.495 (0.038) (13.026)*	0.732 (0.062) (11.806)*	0.351 (0.026) (13.500)*	0.477 (0.044) (10.840)*	0.802 (0.084) (9.547)*	0.519 (0.042) (12.357)*
HHSIZE	0.330 (0.071) (4.647)*	0.136 (0.056) (2.428)*	0.205 (0.121) (1.694)**	0.132 (0.095) (1.389)*	0.247 (0.048) (5.143)*	0.228 (0.084) (2.714)*	0.210 (0.080) (2.625)*
AGEHDH	0.112 (0.078) (1.435)+	0.053 (0.034) (1.558)+	0.059 (0.024) (2.458)+	0.092 (0.041) (2.243)**	0.085 (0.033) (2.575)*	0.051 (0.037) (1.378)+	0.072 (0.035) (2.057)**
Observations	114	171	116	117	172	112	401
R ²	0.651	0.637	0.546	0.563	0.682	0.598	0.612
F	27.921	24.580	19.663	20.582	35.832	20.077	48.261
(Degrees of Freedom)	(3,110)	(3,167)	(3,112)	(3,113)	(3,168)	(3,108)	(3,397)

(a) Dependent and all independent variables are in logarithmic forms.

(b) * indicates a level of significance of 0.01.

** indicates a level of significance of 0.05.

+ indicates a level of significance of 0.10, one-tailed test.

The most striking feature of the empirical findings in table 4, however, is associated with the impact of quality measures on the magnitude of the income elasticity. Although our results reveal an income elasticity estimate of 0.519 for the full sample, considerable variations are found to exist between the different stratified subsamples. These differences stem largely from the changes in quality measures (dwelling or neighborhood) employed in our analysis. As higher measures of dwelling quality are considered, an increase in the magnitude of the income elasticity (from 0.363 in eq. 1 to 0.732 in eq.3) is observed but its value remains below one. Similarly, as higher concepts of neighborhood quality are considered, an increase in the value of the income elasticity (from 0.351 in eq. 4 to 0.802 in eq. 6) is also noticed, but its value still remains below unity. These results imply that housing in Jeddah, as it was found to be the case in most previous studies, is a "necessity". However, our findings suggest that more cautions should be given to this interpretation. Rental housing demand in Jeddah is more responsive to changes in permanent income when quality concepts (dwelling or neighborhood) vary. As lower concepts of quality are considered, housing can be viewed as a necessity of higher degree. Similarly, housing commodity can also be viewed as a necessity but to a lesser extent when higher quality measures are considered. This is because it no longer reflects the basic need to provide a shelter.

On the other hand, housing consumption for our full sample of renters was found to be positively related to both household size and the age of the head of the household. These relationships are quiet realistic. Higher levels of housing consumption are to be expected as a result of larger household sizes. Similarly, as the head of the household ages, the positive wealth effect is to be captured. Based on our full sample, housing demand elasticities with respect to both household size and the age of the head of household were found to be 0.210 and 0.072, respectively. Slight variations in the measurement of these elasticities were found to occur between the different subsamples. However, these trivial variations were not found to follow a similar systematic pattern of change with regard to our various quality concepts.

Past applications usually use dummy variables to account for effects of race or nationality on demand elasticity estimates. In our study, this demographic effect is addressed more appropriately than many of the previous investigations as separate results for Saudi households are presented in table 5. It should be noted that the percentage of Saudi households (as can be reflected by both tables 4 and 5) was found to account for 42.89 percent of the full sample. The percentages of Saudi households in all stratified subsamples, however, were found to range between 39.77 (in fair quality dwellings) to 46.43 (in super quality neighborhoods). This is because Saudi households usually concentrate in other dwelling types (particularly villas). As table 5 shows, similar results are found to exist in the renter demand regressions for Saudi households. Four points may also be made from an examination to the set of housing demand equations in table 5. First, each of our defined independent variables was found to have its expected positive sign and passes at least one of the three levels of significance described by footnote b (with the exception of HHSIZE in equation 4 and AGEHDH in equations 1 and 6). Second, and related to the previous point, the permanent income variable (HPY) was found to be the most highly significant followed by the household size variable (HHSIZE) and the age of the head of the household variable (AGEHDH), respectively. Also, all t-statistics of the permanent income variable proved to be significant at 0.01 level in all specified equations. Third, the statistical significance of our housing demand equation as reflected by R^2 values as a goodness of fit measurement is quite sensible, bearing in mind the nature of our data (individual) and the character of our analysis (cross-sectional). Furthermore, all values of F-statistics (as another goodness of fit measurement) permit us to reject the hypothesis that in any estimated equation all explanatory variable coefficients are jointly zero. Thus, our explanatory variables can be said to account for a substantial amount of the variation in housing consumption for Saudis. Fourth, the demand for rental housing for Saudis was also found to be inelastic with respect to permanent income, household size, and the age of the head of the household.

