TABLE 5

Elements of the Housing Characteristics

Basic Structure (*BSTRUK*)	Interior Quality (*QUAL*)	Interior Space (*SPACE*)[a]	Site (*SITE*)[a]
FULLIN	*HARDWD*	*SQFT*	*SIZLOT*
*GARG*1	*FIREPL*	*SQFTSQ*	*SZLOT*2
*GARG*2	75+*AMP*	*SQFTIR*	*DISCBD*
2+*BATH*	*STEAM*	*SMROOM*	*GEN Q*
LAVTRY	*EXCLNT*	*FINBMT*	*SRVCE*
BLAUND	*VGOOD*	*NOBMT*	*GARBGE*
	FAIR	2*STORY*	*CSEWER*
	FACBSS		
	FACASB		
	AGE		
	AGESQ		

[a] The intercept term is allocated 80 per cent to *SPACE* and 20 per cent to *SITE*.

construction here adds the additional constraint that Interior Space is amalgamated entirely from items purchased as part of the housing bundle. Conceivably, items like room dividers or mirrors are also a part of Interior Space. Third, what to do with the equation intercept is a problem in constructing these gross components. Here it has been allocated 80 per cent to *SPACE* and 20 percent to *SITE*, in accordance with the ratio of structure to site value suggested by Housing and Urban Development (HUD) statistics (1970, p. 198). This can be justified by observing that the intercept is the value of structure and site after all special quality features and location advantages are stripped away. Admittedly, this is not entirely satisfactory, but there is no alternative which seems clearly better.

The price indexes for the four gross characteristics in each town are shown in Table 6. To obtain these, I have specified a standard housing bundle and have then calculated the cost of characteristics by summing the costs of the individual elements as given in Table 4. Finally, each entry has been normalized by dividing by the cost of *SPACE* in New Haven.

TABLE 6

Price Indexes for Housing Components [a]

	New Haven	Hamden	North Haven	East Haven	West Haven	Orange/ Woodbridge	Walling-ford
BSTRUK	.37	.79	.79	.57	.53	.55	.48
QUAL	.88	.78	.77	.48	.86	.81	.66
SPACE	1.00	1.22	1.44	1.21	1.06	1.82	1.49
SITE	1.63	.85	.42	.66	.99	.36	.47

[a] The standard bundle from which these were derived included *FULLIN*, *GARG*2, 2+*BATH*, 2*STORY*, *HARDWD*, *FIREPL*, 75+*AMP*, *EXCLNT* condition, 1 decade *AGE*, 1,420 *SQFT*, 20,000 *SIZLOT*, *GENQ*, and *SRVCE* of −.5 each. Distance from the CBD is an approximate median distance for the town as a whole. In the demand functions of Section V, the price of *SITE* is calculated for each house, according to the distance of that house to the CBD. Thus, the entries for *SITE* here are only illustrative.

VII. THE DEMAND FOR HOUSING CHARACTERISTICS

Using the hedonic prices obtained in the previous section to describe housing price surfaces in the metropolitan area and to construct the gross housing characteristics, I can now inquire whether household behavior corresponds to that predicted. The first question is whether households appear to view housing as a bundle of characteristics and modify their purchases in response to price and outlay variations. If they do, I can continue to the second aspect and investigate location choice as an interaction of prices, work site, and neighborhood quality.

To study the household's purchases of housing characteristics, I use the Rotterdam differential demand model of Barten (1964, 1967) and Theil (1965) with slight modifications as required for application to cross-sectional data and a single demand branch.[27] The resulting equations are of the form

$$w_j^* Dq_{ij} = \mu_i D\bar{m}_j + \sum_h S_{ih} Dp_{hj} + u_{ij}$$

$$h, i = 1, 4$$
$$j = 1, n \text{ households}$$

[27] The material in this section draws heavily on my paper "The Demand for Housing: A Lancastrian Approach" (1973b) and the reader is referred to it for additional details.

Here the q's and p's are the four characteristics identified in the previous section and their prices. The term $\bar{m}$ is the real outlay on the housing bundle and replaces an income term because of the assumed separability. The operator D indicates the logarithmic difference $\ln x - \ln \bar{x}$ where $\bar{x}$ is the mean value of the particular data series. Finally, $w_j^* = [(w_{ij} + \bar{w}_i)/2]$, where w_{ij} is the ith budget share $p_i q_{ij}/m_j$ for the jth household and $\bar{w}_i$ is the mean value of the ith budget share.

