Agency Representation and the Sale Price of Houses

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Abstract

Multiple Listing Service data are employed to examine how the type of agency representation influences the sale price of a residential property. The results differ by property size. The type of agency representation is relevant only for some segments of the market, mainly smaller- to medium-sized properties. For a certain range of property sizes, buyers who engage a buyer's agent pay on average 2% less. However, an above average buyer's agent commission can more than cancel this price effect. Buyers that engage a buyer's agent that comes from the same firm as the listing agent never pay more for a house.

Introduction

Real estate agency issues have motivated a large number of studies since the pioneering work of Yinger (1981). The recent surveys by Benjamin, Jud and Sirmans (2000a, 2000b) provide valuable information on the breadth and scope of the issues in this area. One of the areas of current interest, both inside and outside academe, is the impact of the type of agent representation on the sale price of houses. This issue is important because it has the potential to trigger regulatory and legislative changes to agency representation with significant consequences for the size and distribution of real estate commissions and, ultimately, for the structure of the real estate brokerage industry.[1]

The literature on the impact of agent representation on sale price is rather thin. Most early studies, such as Jud and Frew (1986), are concerned with the issue of how for-sale-by-owner (FSBO) sales compare to those through the broker-assisted Multiple Listing Service (MLS). None of the early studies differentiates among different types of agent representation and, therefore, cannot provide direct guidance for this study. Elder, Zumpano and Baryla (2000) appears to be the first to examine the impact on price of the *type* of agent representation. Based on a national data set with several buyer but few housing characteristics, they conclude that the newly emerging buyer brokers have no impact on price compared to traditional agents.

The present study examines a different angle of the link between the type of agent representation and sale price than earlier work. In particular, only those sales are examined that involve a form of the dominant designated agency relationship. Sales brokered by exclusive buyer brokers are not contained in the data set. The study provides for an encompassing view of the role of agency representation by combining evidence on the impact of the type of agent representation on price with evidence on the impact of the buyer's agent commission.[2] The study is based on a local data set taken from the MLS.

The article is organized as follows. The next section provides pertinent information on the link between agency representation and housing prices. Next, the data are introduced and the estimation results presented and discussed. The article ends with a brief summary of the empirical results and some tentative policy conclusions relating to the regulation of real estate agency.

The Economics of Agency Representation

The traditional agency/subagency relationship came into focus with the advent of the MLS. The listing agent was the seller's main agent. All other agents within the MLS were subagents of the listing agent by the listing contract and the MLS bylaws.

Potential buyers who were being shown properties by an MLS-affiliated real estate agent were typically of the opinion that *their* agent would represent their interests. This view was either explicitly or implicitly supported by the acts of the real estate agent. Therefore, a legal agency relationship between buyer and MLS agent was typically created by implication and the MLS agent was, therefore, cast in the role of a dual agent. This was not only illegal because it was undisclosed and not agreed on by all parties, but it also created a conflict of interest for the MLS agent. If the agent truly represented the best interests of the seller, as mandated by the subagent status, he/she would violate the fiduciary requirements of the implied agency with the buyer. If the agent truly represented the buyer, he/she violated the explicit and contracted agency with the seller under the subagency requirements of the MLS agreement.

This inherent conflict of interest made the agency/subagency representation an easy target of consumer advocacy groups and, over time, led all states to revamp industry regulation. All states now require disclosure of agency representation. Most states have adopted the *designated agency* principle, which allows for four different scenarios of agency representation:

A. The listing agent represents solely the seller. The buyer is a customer and has the right to be dealt with fairly and honestly but has to watch out for his/her own interests. The listing agent advises the seller on how to negotiate with the buyer and has an obligation to reveal all information obtained from the buyer to the seller.

B. The listing agent acts as a limited dual agent for both buyer and seller. Both buyer and seller can share confidential information with the agent and can expect that this information will not be revealed to the other party.

C. The listing agent is designated by his/her broker as the exclusive agent of the seller for a particular listing. All other agents within the same firm are designated as buyer's agents, representing exclusively the buyer. In this case, the broker is a limited dual broker, charged with overseeing the transactions and ensuring that buyer and seller are treated fairly.

D. The listing agent is designated as the exclusive seller's agent as in scenario C. But if an agent from another firm represents the buyer, then the broker is the seller's exclusive broker with the broker and agent from the other firm representing the buyer.

Whatever the type of designated agency, it has to be revealed to both the seller and the buyer in clear and unambiguous form that represents whom and what this representation means. This disclosure has to be acknowledged in writing.

Designated agency representation has been challenged on the grounds that, in everyday practice, buyers have gained little if anything relative to the phased-out agency/subagency representation.[3] This argument rests on the idea that agents continue to have a conflict of interest.

In particular, in scenario A there is no incentive for agents to make sure buyers fully understand their role as customers because few if any buyers would agree to a customer status if they clearly understood the implications. For example, if the buyer is a customer and makes a low offer, the seller's agent is obligated to reveal to the seller if he/she thinks a higher price can be obtained. If buyers were fully aware of that, they would choose a buyer's agent, which, in turn, would typically cut the listing agent's commission in half. Hence, the listing agent has a strong incentive to obfuscate rather than clarify the agency representation issue to the buyer.

In scenario B, the limited dual agency scenario, agents have again a strong interest not to reveal to buyers that they cannot expect to be represented *fully*. If they did, buyers would choose to be represented by a buyer's agent. But that would cut the listing agent's commission. If it is indeed true that most buyers that agree to designated agency representations A or B are unlikely to fully understand that the agent is not obligated to act in their best interest, one can postulate that, everything else constant, they are paying more for a given property than they would have if they were represented by a buyer's agent. Consequently, one would see a higher sale price for agency representations A and B. However, a conflict of interest may also emerge between the listing agent and the seller, the result of which may lead to a lower sale price. If a potential buyer has agreed to agency representations A or B, the listing agent receives the full commission when the sale materializes. Rather than risking that the current buyer declines to buy and is replaced by a buyer who is represented by a buyer's agent, it is in the listing agent's interest to convince the seller to accept a lower price, even though that may not be in the best interest of the seller.[4] Hence, based on a priori reasoning, it is not clear whether or not agency representations A and B lead to a higher or lower price.

