Buyer Search Duration in the Residential Real Estate Market: The Role of the Real Estate Agent

*Edward A. Baryla**
*Leonard V. Zumpano**

Abstract. **This study examines buyer search duration using a national database consisting of transactions conducted with and without the assistance of real estate brokers. The results of this study indicate that information asymmetries are present in the residential real estate market. First-time buyers and out-of-town buyers search longer than more experienced and local, more knowledgeable homebuyers. On the other hand, buyers relocated by their employers spend less time looking for a home. More importantly, real estate brokers are able to reduce buyer search time for all classes of buyers, whether first-time, experienced, or an out-of-town buyer.**

Introduction

The residential real estate market is generally considered to be inefficient due to imperfect information.[1] Imperfect information results from the fact that market transactions are complex and confidential, the product is nonhomogeneous and information is costly to obtain. It is in this type of market that institutionalized intermediaries evolve. Such intermediaries can take advantage of economies of scale in information gathering and generate net gains in the form of lower transaction and information costs. If the intermediary is efficient, it is commonly argued that this should be reflected in reduced buyer search time, all else equal.

Actually, the impact of the real estate broker may not be all that straightforward. In fact, the broker can affect buyer search behavior in three ways. First, the broker can improve the marginal efficiency of search by guiding or limiting the buyer's search to those houses most likely to meet with buyer approval. As a result, this makes it more likely that a buyer will find a satisfactory match much earlier in the search process. Second, by reducing marginal search costs, brokers may encourage buyers to search longer. Third, an agent can provide buyers with more accurate information about current market conditions, allowing buyers to more effectively interpret the distribution of house prices they face. That is, broker-assisted buyers will have an anticipated distribution of house prices that more closely coincides with market reality. This can increase or decrease reservation utility. Buyers who overestimate the typical asking price may have a higher reservation stopping price and hence shorter search duration; and buyers who underestimate the typical asking price have longer duration. The actual effect on buyer search will depend on the relative strength of these effects.[2]

*Department of Economics, Finance and Legal Studies, College of Commerce and Business Administration, University of Alabama, PO Box 870224, Tuscaloosa, Alabama 35487.
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The purpose of this study is to develop an empirical model based on buyer search theory that will provide evidence on the impact of the real estate agent on buyer search duration. Specifically, this study will extend the extant literature in three ways. First, most of the real estate duration studies examine time on the market (TOM) from the seller's perspective. Whereas seller search essentially involves the passive trade-off between price and time, buyers are much more actively involved in the search process. This study is a demand side analysis that will offer empirical evidence on the factors that contribute to buyer search time in this market. Second, earlier TOM studies were based on relatively small samples with the data limited to specific geographic areas. This study uses a national database, allowing a more general analysis than has been previously available in TOM studies. Finally, in all prior TOM studies, the transactions were "broker assisted". Thus, the impact of a broker on transaction time has not been examined. This study, which includes both broker-assisted sales and sales by owner, will provide empirical evidence on the effect of a residential real estate broker on buyer search duration. In the process, this study should provide important insights into the efficiency of the housing market and help assess the validity of claims by some researchers (Yinger, 1981), consumer groups (CFA, 1993), and regulatory agencies (FTC, 1984) that the real estate brokerage industry is inefficient and not adequately serving the needs of homebuyers. Prior studies (Jud and Frew, 1986) of the residential brokerage industry also suggest that compensation to the real estate agent represents a wealth transfer in the form of higher prices paid for housing. If true, this study offers evidence on what return, in the form of reduced search time, the buyer receives for this wealth transfer.

The study proceeds as follows: section two reviews the buyer search theory literature and briefly surveys the TOM literature, section three presents the data, model and variable selections, section four covers the empirical results, and the last section offers conclusions.

Literature Review

Stigler (1961) provides the seminal work in economic search theory. In his model, a buyer who wishes to obtain the most favorable price must first identify properties for sale and then seek out prices from sellers, a process Stigler calls search. After completing the search, the buyer chooses the lowest available price. Buyer search time is positively related to price dispersion, which Stigler characterizes as "a . . . measure of ignorance in the market". The greater the dispersion in prices the longer the search as buyers can attain greater price reductions when prices are more dispersed.[3] Also, given a degree of dispersion, Stigler argues that the greater the expenditure on the commodity, the greater the savings from search and the longer the duration of search. Whatever the distribution of prices, Stigler demonstrates that increased search will yield diminishing returns in the form of further price reductions. Search will continue, therefore, until the cost of search, as measured by time, is equated to the expected marginal return from additional search.