The "outlay" and price elasticities indicating household behavior are readily obtained from the parameters μ_i and S_{ih}. The former is defined as $\frac{\partial q_i}{\partial m}\frac{m}{q_i}\frac{q_i p_i}{m}$; the latter, as $\frac{\partial q_i}{\partial p_h}\frac{p_h}{q_i}\frac{q_i p_h}{m}$. Thus, deflating both by the budget share will yield the derived elasticities.[28]

The u_{ij}'s are random disturbance terms for which we assume $E(u_{ij}) = 0$ for all i and j; $E(u_{ij}, u_{hk}) = 0$ for $j \neq k$; but $E(u_{ij}, u_{hk}) \neq 0$ for $j = k$; $i, h = 1, 4$. That is, the errors are uncorrelated across observations but correlated for the purchases of each household as a consequence of the overall restriction on the housing outlay. It follows from this restriction that the covariance matrix of the error terms is singular, and all four demand equations are not independent.

The assumption of separability permits the demands for the four housing characteristics to be studied as a small, independent demand system. As is well known, classical demand theory implies certain restrictions on the parameters of such complete systems: symmetry of cross-price terms in real-income-compensated functions, homogeneity, and negative own-price elasticities. One of the great advantages of the Rotterdam model is the ease with which these restrictions may be imposed (Brown and Deaton, 1972, p. 1190), and because this increases efficiency, I impose symmetry and homogeneity.[29]

To impose restrictions across equations, parameters of the demand system are estimated simultaneously in a "stacked" equation, using the iterative Zellner estimation procedure (1962) to allow for the nonzero covariances of the error terms. Because the error covariance matrix is singular, only three of the four individual demand functions need actually be estimated; parameters of the other are recovered from these, using the budget constraint, symmetry, and homogeneity.[30] The estimated parameters are given in Table 7 and the elasticities at the mean budget shares in Table 8.

[28] The elasticity is, of course, not constant but depends inversely on the budget share.

[29] Negativity, as an inequality constraint, is not readily imposed, but the condition may be used to evaluate the estimates.

[30] The estimates obtained are invariant with respect to the equation omitted.

TABLE 7

The Demand Parameters for Housing Characteristics

Independent Variables	Dependent Variables			
	BSTRUK	*QUAL*	*SPACE*	*SITE*
OUTLAY	.2400	.3415	.3163	.1022
	(31.94)[a]	(36.11)	(35.73)	(19.06)
PSTRUK	−.0172	.0076	−.0343	.0439
	(1.77)	(.86)	(4.15)	(10.32)
PQUAL	[b]	−.0370	.0096	.0198
		(1.85)	(.71)	(2.52)
PSPACE			−.0712	.0959
			(1.49)	(16.37)
PSITE				−.1596
				(13.29)
R^2	.56	.67	.68	.85

NOTE: Definition of variables:

BSTRUK, *QUAL*, *SPACE*, *SITE* — These are the four Lancastrian characteristics defined in Table 5.

PSTRUK, *PQUAL*, *PSPACE*, *PSITE* — These are the prices for the four characteristics. The method of calculation is explained in Section VI and sample values are shown in Table 6.

OUTLAY This is the real value of the outlay on the housing bundle.

All variables are measured in natural logarithms and used as deviations from mean values as required for the Rotterdam model.

[a] *t* values in parentheses.

[b] Values below the diagonal are obtained from the symmetry condition.