Scenario C has room for several potential conflicts of interest to develop. The buyer's agent may try to push his/her broker's or firm's listings first rather than to look out only for the interests of the buyer. This may be particularly prevalent if the buyer's agent works for the same real estate broker as the listing agent. As the broker has a vested interest in not involving other brokers and, thus, sharing the commission, he/she may pressure his/her agents to steer buyers to his/her own listings. Similar pressure may be exerted by the real estate firm to keep the sale to the listings of the firm to avoid part of the commission going to another real estate firm. How this plays out for the price that the buyer is paying is ambiguous. A higher price may result because buyers are purposely not shown properties with a better price/value ratio. A lower price may result because the listing agent is pressuring the seller to accept a lower offer. In either case, a conflict of interest exists between the broker's or firm's interest to avoid splitting the commission and the best interests of their clients. A conflict of interest exists for the buyer's agent also in that he/she may steer the potential buyer to properties that offer the highest buyer's agent commission rather than to those properties that are best suited for the buyer. Such behavior would concentrate demand on those properties with the highest buyer's agent commission and would, therefore, likely raise the sale price. The involvement of a buyer's agent would not be advantageous to the buyer. Zietz and Newsome (2001) have uncovered some evidence in this respect.

In scenario D, where seller and buyer are represented by agents from different real estate firms, one would suspect fewer conflicts of interest to exist. In fact, the only apparent one for the buyer's agent is that he/she may steer the buyer to those listings with the highest buyer's agent commission rather than to the one most suited to the buyer.

Data and Estimation Results

Data

The study uses MLS data from the Orem/Provo (Utah) region.[5] The useable data set consists of a total of 1334 observations and covers home sales from mid-1999 to mid-2000. MLS data have both advantages and disadvantages for this study. Chief among the advantages is the fact that the results can be easily re-examined on other similar data sets. This is arguably of some importance for an exploratory study such as this. Also, there is no shortage of housing characteristics that may be of importance for determining price. The main disadvantage of using MLS data is that there are no data on buyer characteristics. This is a problem for most hedonic price functions in real estate that are based on MLS data. Sometimes an attempt is made to use locational variables in conjunction with certain housing characteristics to approximate buyers' characteristics. A similar approach is taken in this study. In particular, all observations are geo-coded to construct variables that identify the distance of each residential property to the neighboring city centers, the closest interstate highway, the slope of the property, its earthquake history, the school district, and numerous demographic variables of the census tract that the property is located in.[6]

Exhibit 1 provides a description of the variables used in this study. The dependent variable is the natural logarithm of the sale price (*SP*) for all regressions. The variables *BASFIRM* and *NOBA* are central to identifying the impact of agent representation on price. These two dummy variables make it possible to differentiate among three of the four scenarios. Scenario D, where the buyer's agent comes from a different real estate firm than the listing agent, is the base case, which accounts for 54.9% of all sales. Scenario C, where buyer's agent and listing agent come from the same firm, accounts for 12.9% of all transactions. This scenario is identified by the variable *BASFIRM* taking on the value of unity. In scenarios A and B, which jointly account for 32.2% of all sales in the sample, no buyer's agent is involved. Since the MLS data do not distinguish between these two cases, the variable *NOBA* takes on the value of unity for both scenarios A and B.

Insignificant coefficients for both *NOBA* and *BASFIRM* imply that the type of agency representation plays no role for the sale price of a house. A positive coefficient for variable *NOBA* combined with an insignificant variable *BASFIRM* means that by employing a buyer's agent a buyer can reduce the sale price of a house regardless of whether the buyer's agent comes from the same firm as the listing agent or not. Positive coefficients for both *NOBA* and *BASFIRM* suggest that a buyer's agent from outside the firm of the listing agent can achieve a lower price for the buyer than any other agency arrangement.

The relative size of the coefficients of *NOBA* and *BASFIRM* provide an indication of the relative importance of the conflict of interest that exists for the listing agent on the one hand and the brokerage firm on the other. As suggested earlier, it is conceivable that *BASFIRM* has a negative coefficient. Such a result would suggest that the firm's agents have either managed to prod the seller into accepting a lower price than necessary or they are willing to reduce their commission in order to avoid losing a sale. The first possibility would point toward a conflict between the listing firm's interest in keeping the commission inside the firm and the seller's interest in the highest possible sale price.

The variable *BAC* is central to the issue whether and to what extent the buyer's agent commission affects the sale price.[7] A positive value for *BAC,* as found by Zietz and Newsome (2001), would suggest that listing agents can attract more buyer's agents to properties that offer higher commissions and the increased demand makes for a higher price. It is of interest not only whether this positive effect of BAC also emerges for the current data set but also how any price effect that originates with BAC compares and/or interacts with the price effects that may exist for the type of agency representation.

The variables in Exhibit 1 and all following exhibit are arranged into three groups to make the interpretation of the estimation results more transparent.