Within this framework, Stigler argues that information systems evolve, based on advertising or specialized traders, allowing buyers and sellers to more effectively identify themselves. This results in a reduction in buyer search costs.

Rothschild (1974) extends Stigler's one-period, fixed sample model by developing a multiperiod sequential search model. In this model, the buyer observes a price, then decides to accept it and end search or reject the price and proceed to another observation.

The buyer's accept or reject decision results from an optimal search rule that is based on the buyer's reservation price; search continues until a home is found with a price no greater than the buyer's reservation price. Rothschild shows that a buyer retains a reservation price as he searches through the unknown distribution. However, the reservation price changes as the buyer learns more about the price distribution. Furthermore, he shows that Stigler's fixed sample size results hold when the distribution is unknown.

Morgan and Manning (1985) derive an optimal search model that combines the features of the fixed sample size and multiperiod, sequential search models. Here a buyer chooses to observe a number of housing units in each time period. If the buyer is unable to find an acceptable unit, the buyer proceeds to the next time period and draws another set of observations. The buyer chooses to accept a unit if the utility it provides is greater than the expected utility of additional search. Morgan and Manning demonstrate that this model dominates the fixed sample size and sequential search models and that both of these models exist as special cases of the optimal search construct.

Wu and Colwell (1986) (W & C) examine broker, buyer and seller search in a general equilibrium model. Their analysis of buyer search focuses on the array of asking prices the buyer faces. Their comparative static's show that the probability of a buyer securing a match is inversely related to the level of minimum asking prices. Also, the probability that the buyer accepts some minimum discovered asking price is inversely related to his level of search intensity, which is defined as the product of the number of brokers visited and listings held by the broker. Furthermore, they argue that a buyer's search level increases in an MLS system, since he only needs to visit one broker to gain access to a majority of the available listings. This results in a decrease in unit search costs.

Yavaş (1992) develops a search model that examines the impact of the broker on search intensity of the buyer and seller. He shows that a buyer's search intensity, defined as neighborhood canvassing or contacting friends, increases for higher valued homes. When a seller uses a broker, Yavas assumes the matching process is speeded.[4] This results in reduced buyer search intensity. In addition, he argues that the final negotiated price is not a function of search. Once search is completed, it has no effect on price. This is an interesting theoretical result, since it indicates there may not be a price/time simultaneity bias in buyer search duration analysis.

Wheaton (1990) applies a "labor market matching" search model to the housing industry to develop a "search technology". A buyer becomes mismatched with his present unit when a single person becomes a family (or vice versa), and must search for a larger (or smaller) unit. Information is limited, so a buyer must visit a unit to determine its type. Effort, measured as the number of units visited, is a decision variable of the buyer. By increasing search effort, at a cost, the buyer is matched with an adequate unit faster. Wheaton also shows that sales time is inversely related to the rate of matching. Therefore, it appears that demand side buyer search results may be generalized to the supply side as well.

As noted in the introduction, a majority of the empirical work focuses on the supply side trade-off between TOM and selling price. The data usually consists of broker-assisted transactions in a specific geographic area. Cubbin (1974) finds that higher priced homes sell faster, while Belkin, Hempel and McLeavey (1976) and Zuehlke (1987) find that owners adjust prices downward as time elapses. Trippi (1977) and Miller (1978) find a positive relationship between price and TOM. These conflicting results have yet to be

rationalized in the supply side literature, although Haurin (1988) does provide some interesting results which indicate that house characteristics have a deterministic impact on time on the market.[5]

Although there are no empirical studies that directly model buyer search time, research on buyer demand provide some important insights into the search process and the effect of real estate agents. Jud's study (1983) of the demand for brokerage services, which included the effects of search costs, suggests that brokers do influence the level of housing consumption as well as reduce search time for buyers. In a later study, Jud and Frew (1986) found that broker-assisted buyers have a greater demand for houses than their non-broker-assisted counterparts. They rationalize their finding by hypothesizing that brokers have an effect analogous to that of advertising in markets with imperfect information.

In an empirical study of the Canadian housing market, Janssen and Jobson (1980) find that real estate brokers who list comparable properties for higher prices than competing brokers tend to realize significantly higher selling prices. The higher selling prices are associated with transactions involving executive transfers and broker-arranged secondary financing.[6] These results may, in turn, suggest that brokers obtain higher prices when dealing with buyers who are both less knowledgeable about local market conditions and less sensitive to price.