TABLE 8

Elasticities at Mean Budget Shares

	BSTRUK	*QUAL*	*SPACE*	*SITE*
Outlay	2.06	1.71	.65	.52
Own-price	−.15	−.19	−.15	−.82

As evidence that households perceive housing as a bundle of components and modify purchases in response to prices and outlay, these results seem quite satisfactory. The R^2 for each demand function is quite high, especially considering that units of observation are individual households in cross section. All own-price elasticities are negative; cross-price coefficients indicate *BSTRUK* and *SPACE* to be complements, *QUAL* and *SPACE*, and *SPACE* and *SITE* to be substitutes, all of which seem reasonable. Purchases of quality and special structural features are highly responsive to increased outlay and thus, by implication, to income. Interestingly, the marked increase in *SITE* purchases in the outlying markets of the area appears to result more from decreased prices than from increased income.[31]

VIII. TRADING OFF COMMUTING COSTS, PRICE STRUCTURES AND NEIGHBORHOOD QUALITY

I come now to consider evidence relevant to the first part of the housing demand model set out in Section II. There it was suggested that because location is an integral aspect of a dwelling unit the decision to purchase would involve considerations of the implied journey-to-work costs, the neighborhood quality obtained, and the set of relative prices for housing characteristics. While the evidence for this portion of the model is still incomplete, there are certain regularities discernible even in simple examination, which are quite encouraging.

The method in this section will be the examination of the actual locations chosen by households for evidence that they can be explained as optimal compromise locations given the work sites, neighborhood qualities, and price patterns. From the previous section, it appears that households behave as though they perceive price variations for housing characteristics among the various submarkets. Thus, if place of work and neighborhood quality were no consideration, it would be reasonable to predict that a household would purchase its dwellings in that submarket where the particular combination of characteristics is lowest priced. To test this, I have calculated, for

[31] There are, however, reasons to doubt the precise accuracy of the estimates despite the generally high t statistics. First, the determination of prices in hedonic equations will create some problems of measurement error resulting in bias. Second, the households have the alternative of selecting their budget constraint by moving among markets; thus, the estimates of price response cannot be treated as exactly comparable to the parameters in most demand studies. It should be emphasized, however, that households are not likely to choose a location on the basis of prices alone, since location will affect the journey-to-work and neighborhood quality also. These latter two influences will help reduce bias from this second source.

TABLE 9

Distribution of Housing Purchases by Relative Cost of Market
(per cent)

Town	Low Cost← 1	2	3	4	5	→High Cost 6	7
New Haven	24	16	18	11	7	13	10
Hamden	20	26	18	11	6	10	9
North Haven	20	26	18	11	6	10	9
East Haven	18	12	14	18	18	19	2
West Haven	33	19	12	9	10	11	6
Woodbridge-Orange	2	18	9	25	22	16	8
Wallingford	19	20	13	18	18	7	5

NOTE: The entries in this table show for each submarket (town) the percentage of purchases for which this market was the cheapest, second cheapest, etc. For example, of the houses purchased in New Haven, for 24 per cent New Haven was the cheapest market for this type of dwelling; for 10 per cent, it was the most expensive. Percentages may not add to 100 because of rounding.

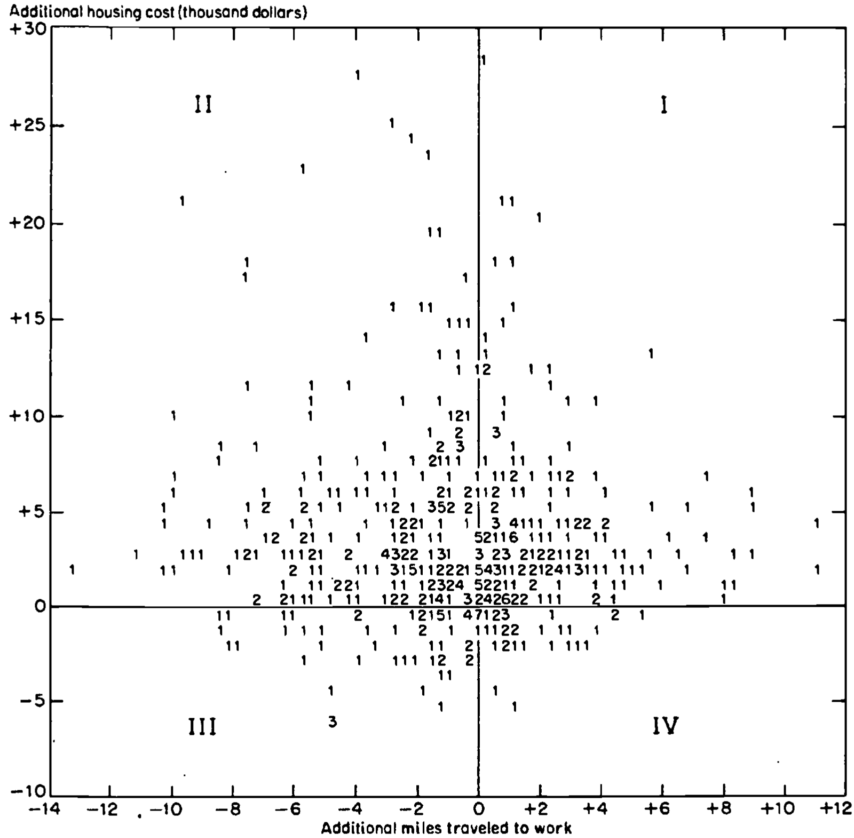
every dwelling actually purchased, its cost in every submarket at the prices prevailing there.