Exhibit 1 | Variable Definitions and Basic Statistics

Variable	Definition	Mean	Min	Max
SP	Sale price in dollars; log(SP) = dependent variable	146894	90000	247000
SIZE	Square feet of house + acres*1,000	2454	830	4904
Elasticities' Variables				
ACRES	Lot size in acres	0.25	0.01	2.10
SQFT	Size of house in square feet	2205	792	4584
YEAR	Year in which the property was built	1975	1877	2000
Marginal Effects' Variables				
BAC	Buyer's agent commission, percentage of sale price	2.93	0	5
BEDR	Number of bedrooms	3.77	1	7
BATHF	Number of full bathrooms	1.63	0	4
BATHT	Number of 3/4 bathrooms (shower, no tub)	0.37	0	3
BATHH	Number of half baths	0.20	0	3
DINK	Number of dining areas in kitchen	0.88	0	2
DINF	Number of formal dining rooms	0.10	0	2
FIREP	Number of fireplaces	0.61	0	3
BASMT	Percentage of house covered by finished basement	0.45	0	1
GARAGE	Number of garage places	1.39	0	5
DECK	Number of decks	0.27	0	3
DI15	Distance to interstate Highway 15, in miles (U.S. topographical map)	1.51	0.01	5.61
DOREM	Distance to city center of Orem, in miles (U.S. topographical map)	6.27	0.26	18.24
DPROVO	Distance to city center of Provo, in miles (U.S. topographical map)	8.85	0.38	20
EARTHQK	Magnitude of largest earthquake, on Richter Scale (EPA data)	1.55	0.12	4.08
PCTSLOPE	Percentage slope of property (U.S. topographical map)	2.18	0.00	17.32
POPLS18	Percentage of population less than 18 years, by census tract	37.77	7.0	48.1
POPOT65	Percentage of population older than 65 years, by census tract	6.71	1.5	19.2
FAMILY	Family households as a percentage of all households, by census tract	85.10	44.8	95.6

Exhibit 1 | (continued)

Variable Definitions and Basic Statistics

Variable	Definition	Mean	Min	Max
WITHCHD	Percentage of households with own children under 18, by census tract	53.93	13.3	75.3
ALONE65	Householder 65 years and over living alone as percentage of all households, by tract	4.61	1.3	13.7
PERHH	Average population per household, by census tract	3.72	2.76	4.73
NWHITRAT	Percentage of population classified as non-white, by census tract	7.24	1.96	22.59
VRATE	Percentage of vacant housing units, by census tract	3.48	1.06	7.78
FORRENT	Percentage of all vacant housing units for rent, by census tract	22.97	0	75.7
FORSALE	Percentage of all vacant housing units for sale only, by census tract	34.57	0	71.4
Percentage Effects' Variables				
NOBA	1 if only listing agent is involved in sale, no buyer's agent, 0 otherwise	0.322	0	1
BASFIRM	1 if buyer's agent is from the same firm as the listing agent, 0 otherwise	0.129	0	1
AIREL	1 if air conditioning is electric, 0 otherwise	0.256	0	1
AIRGAS	1 if air conditioning is gas, 0 otherwise	0.065	0	1
FLHAR	1 if hardwood flooring is present in house, 0 otherwise	0.274	0	1
FLTIL	1 if tile flooring is present in house, 0 otherwise	0.256	0	1
EXTU	1 if exterior is stucco, 0 otherwise	0.142	0	1
EXBRI	1 if exterior is brick, 0 otherwise	0.702	0	1
EXALU	1 if exterior is aluminum or vinyl, 0 otherwise	0.549	0	1
EXFRA	1 if exterior is frame, 0 otherwise	0.066	0	1
LOTSPR	1 if sprinkler is present on lot, 0 otherwise	0.548	0	1
SCHOOLD1	1 if school district Alpine, 0 otherwise—base is Provo school district	0.732	0	1
SCHOOLD2	1 if school district Nebo, 0 otherwise—base is Provo school district	0.168	0	1

Note: Table is the full sample of 1334 observations.

Elasticity variables are converted into logarithmic form for the purpose of estimation. Their estimated coefficients have to be interpreted as elasticities. The estimated coefficients of the *marginal effects variables* can be converted into the absolute change in sale price that results from a unit change in the variable if one multiplies the estimated coefficient by the mean value of sale price for the given sample. The estimated coefficients of the 0/1 variables listed under *percentage effects variables* give the approximate percentage change in sale price that results if the variable switches from zero to one.[8]

Estimation Results

Least Squares Regressions on Full Sample. The first model in Exhibit 2 presents the parameter estimates for the complete sample of 1334 observations. The statistical adequacy tests reported at the bottom of Exhibit 2 strongly suggest that this model does not capture the data generating process. In particular, there is evidence of heteroscedasticity, functional form misspecification, structural instability and spatial autocorrelation. The simultaneous occurrence of these problems may suggest neglected parameter heterogeneity,[9] a point earlier raised by Newsome and Zietz (1992) and Zietz and Newsome (2001).

The second model in Exhibit 2 examines the sensitivity of the regression results to the presence of outliers in the data set. In particular, the second regression excludes outliers as defined by Belsley, Kuh and Welsch (1980: 11–18). Excluding thirty-six observations that fall into the outlier category has no apparent impact on the statistical adequacy tests. However, the outlier removal does have a significant effect on one of the three variables of particular interest in this study. The variable *BAC* almost doubles in value and becomes statistically different from zero as outliers are removed.[10]

As is typical for hedonic price functions in real estate, there is some collinearity among the regressors. Multicollinearity can give rise to serious inference problems if the *variables of interest* are highly correlated among each other or with other model variables. The seriousness of this problem is examined by the calculation of variance inflation factors. As suggested by Belsley, Kuh and Welsch (1980), factors in excess of ten point toward a potential collinearity problem. For the full data set of 1334 observations, the variance inflation factors for the variables *BAC*, *NOBA* and *BASFIRM* are: *BAC* = 1.083, *NOBA* = 1.137 and *BASFIRM* = 1.103. All three factors are far below the critical level of ten, which means that multicollinearity is not a problem as it relates to inferences about the three variables of interest in this study.[11]