The most recent empirical work (Turnbull and Sirmans, 1993) examines the extent to which differences in buyer search costs and knowledge of housing market conditions are reflected in housing prices. Using data from the Baton Rouge, Louisiana area, Turnbull and Sirmans compare the prices paid by first-time buyers and out-of-town buyers to the prices paid for comparable housing by more knowledgeable, local and repeat homebuyers.[7] Their results indicate that residential home prices are similar across buyers with different information sets and search costs. Since these were all broker-assisted transactions, Turnbull and Sirmans conclude that existing brokerage institutions, such as the MLS, successfully eliminate the potential price effects of asymmetric information and, thereby, improve the efficiency of the housing market. It is not possible, however, to tell from this study whether differences in buyer information have any systematic impact on search time.

Data and Methodology

The Morgan and Manning model described above relaxes the one period restriction of the fixed sample model and the one observation per period restriction of the sequential search approach. It allows the buyer to search over time and to choose more than one observation per period. Effectively, this model encompasses two dimensions of search, over time and within period. It is this type of theoretical construct that most accurately depicts the search process, since it can collapse into either of the first two models.

The application of the Morgan and Manning theoretical approach suggests the use of an empirical duration model with a relaxation of the constraint of one observation per period. This can be accomplished by including a search intensity variable within the structure of a duration analysis model. Effectively, we are examining the over time, sequential dimension of search, while including a variable to capture the effect of within period search intensity.

The general form of the model used in duration analysis is:

$$\text{LN}DUR = BX + \alpha\varepsilon,$$

where LN*DUR* is the natural log of duration, which is measured in weeks, and X is a vector of variables that search theory indicates influence buyer search duration. We follow Haurin (1988) in assuming a Weibull distribution for α since it allows the shape of the density function to vary. The model is estimated using the maximum likelihood technique in the "survival analysis" procedure provided in the LIMDEP software package.

As a proxy for the opportunity cost of search we use total weekly household income (*AINC*).[8] Theory suggests that as the opportunity cost of search increases, search time decreases. However, income may also capture, at least to some degree, the fact that more affluent buyers have more choices than buyers with smaller incomes. Higher income buyers, confronted by a greater dispersion of home prices, search longer. Less affluent buyers, unable to qualify for financing on higher priced homes, face fewer choices, which reduces search time.

AP is the original asking price faced by the buyer. Models developed by both Stigler (1961) and Wu and Colwell (1986) indicate asking price should be positively related to duration since increased search will result in lower priced homes. Wheaton (1990) suggests that increased search effort results in a faster match, while Rothschild (1974) indicates a buyer may lower his reservation price as the buyer learns more about the price distribution. To capture these effects, we include an intensity ratio (*INTRAT*), defined as the number of units a buyer visits divided by duration. This ratio is expected to be negatively related to duration.

Demographic changes may influence buyer urgency to purchase a home. The home purchase may be motivated by a change in household status resulting from marriage or divorce. To estimate the effects of these changes we include a dummy variable (*NH*) which we expect to be inversely related to duration if buyers have a greater sense of urgency to purchase when a new household is formed. Family size may also impact on buyer search time. It may be that as families become larger they have to search longer for housing that will meet their needs. Alternatively, larger households may incur higher search costs because of difficulties in arranging and coordinating home inspections when children are present. This, in turn, may increase buyer urgency. Therefore, the number of children in the household (*CHILD*) is included in the variable set.

A buyer may be less price sensitive if the purchase of a home is the result of an employer-mandated move (*EM*), since the buyer is presumably receiving some relocation assistance from his employer.[9] Therefore, this buyer will have a shorter search duration.

Seasonal factors may also influence buyer search, since sellers have a tendency to list more homes in the spring and summer due to weather conditions and school requirements.[10] Therefore, a buyer searching in the spring or summer (*SUM*) may find a home faster, while search may be more difficult and take longer in the late fall or dead of winter (*WIN*).

To test whether duration is influenced by the negotiation process, a control variable representing the discount from asking price received by the buyer (*DISC*) is included. To control for the effects of different information levels among buyers we include indicator variables representing first-time buyers (*NOEXP*) and buyers entering the market from

another location (*DIS*). We expect a positive relationship between these information and experience variables and search duration. Finally, in order to analyze the effect of the real estate agent on buyer search time, which is the principal concern of this research, we include a dummy variable to indicate a broker-assisted purchase (*RE*).