The results are shown in Table 9 as the number of times a dwelling purchased in, e.g., New Haven was purchased in the cheapest, second cheapest, and so on, market in the area. Without making any formal tests, it is apparent that households do not concentrate to any extent in the lowest cost market for their particular dwelling. There is some tendency to buy in the cheaper markets and only rarely do households buy in the highest-cost market. An indication of this is that the mean excess of actual price over lowest possible price is $3,700, while the mean excess of highest price over actual price is $6,100. Overall, however, it is apparent that predicting household location on the basis of where the observed dwelling is cheapest would be quite unsatisfactory.

The question now becomes whether the tendency of households to locate in other than the cheapest market can be explained in terms of the additional goals of low commuting costs and neighborhood quality. The tradeoff of a lengthier work trip for lower housing prices has a venerable standing in the urban economics literature. Although the cost variations for housing examined in this study arose for different

FIGURE 1

Plot of Additional Miles Traveled to Work against Additional Housing Cost



reasons than are usually suggested, the rationale for the tradeoff is the same, and I begin by looking at this.

In Figure 1, the additional dollar cost incurred by purchasing in other than the lowest-cost market is plotted against the difference in the journeys-to-work from the two markets.[32] If households recog-

[32] The number of households examined in Fig. 1 and subsequent Table 10 is only 538 compared to the 683 studied in the demand analysis. For some households, job sites were unknown or outside the area studied; in addition, efforts were made to

nize low-cost markets but accept higher prices to achieve a more desirable commuting trip, the points should lie in quadrants II and IV.[33] It is evident that this clustering does not exist, though more observations lie in II and IV – 292 – than in I – 199. (In addition, there are 60 observations enjoying the double bonus of quadrant III.)[34]

At this point it appears that the hypothesis of an exchange of commuting cost for housing cost must either be abandoned as a rather imprecise description or amended by the introduction of a third goal, the search for neighborhood quality being that suggested. To examine this possibility, I show in Table 10 average excess commuting trips, excess costs, and excess neighborhood quality[35] by income classes for the observations in each quadrant of Figure 1.

The results are quite remarkable. In comparing quadrant I to II, notice that in every income class the neighborhood quality obtained by households in I (henceforth "I's") exceeds that of II's by a wide margin. With one exception where it is equal, the quality available to I's in the low cost market is substantially less than that available to II's. Thus, whereas II's in their choice of location have sacrificed little if any quality (the entries in the "Excess *GEN Q*" are usually small), I's have obtained much greater quality by foregoing the low-cost market. The cost of this to I's appears to be the longer commuting trip both in absolute distance and relative to the commuting trip from the low-cost market.

For the entries in quadrants III and IV, one's expectations from the hypothesis of tradeoffs are not so clear. There would seem to be no reason why the double bargains in III might not be triple

exclude all self-employed persons who might work in their own homes and such persons as traveling salesmen.

The calculation of the hypothetical work trip from the low-cost market is somewhat crude. Whereas the actual work trip was calculated quite precisely, the hypothetical trip was assumed to begin from a central location in each market. Markets are small (rarely more than two miles in diameter) but in future work this calculation will be refined.

[33] Quadrants III and IV exist because households are sometimes able to buy a dwelling for less than the price predicted for the cheapest market. This might reflect special bargaining skills, seller urgency, or the like. Households in IV can be regarded as trading off their "bargain savings" against a longer commuting trip, while those in III have obtained a double bargain: a shorter commuting trip and a lower price than in the low-cost market.