For completeness, the last two columns in Exhibit 2 give the economic interpretation of the coefficient estimates for both the least squares model with and without outliers. *Marginal Effects* are derived as the estimated coefficients multiplied by the mean of the sale price. The *Percentage Effect* for a given coefficient b is calculated as $e^b - 1$. *Marginal Effects* give the change in sale

Exhibit 2 | Least Squares Regression Results on Full Sample

	Coefficient Estimates and *t*-Values				Interpretation of Coefficients	
	With Outliers		Without Outliers		With Outliers	Without Outliers
Variable	Coefficient	*t*-Values	Coefficient	*t*-Values		
Constant	−12.0141	−3.73	−12.1453	−3.64	Elasticities	
ln *ACRES*	0.0509	5.26	0.0578	5.58	0.05	0.06
ln *SQFT*	0.2182	15.47	0.2169	15.42	0.22	0.22
ln *YEAR*	2.8887	6.80	2.9126	6.62	2.89	2.91
					Marginal Effects	
BAC	0.0109	1.66	0.0186	2.50	1,603	2,728
BEDR	0.0029	0.78	0.0032	0.84	419	464
BATHF	0.0618	9.77	0.0609	9.39	9,072	8,948
BATHT	0.0339	5.52	0.0331	5.22	4,987	4,863
BATHH	0.0308	4.61	0.0304	4.33	4,524	4,465
DINK	0.0023	0.42	0.0022	0.39	331	320
DINF	0.0190	1.88	0.0174	1.66	2,785	2,554
FIREP	0.0030	0.72	0.0028	0.66	438	409
BASMT	−0.0098	−1.39	−0.0094	−1.31	−1,443	−1,376
GARAGE	0.0239	6.46	0.0237	6.32	3,514	3,482
DECK	0.0000	0.00	0.0006	0.12	1	94
DI15	0.0101	2.88	0.0095	2.56	1,488	1,402
DOREM	0.0074	2.91	0.0058	1.76	1,083	852
DPROVO	−0.0070	−2.76	−0.0047	−1.45	−1,021	−696
EARTHQK	−0.0103	−2.15	−0.0103	−2.06	−1,512	−1,509
PCTSLOPE	−0.0005	−0.42	−0.0007	−0.47	−80	−101
POPLS18	−0.0021	−0.72	−0.0018	−0.55	−307	−267
POPOT65	−0.0064	−1.86	−0.0049	−1.21	−945	−720
FAMILY	0.0014	1.03	0.0002	0.15	207	34
WITHCHD	−0.0006	−0.34	−0.0008	−0.45	−82	−111
ALONE65	0.0079	2.42	0.0061	1.69	1,167	901
PERHH	0.0245	1.22	0.0389	1.77	3,606	5,717
NWHITRAT	−0.0026	−1.64	−0.0014	−0.85	−386	−209
VRATE	0.0033	1.21	0.0006	0.20	488	87
FORRENT	−0.0003	−1.06	−0.0003	−0.90	−41	−38
FORSALE	−0.0002	−0.63	−0.0001	−0.42	−28	−20

Exhibit 2 | (continued)

Least Squares Regression Results on Full Sample

	Coefficient Estimates and *t*-Values				Interpretation of Coefficients	
	With Outliers		Without outliers		With Outliers	Without Outliers
Variable	Coefficient	*t*-Values	Coefficient	*t*-Values		
					Percentage Effects	
NOBA	0.0043	0.74	0.0048	0.83	0.004	0.005
BASFIRM	−0.0041	−0.53	−0.0061	−0.77	−0.004	−0.006
AIREL	0.0356	6.13	0.0342	5.82	0.036	0.035
AIRGAS	0.0069	0.67	0.0094	0.92	0.007	0.009
FLHAR	0.0344	6.28	0.0355	6.35	0.035	0.036
FLTIL	0.0171	3.03	0.0177	3.11	0.017	0.018
EXTU	0.0691	6.90	0.0706	6.86	0.072	0.073
EXBRI	0.0026	0.40	0.0030	0.47	0.003	0.003
EXALU	0.0169	2.70	0.0191	2.98	0.017	0.019
EXFRA	0.0174	1.75	0.0204	1.98	0.018	0.021
LOTSPR	0.0248	4.62	0.0270	4.97	0.025	0.027
SCHOOLD1	0.0758	2.88	0.0519	1.57	0.079	0.053
SCHOOLD2	0.0692	3.54	0.0544	2.55	0.072	0.056
P−Values for test of:						
Homoscedasticity	0.000		0.000			
Functional form	0.000		0.000			
Structural stability	0.000		0.000			
No spatial autocorrelation	0.001		0.004			
R^2	0.7723		0.7706			

Notes: Sample size with outliers is 1,224; sample size without outliers is 1,298. The log of sale price (*SP*) is the dependent variable. The null of homoscedasticity is checked by the Breusch−Pagan (1979) test; the null of correct functional form by Ramsey's (1969) Reset test; the null of structural stability by a Chow test that is robust to heteroscedasticity (MAC2 of Thursby, 1992), the null of no−spatial autocorrelation by Moran's I test with a standardized weight matrix (Cliff and Ord, 1972). Outlier identification follows Belsley et al. (1980, 11-18). *t*−values are robust to heteroscedasticity by application of a jackknife approximation as discussed in Davidson and MacKinnon (1993: 552−56).

price that results from a unit change in the variable of interest. *Percentage Effects* provide the percentage change in sale price if the associated dummy variable switches from zero to one.

Least Squares Regressions on Subsamples. Suggesting that housing characteristics do not have a unique price across the sample is uncommon in real estate valuation. However, hedonic price theory does not rule out this case. In fact, theory can justify it by assuming heterogeneous buyer preferences (*e.g.*, Triplett, 1987: 632). In particular, if preferences for housing attributes differ among buyers, then buyers can face different attribute prices even though they are located on the same hedonic price surface.[12]

Finding statistical evidence that is consistent with parameter heterogeneity is relatively easy. Performing the next step and identifying homogeneous subsamples of the data set is considerably more involved. It also gives rise to potential statistical pitfalls. For example, identifying subsamples by price, that is, by the size of the dependent variable, can generate biased parameter estimates as discussed in detail by Heckman (1979).[13] By contrast, defining subsamples by the size of some independent variable is perfectly legitimate (Koenker and Hallock, 2001). This latter approach will be taken in this study.