In summary, we model buyer search as follows:

$$DUR = f(RE, NOEXP, DIS, AINC, CHILD, SUM, WIN, AP, INTRAT, EM, NH, DISC).$$

The variables used in the model are defined in Exhibit 1 and summary statistics are provided in Exhibit 2.[11] This study uses a cross-section subsample from a 1987 nationwide survey of homebuyers conducted by the Research Division of the National Association of Realtors. Survey questionnaires were mailed to a national sample of 9,000 homebuyers and 2,500 homebuyers in each of twelve metropolitan areas. There was a total of 3,999 responses to the survey. The subsample consisted of 843 observations drawn from the original 3,999 responses. After eliminating incomplete or faulty responses, the database totals 526 transactions, with 395 transactions involving the use of a real estate agent.[12]

Exhibit 1
Definition of Variables

DUR:	Search duration of the buyer in weeks.
LN*DUR*:	Natural log of duration.
RE:	An indicator variable. 1 if a realty agent was used in the transaction; 0 otherwise.
AP:	Original asking price of the home.
WINTER (*WIN*):	An indicator variable. 1 if the house was bought between November 1 and February 28; 0 otherwise.
SUMMER (*SUM*):	An indicator variable. 1 if the house was bought between May 1 and August 31; 0 otherwise.
DISTANT (*DIS*):	An indicator variable. 1 if distance moved by a buyer from a previous location is greater than 25 miles; 0 otherwise. This represents a buyer's information level of local market conditions.
NOEXP:	An indicator variable. 1 for a first-time buyer; 0 otherwise. This represents a buyer's familarity with the homebuying process.
EMP MOVE (*EM*):	An indicator variable. 1 if the main reason for moving is relocation caused by employer; 0 otherwise.
NEW HSLD (*NH*):	An indicator variable. 1 if the main reason for moving was a change in family status due to marriage or divorce; 0 otherwise.
INTRAT (*INTRAT*):	Number of homes examined by a buyer per week.
CHILD:	Number of children in the family.
INCOME (*AINC*):	Household income per week.
DISC:	The discount attained by the buyer, as a percent of ask price.
REDIS:	Interaction term of *RE* and *DISTANT*.
RENOXP:	Interaction term of *RE* and *NOEXP*.
RENH:	Interaction term of *RE* and *NEW HSLD*.
REM:	Interaction term of *RE* and *EM*.
REINT:	Interaction term of *RE* and *INTRAT*.

Exhibit 2
Summary Statistics

Variables	Mean	Std Dev.	Minimum	Maximum
DUR	12.930	16.330	1.00	99.00
RE	.751	.433	.00	1.00
AINC	1045.500	698.500	57.69	5769
AP	117,130	68,163	28,000	525,000
DIS	.365	.482	.00	1.00
NOEXP	.329	.470	.00	1.00
EM	.133	.340	.00	1.00
NH	.099	.299	.00	1.00
SUM	.705	.456	.00	1.00
WIN	.103	.304	.00	1.00
INTRAT	3.565	5.530	.03	50
DISC	.036	.060	−.07	.91
CHILD	.958	1.110	.00	4.00

Empirical Results

Two versions of the model are estimated. A baseline, or parsimonious, version is presented in Exhibit 3 and an expanded version, including some interaction terms, is presented in Exhibit 4.[13] In both the parsimonious and expanded version of the model, neither income or asking price is statistically significant. Because income and asking price appeared to be correlated, additional estimations were run that alternatively excluded income and asking price. With income excluded, asking price is statistically significant at the 1% level and positively signed, which suggests, in accordance with theory, that the higher the asking price, the longer buyer search duration.

Similarly, when asking price is excluded from the model, income becomes significant at the 10% level and is positively signed. While the sign of this coefficient is contrary to expectations, it may be, as speculated earlier, that income is less a measure of buyer opportunity cost than buyer purchasing power. Simply stated, consumers with large incomes have more homes to choose from and, therefore, search longer.

The seasonality variables performed as expected. *SUM*, representing a transaction that takes place in the late spring or summer, is significant at the 10% level. The coefficient is negative, which is in line with Haurin's finding (1988) that marketing time is shortest in the spring and summer. The *WIN* variable, although positive, is not statistically significant.