TABLE 5
Renter Demand Regressions: Saudi Households

Variables ^(a)	OLS Regression Coefficients (Standard Error) (t-statistic) ^(b)						
	Quality of Dwellings			Quality of Neighborhoods			
	Poor (1)	Fair (2)	Super (3)	Poor (4)	Fair (5)	Super (6)	All (7)
Constant	3.139 (0.586) (5.356)*	2.819 (0.329) (8.568)*	2.738 (0.343) (7.982)*	2.853 (0.359) (7.947)*	2.709 (0.312) (8.682)*	1.839 (0.346) (5.315)*	2.581 (0.236) (10.936)*
HPY	0.382 (0.049) (7.795)*	0.417 (0.051) (8.176)*	0.599 (0.060) (9.983)*	0.401 (0.033) (12.151)*	0.433 (0.042) (10.309)*	0.603 (0.085) (7.094)*	0.465 (0.052) (8.942)*
HHSIZE	0.201 (0.048) (4.187)*	0.098 (0.054) (1.814)**	0.115 (0.055) (2.090)**	0.091 (0.082) (1.109)	0.226 (0.072) (3.139)*	0.215 (0.033) (6.515)*	0.157 (0.056) (2.803)*
AGEHDH	0.090 (0.074) (1.216)	0.076 (0.045) (1.688)**	0.074 (0.041) (1.804)**	0.0108 (0.048) (2.250)*	0.099 (0.031) (3.193)*	0.075 (0.067) (1.119)	0.083 (0.049) (1.693)**
Observations	51	68	53	48	72	52	172
R ²	0.522	0.584	0.503	0.496	0.615	0.487	0.534
F	10.558	15.927	9.662	9.445	17.183	9.115	18.228
(Degrees of Freedom)	(3,47)	(3,64)	(3,49)	(3,44)	(3,68)	(3,48)	(3,168)

(a) Dependent and all independent variables are in logarithmic forms.

(b) * indicates a level of significance of 0.01.

** indicates a level of significance of 0.05.

+ indicates a level of significance of 0.10; one-tailed test.

The results in table 5 are strikingly similar to those in table 4 with regard to the impact of quality measures on the estimation of the income elasticity. Although our findings reflect an income elasticity of 0.465 for the whole Saudi sample of renters, sizable differences are found to occur between its six stratified subsamples. These differences are to be mainly attributed to the various quality aspects (dwelling as well as neighborhood) used in our estimation. Higher aspects of dwelling quality are found to inflate income elasticity values for Saudi households (from 0.382 in eq.1 to 0.599 in eq.3). Similarly, higher aspects of neighborhood quality seem to enhance income elasticity estimates for this group of households (from 0.401 in eq. 4 to 0.603 in eq. 6). Thus, it can still be argued that the magnitude of the income elasticity of housing demand for Saudi renters is highly sensitive to changes in quality aspects. For this group of renters, the housing commodity can also be viewed as a necessity. In short, the degree of this necessity decreases/increases as dwelling or neighborhood quality concepts increases/decreases. Demand elasticities with respect to both household size and the age of the head of the household variables for the full Saudi sample were estimated to be 0.157 and 0.083, respectively. Small differences with regard to both of these elasticities were also found to exist between the various subsamples linked with this group of households. However, different quality aspects do not seem to produce systematic changes in the values of these elasticities similar to those associated with the income elasticity.