[34] There is some slight double counting in these figures, as observations lying exactly on an axis are counted as belonging to two quadrants.

[35] Excess commuting trips, costs, and neighborhood quality are all calculated by subtracting these items in the low-cost market from what is actually received. The neighborhood-quality measure is based on *GEN Q* only.

TABLE 10

Housing Costs, Commuting Costs, and Neighborhood Quality

	Income (Thousands of Dollars)						
	0–7.5	7.5–9.5	9.5–13	13–17	17–21	21–25	25+
				Quadrant I			
Excess cost	2.20	2.62	3.66	4.68	10.34	11.11	10.30
Excess miles	2.19	2.85	2.35	2.01	1.66	.78	2.40
Excess *GEN Q*	.26	.36	.59	.56	.61	.50	.67
Value	19.09	19.78	23.10	24.33	32.00	44.71	40.11
HValue	16.90	17.16	19.44	19.65	21.67	33.61	29.81
Dwork	5.41	6.32	6.13	4.99	5.47	4.11	6.51
HDwork	3.22	3.46	3.78	2.98	3.81	3.33	4.12
GEN Q [a]	.27	.44	.51	.40	.71	.44	.74
HGEN Q [a]	.01	.08	−.08	−.17	.10	−.06	.07
Observations	25	44	70	31	12	7	10
				Quadrant II			
Excess cost	2.35	3.24	3.74	5.00	8.43	10.92	12.87
Excess miles	−3.44	−3.26	−3.31	−2.81	−3.43	−2.73	−2.72
Excess *GEN Q*	.06	−.02	.00	−.07	.10	−.15	−.24
Value	17.02	20.56	22.20	26.38	33.29	37.68	46.23
HValue	14.68	17.32	18.46	21.38	24.86	26.75	33.37
Dwork	2.54	3.49	3.02	2.99	3.46	3.94	2.87
HDwork	5.95	6.75	6.34	5.80	6.89	6.66	5.60
GEN Q [a]	.06	.30	.26	.21	.35	.20	−.03
HGEN Q [a]	.01	.31	.26	.28	.25	.35	.21
Observations	42	57	65	38	24	7	22
				Quadrant III			
Excess cost	−1.27	−1.50	−1.73	−1.96	−2.47	−6.07	–
Excess miles	−2.10	−2.28	−3.62	−2.95	−2.92	−4.71	–
Excess *GEN Q* [a]	−.30	−.54	−.07	.35	.13	.05	–
Value	13.60	16.72	19.26	24.04	27.63	26.98	–
HValue	14.87	18.21	21.00	26.00	30.10	33.05	–
Dwork	1.99	3.65	3.25	4.88	4.16	2.21	–
HDwork	4.03	5.93	6.87	7.83	7.08	6.92	–
GEN Q [a]	−.42	−.51	.17	.57	.38	.70	–
HGEN Q [a]	−.12	.04	.24	.21	.25	.65	–
Observations	20	13	12	8	6	1	0

TABLE 10 (concluded)

	Income (Thousands of Dollars)						
	0–7.5	7.5–9.5	9.5–13	13–17	17–21	21–25	25+
				Quadrant IV			
Excess cost	–.70	–.98	–1.30	–1.16	–.75	–4.93	-
Excess miles	1.44	1.95	1.57	1.19	.65	1.06	-
Excess *GEN Q*[a]	.62	.42	.37	.03	.63	.51	-
Value	17.55	16.60	17.87	21.88	23.09	15.91	-
HValue	18.25	17.58	19.17	23.05	23.84	20.84	-
Dwork	3.86	7.57	5.75	3.76	5.22	6.63	-
HDwork	2.41	5.61	4.18	2.57	4.57	5.58	-
GEN Q[a]	–.09	.44	.40	.55	.68	.91	-
HGEN Q[a]	–.71	.03	.03	.53	.05	.40	-
Observations	5	8	17	4	2	1	0

NOTE: Households are classified by quadrant from Figure 1 and by income class (in thousands of dollars) as shown in each column heading.