NOEXP, representing inexperienced buyers, is positive and significant at the 1% level in the parsimonious version of the model. Less experienced first-time buyers spend more time in search than more experienced repeat buyers. This suggests that previous homeowners are better able to collect and process relevant information than buyers who enter the market for the first time. Whereas Turnbull and Sirmans (1993) found that new and experienced buyers paid the same price for comparable housing, our results indicate that these buyers can be differentiated on the basis of search time. When the broker and

Exhibit 3
Duration Analysis of Buyer Search Time

Variables	Coefficient	*T*-Ratio	Probability
Constant	2.796	22.823	.000
RE	−.199	−2.163	.031**
AINC	.000	.746	.456
AP	.000	.563	.574
DIS	.077	.871	.384
NOEXP	.295	3.271	.001***
EM	−.372	−2.682	.007***
NH	−.239	−1.556	.120
SUM	−.151	−1.656	.098*
WIN	.002	.014	.989
INTRAT	−.089	−22.709	.000***
DISC	.675	.831	.406
CHILD	.034	1.007	.312
α	.920	25.798	.000

Log-likelihood −753.29
*significant at the 10% level
**significant at the 5% level
***significant at the 1% level

the no experience variables are combined as an interaction term, *NOEXP* is no longer statistically significant, but the interaction term, *RENOXP*, is significant and positive at the 5% level.[14]

Although not statistically significant in the baseline version, *DIS*, representing a buyer from outside the immediate market area, is positive and significant in the more inclusive model. This result indicates that information asymmetries exist for buyers moving into new markets, whether new or repeat buyers, which results in more costly and time-consuming search.

A buyer who is relocated by his employer, *EM*, spends less time searching for a home. The coefficient for the *EM* variable is negative and statistically significant in both versions of model. This is not an unexpected result, as employer-mandated moves commonly involve relocation assistance, cost of living salary differentials and purchase subsidies. Moreover, families in such situations often simply have less time to search for another home. The intensity ratio, *INTRAT*, is significant at the 1% level and negative. A buyer who views more homes per week finds a home faster. However, an unanswered question is whether or not this home represents the buyer's ideal choice.

The coefficient on *RE*, the use of a real estate agent, is negative and statistically significant in both versions of the model. When buyers employ the services of real estate agents, search time falls, a result that follows directly from the role of the real estate agent as an information system designed to reduce information costs. This result is encouraging since this is the first study that has isolated the effect of the real estate agent on search duration. By implication, this finding also suggests that the real estate agent does, in fact, provide important marketing services to sellers. If properties listed by a real estate agent

Exhibit 4
Duration Analysis of Buyer Search Time

Variables	Coefficient	*T*-Ratio	Probability
Constant	3.0675	20.031	.000
RE	−.5057	−3.149	.002***
AINC	.0001	1.090	.275
AP	.0000	.668	.504
DIS	.2729	1.606	.108
NOEXP	−.0335	−.209	.835
EM	−.8250	−2.126	.034**
NH	.3358	1.154	.248
SUM	−.149	−1.615	.106
WIN	.027	.194	.846
INTRAT	−.218	−7.597	.000***
DISC	1.032	1.359	.174
CHILD	.035	1.055	.291
RENOXP	.394	2.050	.040**
REDIS	−.324	−1.596	.111
RENH	−.734	−2.164	.030**
REINT	.132	4.598	.000***
REM	.623	1.493	.136
α	.889	25.140	.000

Log-likelihood −738.68
**significant at the 5% level
***significant at the 1% level

sell quicker, they may also command higher prices if reduced selling time results in less accumulated downward pressure on seller reservation prices.

The coefficient for α is less than one and significant at the 1% level. This result indicates that the estimated survival function has positive duration dependence. That is, the probability that search will end increases as the duration interval increases.

The lack of significance for a number of variables is also revealing. Family size, as measured by *CHILD*, was not statistically significant in either estimation. Apparently the presence of children neither effectively limits choice alternatives or substantially increases search costs. Changes in household status (*NH*) resulting from marriage or divorce appear to have a positive, but marginal effect on search duration in the parsimonious model, but this variable is not statistically significant in the larger model that includes interaction terms. *DISC* is not significant in either version of the model which suggests that buyer search is not influenced by the bargaining process or the negotiated price; a finding that is consistent with Yavaş' (1992) theoretical results.