A second striking feature of our empirical results can be obtained by setting the income elasticity estimates of both tables 4 and 5 for comparability. In general, the value of the income elasticity for the full Saudi sample (0.465) is found to be lower than that calculated for the whole sample (0.519). Likewise, the estimated income elasticity of each Saudi subsample in table 5 is also found to be less than that of its corresponding subsample in table 4 (with the exception of both the poor quality dwelling and the poor quality neighborhood subsamples). Thus, when quality measures are held constant, our results indicate that housing can generally be viewed as a more important commodity to Saudi as compared to non-Saudi renters. The validity of this argument, however, gains more strength as higher quality aspects (dwelling or neighborhood) are considered.

To conclude, the income elasticity of demand, derived from our full sample (0.519) is within the range (0.08 to 0.69) of income elasticity

estimates for renters elsewhere (see table 1). Also, our estimate is within the range (0.35 to 0.54) of the majority of renter estimates. Although this consistency with most previous findings raises confidence in our results, there is no reason to expect similar income demand elasticities because local housing markets for both renters and owners are quite distinct.

V. SUMMARY AND CONCLUSIONS

Frequent and rapid changes in population growth as a consequence of immigration is a distinctive feature of the housing market of Jeddah, Saudi Arabia. This had led to the formation of new houses and districts. At present, dwellings and neighborhoods in the city are of diverse quality aspects. It is important, thus, to bear this in mind when representative samples are to be drawn from the housing market of Jeddah.

This study has provided empirical evidence on housing demand by looking specifically at the influence of both dwelling and neighborhood quality concepts on the determination of the income elasticity for renters in Jeddah. The results indicate that for a range of various housing quality measures, the income elasticity is estimated to be well below one. Thus, one should conclude that housing in Jeddah is a necessity and this should be incorporated into policy makers' planning decisions. However, our suggested quality concepts were found to exert sizable differences on the magnitudes of the estimated income elasticities. Higher income elasticity estimates are found to be associated with higher quality measures and vice versa. This reflects households' responsiveness to improvements in quality aspects and this should also be incorporated into the debates on housing policy issues.

Similar results for Saudi renters have also emerged. However, the income elasticity estimate for Saudis (0.465) was found to be generally less than that for the whole sample (0.519). This was also true in almost all stratified housing demand subsamples. It implies that housing is more important to Saudi as compared to non-Saudi households, and thus another result of particular relevance to government housing policy issues has emerged.

The demand for rental housing in Jeddah was also found to be inelastic with respect to both demographic variables (HHSIZE and AGEHDH). Coefficients for both of these variables are not found to differ significantly, but these remain positive across all stratified subsamples.

To conclude, it is worth pointing out that our income elasticity estimates

are believed to be reliable. They appear to be relatively free of major biases. This is because they are based on an appropriate measure of permanent income, individual data, an estimation method that takes account of the distinctive quality features in the housing market of Jeddah, and restricted to households who had recently moved. Finally, data collection effort with regard to housing should be subject to remarkable improvements if the estimation of enhanced housing models are to be carried out for Saudi Arabia in the future.

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The Impact of Dwelling and Neighborhood Quality Aspects on the Estimation of the Income Elasticity of Demand for Rental Housing in Jeddah, Saudi Arabia

Mohammad M. Gandil
King Abdul-Aziz University

This study provides new evidence on the estimation of the income elasticity of demand for rental housing based on individual interviews with 405 households. It looks specifically at the impact of both dwelling and neighborhood-quality aspects on the evaluation of this elasticity. The study finds that the income elasticity of demand for rental housing in Jeddah is 0.519. When the sample is restricted to include Saudi households only, the elasticity estimate is 0.465. These values are within the range of previous empirical estimates. The results also indicate that for a range of various quality measures, the income elasticity is estimated to be less than unity. But, our suggested quality aspects were found to exert sizeable differences on the magnitude of this elasticity for the full sample (from 0.351 to 0.802) as well as for the Saudi sample (from 0.382 to 0.603). Stratified income elasticity estimates for Saudis were also found to be generally less than those for the whole sample.