Value: value of housing bundle (thousands of dollars) in market of purchase.
HValue: hypothetical value of housing bundle calculated at the set of prices in the lowest-cost town.
Dwork: journey-to-work in miles from actual dwelling.
HDwork: hypothetical journey-to-work from low-cost town.
GEN Q: neighborhood quality.[a]
HGEN Q: hypothetical neighborhood quality, an average value for the low-cost town.[a]
Excess cost: *Value* – *HValue*
Excess miles: *Dwork* – *HDwork*
Excess *GEN Q*: *GEN Q* – *HGEN Q*[a]

[a] To provide an easier, more intuitive understanding, I have multiplied the scores for *GEN Q* by –1 *in this table only*. Consequently, a *positive GEN Q* is desirable and a *positive* deviation indicates a better neighborhood. Differences in *GEN Q* of less than about .10 are not meaningful.

bargains as well, offering lower costs, shorter commuting trips and better neighborhood qualities. Still, one might expect that households would sometimes accept lesser quality to obtain the other two bargains, so the net effect is not certain. It appears, in fact, that for the majority of III's, quality is lower than that of I's or II's; moreover, for the same cases, it appears to be lower than that available in the low-cost market. Thus, there is some evidence that for the lower-income families a sacrifice in quality was accepted in order to obtain the dollar savings and the shorter commuting trip.

For quadrant IV, one's expectations are once again uncertain. However, it appears that the main influence on the location choice must have been the possibility of superior neighborhood quality, since the saving of housing cost is rather trivial and the extra commuting trip not great. In contrast, the neighborhood quality is high relative to that obtained in other quadrants for similar income levels, and the excess neighborhood-quality figures are (particularly for low income) among the largest in any quadrant.

IX. CONCLUSION

Housing markets have long been described as erratic, unpredictable, or even chaotic. Hopefully, the investigations reported here will help dispel some of this. The evaluation is incomplete and certain assumptions used in this analysis are clearly open to question; nevertheless, there can be no doubt that household behavior in purchasing a single-family dwelling and choosing a location conforms quite well to the model set out. Choice of location is surely complex, but it is not a random process; place of work, neighborhood quality, and optimal prices seem to shape the decision. To obtain a superior neighborhood, households will travel further and pay more than they would have to if the house itself were their only concern; conversely, the chance to save on housing costs and work trips will induce households to settle for less neighborhood quality, particularly lower-income families.

If one considers only the choice of dwelling type within a particular market, the evidence of economically rational behavior is unmistakable. Prices and outlay both influence purchases just as would be expected. One particularly interesting implication of these results is that an important heterogeneous good like "housing" can usefully be treated as a collection of fairly specific characteristics. Since the purchases of these different items respond quite differently to price and outlay changes, it is clear that suppressing these, as do the usual studies of "housing demand," will reduce understanding of consumer behavior in a very important market.

Finally, though much of the attention in this paper has been directed toward the model of household behavior, the fundamental role of hedonic price estimation must not be overlooked. Contrary to an established opinion, it appears that housing prices are not chaotic and randomly set; they may vary in relation to components but regularly and over discernible areas. Significantly, choice of dwelling type and location both indicate the price patterns to be sufficiently apparent to households so that decisions bear their marks. When detailed information regarding housing transactions is available, it seems that hedonic price estimation can usefully be employed to indicate to the outside observer the price patterns needed in the investigation of housing market behavior.

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Comments on "The Demand for Housing: Integrating the Roles of Journey-to-Work, Neighborhood Quality, and Prices"

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STUDYING the demand for housing is conceptually very similar to studying the demand for other goods. There are quantities demanded and prices paid; presumably the quantities can be related to the prices and other household characteristics within the traditional framework of demand analysis. As King points out, however, it is often difficult to obtain information on the prices and quantities of the goods that comprise a dwelling unit. Although the quantities of the physical attributes of housing can be measured, the prices of these individual attributes cannot be observed directly. The only price observed in the housing market is the selling price or rent for the dwelling unit as a whole.

These data problems led many early empirical studies of housing markets to assume that dwelling units produce a homogenous good, "housing services," that sells at a constant price per unit at all locations in a metropolitan area. Since price differences are assumed away by these studies, expenditures are often used as a proxy for the quantity of housing services in demand analyses that relate the expenditure on housing to the income and other characteristics of households.