If one wants to allow for different attribute prices along the hedonic surface, some auxiliary assumptions are needed to tie unobservable buyer preferences to observable variables. For the purpose of this study, two auxiliary assumptions are made. First, it is assumed that differences in buyer preferences are systematically related to unobserved buyer characteristics. Second, it is assumed that an *observable* variable exists that is closely related to these *unobservable* buyer characteristics so that attribute prices vary systematically with that *observable* variable. It is conjectured that property *SIZE*, a weighted average of square footage and acreage, is such an observable variable.[14] The rationale for choosing *SIZE* is as follows. Houses characterized by smaller size are likely to be preferred by young, smaller families that are looking for a starter home or by older retired couples with a preference for smallness. It is also likely that less educated buyers opt for homes of a smaller size because they are liquidity constrained over their lifetime. What may potentially tie these buyer groups together is that they may be less aggressive in real estate dealings, either because they are less experienced or because they put more value on absence of conflict. That should give real estate agents some leverage in influencing the behavior of these buyers. In obvious analogy, one would expect that buyers that opt for larger-sized properties are, on average, more experienced and aggressive and are, therefore, less likely influenced by the negotiating tactics of real estate agents.

If one assumes that the coefficients of the three variables of interest depend on property *SIZE*, one can estimate a model that includes interaction terms between these three variables and *SIZE*. The estimates of such a model do indeed suggest that the coefficients of *BAC* and *BASFIRM* change with property *SIZE*. However, the statistical adequacy tests of such an amended model are not any more encouraging than those reported in Exhibit 2.

Rather than trying out interaction terms with *SIZE* for each and every variable, the data are sorted by *SIZE* and regressions like those of Exhibit 2 are run on subsamples of the data. The results of the regressions on four such subsamples are reported in Exhibit 3. The subsamples are determined from the sorted data as follows. Starting from the 200 observations with the lowest *SIZE*, the sample is successively enlarged to the point where adding more observations would lead to a decisive and permanent structural break, as evidenced by a heteroscedasticity-consistent Chow test,[15] or evidence of a wrong functional form, as tested by Ramsey's (1969) *Reset.* This process generates the size class identified as *Small Size* in Exhibit 3. The process of finding statistically viable subsamples of observations is repeated starting from the end of the first subsample and so forth.[16]

It is noteworthy that the subsample regressions reported in Exhibit 3 provide no evidence of spatial autocorrelation even at the 10% level of statistical significance. This result suggests that spatial autocorrelation and parameter heterogeneity may be directly related, a point that requires further study in light of the prominence given to spatial autocorrelation issues in the more recent hedonic price literature (Pace, Barry and Sirmans, 1998). The apparent absence of parameter heterogeneity for the regressions of Exhibit 3 makes heteroscedasticity, which shows up in three of the four size classes, easy to deal with: the *t*-values for the coefficient estimates can be and are taken from a heteroscedasticity robust variance covariance matrix.[17]

The regressions of Exhibit 3 reveal rather different coefficients across subsamples both in size, sign and statistical significance. This is particularly apparent for the elasticity variables but also applies to the three coefficients of key interest in this study, *BAC*, *NOBA* and *BASFIRM*. Given these apparent differences, it is not surprising that the regressions on the full sample reported in Exhibit 2 reveal significant statistical problems.

Exhibit 4 provides summary statistics on the untransformed variables for each of the four size classes. It is apparent that the mean values by size class of most neighborhood variables are either positively or negatively related to the classification variable *SIZE*. This suggests that the variable SIZE may indeed be a useful proxy for key but unobserved buyer characteristics.

Economic Interpretation of Subsample Results. To discuss the substantive results, it is convenient to move to Exhibit 5, which contains the elasticities, marginal effects and percentage effects for sale price that are implied by the coefficient estimates of Exhibit 3. The following results emerge for the price effects of agency representation.

The variable *NOBA* is statistically significant at better than the 5% level only for small- to medium-sized properties. Exhibit 5 reveals that buyers of these types of properties are paying on average about 2% more because they are not represented by a buyer's agent. Since *BASFIRM* is statistically insignificant for this size class, it does not matter whether or not the buyer's agent comes from inside or outside the listing firm. Buyers of smaller and larger properties do not pay a premium for not engaging a buyer's agent.

Exhibit 3 | Least Squares Regressions on Subsamples, With Data Ordered by Property Size