Five interaction terms are included in the expanded model that is presented in Exhibit 4. The choice of which interaction terms to include in the model is somewhat problematic given the large number of alternative specifications that can be constructed.[15] Since a principal concern of this research is to isolate the effect of the broker on buyer search time we limited our selection to those variable constructions that in addition to being

conceptually appropriate also reveal the differential impact of the real estate agent on search duration for buyers in different economic circumstances (with different amounts of market information and experience).

Whereas out-of-town buyers, in general, search longer than local homebuyers, the interaction term capturing the effect of the agent on search time for a buyer entering a new market, *REDIS*, is marginally significant and negative. This suggests the real estate agent exhibits some capacity to reduce information asymmetries for out-of-town buyers who are not familiar with the local market conditions. Along the same line, *RENH* indicates that the real estate agent reduces search time for new households.

This does not seem to be the case with the interaction between brokers and first-time homebuyers. *RENOXP* is positive and significant. The presence of this interaction term also causes the first-time homebuyer variable, *NOEXP*, in the expanded model to become insignificant, which suggests that these variables are correlated. It appears that inexperienced buyers search longer when aided by a real estate agent.

The interaction between employer-induced relocation and real estate agent, *REM*, is positive, but not statistically significant. *EM*, however, representing all employer-induced relocations, remains significant and negative in the expanded model. It seems that buyer urgency and employer relocation assistance exert the major influences on buyer search in this situation.

The interaction of search intensity and the use of a real estate agent, *REINT*, is significant and positive at the 1% level. While this implies that visiting more homes per week with a real estate agent actually extends search time, it is in line with some theoretical arguments that the real estate agent reduces search costs, allowing the buyer to search more units.[16] Intuitively, the agent may have more "acceptable" units that a buyer can walk through and examine. The buyer recognizes the efficiency of the search process and does not feel pressured into accepting a unit that is not "just right". Therefore, buyers can be more discriminating and search longer.[17] What this result suggests is the search time, per se, may not be an unambiguous measure of market or broker efficiency. Researchers must also look to the outcome of the search and the extent to which buyers are able to achieve their housing goals without having to compromise quality standards.

Conclusions

This study offers a number of encouraging results. First, it presents initial empirical evidence on the effect of the real estate agent on buyer search duration within a search theory framework. Evidence presented strongly suggests the real estate agent can reduce buyer search duration. Additionally, there is some evidence that the agent can reduce information asymmetries suffered by out-of-town buyers, thereby speeding the search process for this class of homebuyer. Our findings also indicate that brokers affect other types of buyers, although the correlation between some of the variables makes these relationships less certain. Equally important, our results suggest that market efficiency, and the impact of market intermediaries such as real estate brokers, cannot be judged solely on the basis of search time. Although beyond the scope of this paper, the evidence presented here does intimate that the outcome of search, in the form of consumer satisfaction, must also be evaluated in order to truly determine the value of real estate brokerage services. If a broker is successful in reducing search costs, buyers can search

longer, sample more housing units, and, in the process, maybe avoid having to settle for less desirable housing.

Notes

[1]For a discussion of the concept of market efficiency as it applies to real estate transactions see Greer and Farrell (1993). Although empirical studies of the efficiency of the residential real estate market have generated conflicting findings they all examine a market where an information system and market intermediaries are already present. See Case and Shiller (1989), Gau (1984), Guntermann and Smith (1987), Linneman (1986), and Zumpano and Hooks (1988). The point we are trying to make here is that the nature of the real estate market requires the intervention of intermediaries to improve efficiency.

[2]The fact that real estate brokers have traditionally served as agents of the seller does not alter these functions. Agency is a fiduciary relationship, rather than a marketing arrangement. The buyer does not need a contract with an agent and can use the services of more than one broker. What the seller's agent should not (legally cannot) do is represent the buyer's interest in negotiations with the seller, who is the agent's principal. In the last few years traditional agency arrangements have been changing, with the introduction of buyer's agents, dual agents, and non-agent, independent contractors. While these changes may be associated with changes in compensation, contracting, and liability issues, they should not alter the basic marketing arrangements of brokers.

[3]It can be demonstrated that as price dispersion increases, the average minimum price falls. The expected value of the minimum of the distribution is a decreasing function of the number of observations.

[4]He draws on Jud's (1983) result as an empirical basis for this assumption. See page 5 and subsequent footnotes for more on Jud's research findings.

[5]Haurin finds that nonstandard, atypical homes take longer to sell because such units are subject to greater offer price dispersion.