More recently, hedonic indexes for housing have been estimated so that prices can be imputed to individual housing attributes and the homogeneous housing services assumption can be relaxed. These hedonic indexes also constitute an empirical test for the constant price assumption imbedded in the homogeneous-good approach. Many of the hedonic equations that have been estimated, including those reported by King, suggest that the prices of housing attributes vary significantly within a metropolitan housing market. If attribute prices do differ, variations in housing expenditures include these price differences as well as possible quantity differences, so housing expenditures cannot be used as a pure measure of the quantity of housing consumed.[1]

Whereas a lack of price information inhibited housing market analysis in the past, the estimation of hedonic prices for large numbers of housing attributes has made the abundance of price information a problem for housing demand studies now. For example, King estimates prices for more than twenty attributes of a dwelling unit. These twenty-odd prices could be used in a simultaneous-equations framework to estimate the demand for each attribute, but the estimation problems would be severe. Some simplification is obviously called for to solve this multitude-of-attribute-prices problem.

In addition, different hedonic attribute prices are typically estimated for spatial subareas of a metropolitan housing market; King has estimated hedonic attribute prices for each of seven subareas in the New Haven region. Having different hedonic prices for several subareas may at first appear merely to exacerbate the multitude-of-attribute-prices problem by increasing the number of prices to be considered. However, the spatial stratification actually creates a new problem because a household must buy all of its housing attributes in only one subarea as a spatially tied purchase. This spatially tied purchase requirement differentiates the analysis of housing demand from that of most other consumer goods.

Analyses of housing demand based on hedonic prices differ principally in the way in which they resolve the multitude-of-attribute-prices problem and the spatially tied purchase requirement. King solves the multitude-of-attribute-prices problem by aggregating his

[1] King does not statistically test his individual equations to see if attribute prices differ significantly between towns in the New Haven area. Such tests assume that the specification of the hedonic indexes is correct. It has been argued that specification errors largely explain the spatial differences in attribute prices found by housing market studies; see George Peterson, "The Capitalization of Fiscal Variables," Urban Institute Working Paper 1207-25 (January, 1973).

numerous housing attributes into four "Lancastrian" housing characteristics. This number of characteristics presents few problems of estimation. King then satisfies the spatially tied purchase requirement by assuming that households have no opportunity for substitution among the seven subareas in the New Haven region. For example, if a sampled household has originally chosen a unit in East Haven, only the East Haven prices are allowed to influence that household's chosen quantities of the four housing characteristics. The demand equations are then estimated, using the seven sets of relative prices of the four aggregate housing characteristics as independent variables.

Although these procedures readily permit the estimation of demand equations, they are not without problems. Thus, reducing the number of housing attributes by constructing four aggregate "Lancastrian" characteristics places a strong condition on household utility functions. To be able to use a composite of price-weighted quantities of several housing attributes as an index of the quantity of an aggregate housing characteristic, households must be indifferent to the combination of attributes that comprise a constant expenditure on an aggregate characteristic. That is, a household's indifference curves in attribute space must be coterminous with the price surfaces defined by various expenditures on the attributes that make up each aggregate characteristic. The likelihood of this condition holding for the four aggregate characteristics is doubtless low.

Furthermore, restricting the choice set of households to a particular subarea for purposes of demand estimation severely limits households' substitution possibilities. If households actually do make substitutions among spatial subareas, their opportunity set is defined by the envelope of price surfaces in the seven subareas rather than by the price surface in a single subarea. Of course, using the envelope of price surfaces in demand estimation is not possible with the model put forward by King, because all households would face the same envelope of market prices. These prices would not vary across households; and without price variation, it would not be possible to estimate demand equations. The envelope of prices could only be used in a demand model that allowed the price envelope to vary by household, for example by adding household-specific travel costs to the market prices of housing.

One important housing attribute incorporated in King's demand framework is neighborhood quality, and his analysis in the final section of the paper suggests that neighborhood quality is an important determinant of a household's location choice. This analysis also implies that neighborhood quality cannot be combined with the other attributes in the *SITE* characteristic, because household location is explained or rationalized only when a household's choice of neighborhood quality (*GEN Q*) is included as a separate attribute in the travel cost–housing price tradeoff. King's paper represents an interesting attempt to integrate the choice of housing attributes, neighborhood quality, and travel costs, but he correctly warns the reader that in this area, much work still remains to be done.