	Small Size		Small to Medium Size				Medium to Large Size		Large Size	
	With Outliers		With Outliers		Without Outliers		With Outliers		With Outliers	
Variables	Coefficient	*t*–Value	Coefficient	*t*–Value	Coefficient	*t*–Value	Coefficient	*t*–Value	Coefficient	*t*–Value
Constant	4.815	0.63	−13.828	−3.26	−15.009	−3.51	−8.813	−1.20	−40.700	−4.37
ln *ACRES*	0.014	0.84	0.042	2.84	0.042	2.13	0.052	1.60	0.075	3.89
ln *SQFT*	0.099	1.88	0.238	3.98	0.252	3.86	0.095	0.72	0.230	4.05
ln *YEAR*	0.798	0.81	3.088	5.36	3.230	5.56	2.621	2.69	6.702	5.43
BAC	−0.010	−0.82	0.029	2.86	0.033	3.01	−0.003	−0.21	−0.013	−0.85
BEDR	0.023	1.80	0.004	0.60	0.007	1.06	0.014	1.81	−0.003	−0.55
BATHF	0.054	3.22	0.056	4.96	0.049	4.44	0.077	6.00	0.040	3.24
BATHT	0.038	1.68	0.041	3.25	0.034	2.65	0.033	2.49	0.014	1.19
BATHH	0.020	1.15	0.036	2.80	0.033	2.54	0.019	1.13	0.020	1.65
DINK	−0.023	−1.64	−0.003	−0.33	−0.007	−0.78	0.024	1.96	0.007	0.81
DINF	0.007	0.23	0.009	0.65	0.011	0.79	0.027	0.97	0.013	0.84
FIREP	−0.017	−1.05	0.003	0.41	0.003	0.45	−0.004	−0.46	0.010	1.22
BASMT	−0.002	−0.10	−0.002	−0.15	−0.003	−0.27	−0.004	−0.24	0.015	0.93
GARAGE	0.024	2.61	0.028	4.36	0.026	4.18	0.022	2.85	0.009	0.92
DECK	0.030	1.42	−0.007	−0.82	−0.005	−0.56	0.002	0.16	−0.001	−0.15
DI15	−0.008	−0.63	0.004	0.78	0.002	0.35	0.004	0.53	0.012	1.72
DOREM	0.002	0.27	0.004	0.78	0.005	0.92	0.001	0.16	0.004	1.00
DPROVO	−0.006	−0.89	−0.002	−0.35	−0.002	−0.29	−0.004	−0.59	−0.005	−1.25
EARTHQK	−0.009	−0.52	−0.011	−1.30	−0.011	−1.21	−0.010	−0.97	0.000	0.03

Exhibit 3 | (continued)

Least Squares Regressions on Subsamples, With Data Ordered by Property Size

	Small Size		Small to Medium Size				Medium to Large Size		Large Size	
	With Outliers		With Outliers		Without Outliers		With Outliers		With Outliers	
Variables	Coefficient	*t*–Value	Coefficient	*t*–Value	Coefficient	*t*–Value	Coefficient	*t*–Value	Coefficient	*t*–Value
PCTSLOPE	0.009	1.74	0.005	0.96	0.008	2.11	−0.002	−0.63	−0.004	−1.73
POPLS18	−0.013	−1.54	0.001	0.24	0.001	0.28	−0.008	−1.55	−0.001	−0.18
POPOT65	−0.011	−0.94	0.001	0.10	0.004	0.62	−0.012	−1.42	0.001	0.17
FAMILY	0.003	0.54	0.001	0.34	−0.001	−0.56	0.003	0.95	−0.001	−0.36
WITHCHD	0.006	1.15	−0.002	−0.80	−0.001	−0.54	0.000	0.10	0.001	0.32
ALONE65	0.013	1.15	0.000	−0.01	−0.001	−0.25	0.007	0.84	0.003	0.36
PERHH	−0.010	−0.21	0.044	1.10	0.067	1.58	−0.026	−0.58	0.004	0.08
NWHITRAT	−0.006	−1.46	0.000	0.10	0.002	0.52	−0.007	−2.08	−0.006	−1.56
VRATE	0.012	1.18	0.006	1.03	0.003	0.45	0.009	1.43	0.000	0.03
FORRENT	−0.001	−1.04	0.000	0.03	0.000	0.64	−0.001	−0.99	0.000	−0.14
FORSALE	−0.001	−0.97	0.000	−0.86	0.000	−0.81	0.001	1.38	0.000	0.21
NOBA	−0.004	−0.32	0.020	2.12	0.023	2.47	−0.005	−0.41	0.001	0.05
BASFIRM	−0.014	−0.68	−0.003	−0.24	0.003	0.27	−0.038	−2.07	−0.008	−0.52
AIREL	0.008	0.60	0.028	3.04	0.027	2.95	0.028	2.31	0.045	3.82
AIRGAS	−0.027	−0.95	−0.015	−0.62	−0.004	−0.15	0.012	0.65	0.026	1.39
FLHAR	0.017	1.22	0.022	2.19	0.019	1.93	0.012	0.94	0.050	4.86
FLTIL	0.022	1.41	0.017	1.82	0.018	1.95	−0.001	−0.08	0.022	2.02
EXTU	0.060	1.42	0.060	3.33	0.059	3.25	0.119	5.69	0.044	2.21

Exhibit 3 | (continued)

Least Squares Regressions on Subsamples, With Data Ordered by Property Size

	Small Size		Small to Medium Size				Medium to Large Size		Large Size	
	With Outliers		With Outliers		Without Outliers		With Outliers		With Outliers	
Variables	Coefficient	*t*−Value	Coefficient	*t*−Value	Coefficient	*t*−Value	Coefficient	*t*−Value	Coefficient	*t*−Value
EXBRI	0.021	1.79	0.013	1.37	0.016	1.67	0.030	1.93	−0.008	−0.50
EXALU	0.019	1.53	0.010	0.87	0.012	1.03	0.054	3.62	0.014	1.13
EXFRA	−0.011	−0.50	0.021	1.30	0.018	1.06	0.033	0.97	0.016	0.74
LOTSPR	0.041	3.12	0.019	2.15	0.017	1.83	0.017	1.51	0.035	2.89
SCHOOLD1	0.030	0.47	0.019	0.36	0.015	0.23	0.028	0.38	0.063	1.39
SCHOOLD2	0.049	1.23	0.049	1.27	0.051	1.23	0.030	0.66	0.071	1.51
P−Values for tests of:										
Homoscedasticity	0.050		0.005		0.005		0.000		0.006	
Functional form	0.026		0.036		0.064		0.058		0.254	
Structural stability	0.123		0.202		0.210		0.292		0.016	
No. spatial autocorr.	0.173		0.339		0.283		0.219		0.343	
R^2	0.5999		0.6775		0.6842		0.5983		0.6017	

Notes: Sample size for small size with outliers is 222; sample size for small to medium size with outliers is 358; sample size for medium to large size without outliers is 324; sample size for large size with outliers is 430. See Exhibit 2 for details on the statistical tests.