[6]Ferreira and Sirmans (1989) also examine the relationship between selling price, financing premiums and TOM. Their results do not indicate that financing premiums are captured by sellers in higher prices, but assumption financing does appear to reduce duration, at least in some markets.

[7]Jud (1983) also argues that a buyer's information level can be captured by identifying whether or not the buyer is a county resident or a first-time homebuyer.

[8]There may be other costs associated with a home purchase. Weinberg, Friedman and Mayo (1981) offer the time spent living in the previous unit as a proxy for a psychological cost. No attempt is made in this study to proxy such costs or assess their impact on buyer search.

[9]See Janssen and Jobson (1980) for empirical evidence on this argument.

[10]See Haurin (1988) for empirical evidence and Salant (1991) for a theoretical argument on the effects of seasonality.

[11]The *RE* variable refers to real estate brokers employed by sellers. At the time the survey was conducted virtually all broker-assisted transactions involved seller-agents or seller-subagents through the MLS. This fact was corroborated by the Research Division of NAR. House characteristics and location variables were also included, but they added little to the empirical results. Thus, to maintain tractability, we follow Kaserman et al. (1989) by using the ask price rather than a vector of characteristics. The sales price averaged approximately 95% of the original ask price.

[12]Names and addresses of the survey participants were obtained by NAR from Dataman Information Services, Inc., which compiles residential real estate data in 595 counties by accessing courthouse deed recordings. The NAR used a proportional sampling method where the probability of selecting an observation in a county is the same as the proportion of the number of deeds recorded in the county. A copy of the survey questionnaire is available from the authors upon request.

[13]Tests indicate that heteroscedasticity may be present in the parsimonious version of the model. Therefore, this model may suffer from incomplete specification. This was not corrected since, without knowing the form of heteroscedasticity, it is dangerous to adjust results based on an

assumption of a specific type of heteroscedasticity. See Heckman and Singer (1984). In the full model, there is no evidence of heteroscedasticity. Therefore, it appears that the interaction terms are proper and necessary for model specification.

[14]When *RENOXP* is deleted from the variable set in the expanded model, *NOEXP* is again statistically significant and positive at the 1% level. That these variables are correlated is not a surprising finding.

[15]Approximately 75% of the sales included a real estate agent. We did construct and estimate a number of different interaction terms, but some of the agent's impact, when spread among many interaction terms, became "tangled" and difficult to isolate. When the variable *RE* was not included, the significance level of all the interaction terms in Exhibit 4 increased.

[16]See Wu and Colwell (1986).

[17]In a more theoretical sense, most search models are based on the assumption that buyers become "less finicky" as they search more. It could be that the use of a real estate professional allows the buyer to maintain his initial standards. See Rothschild (1974), p. 70.

References

Asabere, P. K. and F. E. Huffman, Price Concessions, Time on the Market, and the Actual Sale Price of Homes, *Journal of Real Estate Finance and Economics,* 1993, 6, 167–74.

Bagnoli, M. and N. Khanna, Buyers' and Sellers' Agents in the Housing Market, *Journal of Real Estate Finance and Economics,* 1991, 4, 147–56.

Belkin, J., D. J. Hempel and D. W. McLeavey, An Empirical Study of Time on the Market Using Multidimensional Segmentation of Housing Markets, *AREUEA Journal,* 1976, 4, 57–75.

Case, K. E. and R. J. Shiller, The Efficiency of the Market for Single Family Homes, *American Economic Review*, 1989, 79, 125–37.

Consumer Federation of America (CFA), *Discrimination by Traditional Real Estate Brokers Against Alternative Brokers,* Washington, DC: CFA, July 1993.

Copeland, T. and F. Weston, *Financial Theory and Corporate Policy*, New York: Addison-Wesley, 1988.

Crockett, J. H., Competition and Efficiency in Transacting: The Case of Residential Real Estate Brokerage, *AREUEA Journal,* 1982, 10, 209–27.

Cubbin, J., Price, Quality and Selling Time in the Housing market, *Applied Economics,* 1974, 6, 171–87.

Federal Trade Commission (FTC), *Residential Real Estate Brokerage Industry Staff Report,* Vols. I & II, Washington, DC: FTC, 1984.

Ferreira E. J. and G. S. Sirmans, Selling Price, Financing Premiums, and Days on the Market, *Journal of Real Estate Finance and Economics,* 1989, 2, 209–22.

Gau, G. W., Weak Form Tests of the Efficiency of Real Estate Investment Markets, *Financial Review,* 1984, 19, 301–20.

Greene, W. H., *Econometric Analysis,* New York: Macmillan, 1993.

———, *LIMDEP Version 6.0 User's Manual and Reference Guide,* New York: Econometric Software, 1993.

Greer, G. and M. Farrell, *Investment Analysis for Real Estate Decisions,* Longman Financial Services Publishing, third edition 1993.

Guntermann, K. L. and R. L. Smith, Efficiency of the Market for Real Estate, *Land Economics,* 1987, 63, 34–43.

Haurin, D., The Duration of Marketing Time of Residential Housing, *AREUEA Journal,* 1988, 16, 396–410.

Heckman, J. and B. Singer, A Method For Minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data, *Econometrica,* 1984, 271–320.

Janssen, C. T. L. and J. D. Jobson, Applications and Implementation on the Choice of Realtor, *Decision Sciences,* 1980, 11, 299–311.

Jud, G. D., Real Estate Brokers and the Market for Residential Housing, *AREUEA Journal,* 1983, 11, 69–82.

——— and J. Frew, Real Estate Brokers, Housing Prices, and the Demand for Housing, *Urban Studies*, 1986, 23, 21–31.

Kaserman, D. L., J. L. Trimble and R. C. Johnson, Equilibriation in a Negotiated Market: Evidence from Housing, *Journal of Urban Economics,* 1989, 26, 30–42.

Kiefer, N. M., Economic Duration Data and Hazard Functions, *Journal of Economic Literature,* 1988, 26, 646–79.

Kohn, M. G. and S. Shavell, The Theory of Search, *Journal of Economic Theory*, 1974, 9, 93–123.

Linneman, P., An Empirical Test of the Efficiency of the Housing Market, *Journal of Urban Economics,* 1986, 20, 140–54.

McCall, J. J., The Economics of Information and Optimal Stopping Rules, *Journal of Business,* 1965, 38, 300–17.

McKenna, C. J., Theories of Individual Search Behaviour, *Bulletin of Economic Research,* 1986, 38, 189–207.

Miller, N. G., Time on the Market and Selling Price, *AREUEA Journal*, 1978, 6, 164–74.

Morgan, P. and R. Manning, Optimal Search, *Econometrica* 1985, 53, 923–44.

National Association of Realtors, *The Homebuying and Selling Process: 1987*, Washington, DC: NAR, 1987.

Rothschild, M., Searching for the Lowest Price When the Distribution of Prices Is Unknown, *Journal of Political Economy,* 1974, 82, 689–711.

Salant, S. W., For Sale by Owner: When to Use a Broker and How to Price the House, *Journal of Real Estate Finance and Economics,* 1991, 4, 157–73.

Stigler, G. J., The Economics of Information, *Journal of Political Economy,* 1961, 69, 213–25.

Trippi, R. R., Estimating the Relationship Between Price and Time to Sale for Investment Property, *Management Science,* 1977, 23, 838–42.

Turnbull, G. K. and C. F. Sirmans, Information, Search and House Prices, *Regional Science and Urban Economics,* 1993, 23, 545–57.

Weinberg, D. H., J. Friedman and S. K. Mayo, Intraurban Residential Mobility: The Role of Transactions Costs, Market Imperfections, and Household Disequilibrium, *Journal of Urban Economics,* 1981, 9, 332–48.

Wheaton, W. C., Vacancy, Search, and Prices in a Housing Market Matching Model, *Journal of Political Economy,* 1990, 98, 1270–92.

Wu, C. and P. F. Colwell, Equilibrium of Housing and Real Estate Brokerage Markets Under Uncertainty, *AREUEA Journal,* 1986, 14, 1–23.

Yavaş, A., A Simple Search and Bargaining Model of Real Estate Markets, *Journal of the American Real Estate and Urban Economics Association,* 1992, 20, 533–48.

Yinger, J., A Search Model of Real Estate Broker Behavior, *American Economic Review*, 1981, 71, 591–605.

Zuehlke, T. W., Duration Dependence in the Housing Market, *Review of Economics and Statistics,* 1987, 69, 701–704.

Zumpano, L. V. and D. L. Hooks, The Real Estate Brokerage Market: A Critical Reevaluation, *AREUEA Journal,* 1988, 16, 1–16.

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