Exhibit 4 | Basic Statistics on Variables, By Property Size Class

	Small Size			Small to Medium Size			Medium to Large Size			Large Size		
Variable	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
SP	119820	90000	164583	133794	100000	190000	145717	99000	204000	172666	107000	247000
SIZE	1487	830	1812	2066	1813	2286	2490	2287	2704	3250	2708	4904
Elasticities' Variables												
ACRES	0.20	0.01	0.52	0.22	0.01	0.99	0.24	0.01	1.30	0.31	0.01	2.10
SQFT	1291	792	1717	1849	949	2155	2252	1015	2604	2937	875	4584
YEAR	1958	1877	2000	1972	1889	2000	1979	1900	2000	1982	1894	2000
Marginal Effects Variables												
BAC	2.92	0	5	2.88	0	5	2.96	0	5	2.96	0	5
BEDR	3.00	2	5	3.65	1	6	3.90	2	6	4.18	2	7
BATHF	1.23	0	3	1.54	1	3	1.68	0	4	1.88	0	4
BATHT	0.15	0	2	0.29	0	2	0.37	0	2	0.57	0	3
BATHH	0.15	0	1	0.17	0	2	0.16	0	3	0.28	0	2
DINK	0.80	0	2	0.90	0	2	0.92	0	2	0.86	0	2
DINF	0.05	0	1	0.05	0	1	0.08	0	2	0.17	0	2
FIREP	0.30	0	2	0.47	0	2	0.56	0	2	0.92	0	3
BASMT	0.16	0	1	0.53	0	1	0.50	0	1	0.48	0	1
GARAGE	0.94	0	2	1.18	0	3	1.40	0	3	1.79	0	5
DECK	0.09	0	1	0.29	0	2	0.26	0	1	0.36	0	3
DI15	1.17	0.01	3.42	1.20	0.02	4.82	1.47	0.01	5.51	1.98	0.01	5.61
DOREM	6.00	0.28	18.24	6.22	0.38	18.20	6.46	0.34	17.68	6.31	0.26	15.36

Exhibit 4 | (continued)

Basic Statistics on Variables, By Property Size Class

	Small Size			Small to Medium Size			Medium to Large Size			Large Size		
Variable	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
DPROVO	7.31	0.40	19.32	8.74	0.54	19.98	9.45	0.38	19.98	9.29	0.70	20.00
EARTHQK	1.80	0.24	3.78	1.60	0.12	4.00	1.56	0.14	4.08	1.37	0.16	4.06
PCTSLOPE	1.62	0.00	10.32	1.74	0.00	14.97	2.32	0.00	11.85	2.72	0.00	17.32
POPLS18	34.90	7.0	48.0	37.08	12.2	48.1	38.40	7.0	48.1	39.34	15.7	48.1
POPOT65	6.93	1.5	19.2	6.62	2.0	17.8	6.66	1.5	19.2	6.70	2.0	19.2
FAMILY	80.94	44.8	95.1	83.94	44.8	95.1	85.85	47.8	95.1	87.65	44.8	95.6
WITHCHD	49.31	13.3	74.1	52.90	18.6	75.3	54.99	13.3	75.3	56.38	21.7	75.3
ALONE65	5.14	1.3	13.7	4.75	1.3	10.7	4.58	1.3	13.7	4.26	1.3	13.7
PERHH	3.46	2.88	4.53	3.62	2.76	4.73	3.76	2.86	4.73	3.89	2.98	4.73
NWHITRAT	9.32	3.23	18.89	8.12	2.50	22.59	6.74	2.50	22.59	5.80	1.96	18.87
VRATE	3.82	1.21	7.78	3.62	1.06	6.75	3.40	1.06	7.78	3.25	1.06	7.78
FORRENT	30.05	0.0	75.7	24.16	0.0	75.7	21.71	0.0	75.7	19.26	0.0	75.7
FORSALE	28.39	0.0	71.4	33.15	0.0	71.4	35.25	0.0	71.4	38.42	0.0	71.4
Percentage Effects Variables												
NOBA	0.32	0	1	0.29	0	1	0.34	0	1	0.34	0	1
BASFIRM	0.14	0	1	0.12	0	1	0.12	0	1	0.14	0	1
AIREL	0.21	0	1	0.18	0	1	0.23	0	1	0.36	0	1
AIRGAS	0.05	0	1	0.06	0	1	0.06	0	1	0.08	0	1
FLHAR	0.29	0	1	0.24	0	1	0.23	0	1	0.32	0	1

Exhibit 4 | (continued)

Basic Statistics on Variables, By Property Size Class

Variable	Small Size			Small to Medium Size			Medium to Large Size			Large Size		
	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max	Mean	Min	Max
FLTIL	0.20	0	1	0.21	0	1	0.24	0	1	0.33	0	1
EXTU	0.08	0	1	0.09	0	1	0.13	0	1	0.23	0	1
EXBRI	0.50	0	1	0.70	0	1	0.77	0	1	0.76	0	1
EXALU	0.47	0	1	0.64	0	1	0.63	0	1	0.46	0	1
EXFRA	0.10	0	1	0.07	0	1	0.06	0	1	0.05	0	1
LOTSPR	0.42	0	1	0.51	0	1	0.54	0	1	0.66	0	1
SCHOOLD1	0.57	0	1	0.70	0	1	0.79	0	1	0.79	0	1
SCHOOLD2	0.29	0	1	0.19	0	1	0.10	0	1	0.14	0	1

Exhibit 5 | Economic Interpretation of Coefficients of Exhibit 3, By Property Size

	Small Size	Small to Medium Size	Medium to Large Size	Large Size
Elasticities				
ACRES	0.014	0.042*	0.052	0.075*
SQFT	0.099	0.238*	0.095	0.230*
YEAR	0.798	3.088*	2.621*	6.702*
Marginal Effects				
BAC	−1224	3819*	−426	−2253
BEDR	2766	532	1980	−589
BATHF	6500*	7481*	11228*	6840*
BATHT	4503	5447*	4803*	2395
BATHH	2377	4827*	2826	3420
DINK	−2768	−418	3429*	1281
DINF	879	1238	3878	2293
FIREP	−2035	376	−575	1677
BASMT	−267	−221	−594	2581
GARAGE	2822*	3686*	3161*	1618
DECK	3617	−981	272	−239
DI15	−909	583	622	2064
DOREM	196	547	173	721
DPROVO	−758	−257	−621	−842
EARTHQK	−1061	−1531	−1425	61
PCTSLOPE	1123	630	−257	−736
POPLS18	−1571	152	−1146	−197
POPOT65	−1295	95	−1680	247
FAMILY	374	104	439	−188
WITHCHD	766	−285	54	209
ALONE65	1540	−6	957	469
PERHH	−1144	5833	−3777	613
NWHITRAT	−775	40	−953*	−1090
VRATE	1390	823	1270	30
FORRENT	−120	2	−73	−15
FORSALE	−131	−63	130	23
Percentage Effects				
NOBA	−0.004	0.020*	−0.005	0.001
BASFIRM	−0.014	−0.003	−0.037*	−0.008
AIREL	0.008	0.029*	0.029*	0.046*

Exhibit 5 | (continued)

Economic Interpretation of Coefficients of Exhibit 3, By Property Size

	Small Size	Small to Medium Size	Medium to Large Size	Large Size
AIRGAS	−0.026	−0.015	0.013	0.026
FLHAR	0.017	0.023*	0.012	0.051*
FLTIL	0.022	0.017	−0.001	0.022*
EXTU	0.061	0.062*	0.126*	0.045*
EXBRI	0.021	0.013	0.031*	−0.008
EXALU	0.019	0.010	0.056*	0.014
EXFRA	−0.011	0.021	0.033	0.016
LOTSPR	0.042*	0.019*	0.017	0.035*
SCHOOLD1	0.031	0.019	0.029	0.065
SCHOOLD2	0.050	0.050	0.030	0.074

Notes: Marginal Effects are derived as estimated coefficient times the mean of sale price for a given subsample. The Percentage Effect for coefficient b is given as $\exp(b) - 1$. Marginal Effects give the change in sale price that results from a unit change in the variable of interest. Percentage Effects provide the percentage change in sale price if the dummy variable switches from zero to one. All price effects hold relative to the average variable values in the subsample for which they are calculated.

*Significant at the 5% level or better.

Exhibit 4 provides some information on the neighborhood characteristics of houses in the small to medium size class, for which *NOBA* is positive and statistically significant. It is apparent that the average property in this size class tends to be located somewhat closer to interstate Highway 15 and to the city centers of Orem and Provo than the average property (Exhibit 1). Compared to the full sample, fewer family households and households with children can be found in this size class, but a larger than average share of elderly people living alone and of minorities (mainly Hispanics) can be found. In addition, an above average vacancy rate and a larger share of rental properties point toward a more transient environment. But for the same neighborhood variables, the *small size* class has a more extreme mean than the class with small- to medium-sized properties. Hence, it is difficult to suggest that a linear or even monotonic relationship exists between the economic behavior underlying the coefficient of *NOBA* and neighborhood characteristics. In particular, if one wants to read into the results that the price effect of *NOBA* more heavily affects less experienced, less educated, older or minority buyers, one needs some ancillary assumption to explain why the coefficient of *NOBA* is not the highest in the small size class. One somewhat speculative explanation could be that real estate agents somehow refrain from taking advantage of their most vulnerable clients.

The variable *BASFIRM* is negative and economically significant for medium to large size properties. For this size class, the price is about 3.7% lower if both buyer's agent and listing agent come from the same firm as opposed to from different firms. For all other size classes, the firm affiliation of buyer's and listing agents makes no difference to the sale price. This result contradicts some of the arguments against designated agency relationships that are employed by consumer advocacy groups and representatives of exclusive buyer brokers. In particular, general statements that the allegiance of buyer's agents to their real estate firm matters for price are not supported by the data. There is also no evidence that buyers get a lower price by employing a buyer's agent from a different firm than the listing agent's. On the contrary, the evidence points in the opposite direction. Buyers get a better deal from those buyer's agents that share the same firm with the listing agent.

Although buyers do not appear to be any worse off by employing a buyer's agent from the same firm as the listing agent's, the same argument does not hold for sellers. The negative sign of *BASFIRM* can imply one of two things. Either the agents lower their joint commission to avoid getting other real estate firms involved in the sale or they act to pressure the seller to give in to a lower sale price. The second scenario is more likely because the first scenario is inconsistent with the fact that the percentage price reduction associated with *BASFIRM* (3.7%) is considerably larger than the average buyer's agent commission (2.9%) that would have to be paid to the buyer's agent from a different real estate firm. Hence, it appears that the seller in the medium to large category ends up with a lower price as a result of pressure by his/her listing agent. If this result can be confirmed in other studies, it would represent a classic conflict of interest between the interests of the real estate firm that is listing the property and the seller. Such an outcome would be of interest to regulators and law makers because it would suggest a basic problem with the designated agency concept.

Exhibit 5 reveals that *BAC* is statistically significant for the same size class as the variable *NOBA*. For small- to medium-sized properties, a one percentage point increase in the buyer's agent commission is predicted to raise the price by about $3,819, which is about 2.9% of the average sale price.[18] This is a significant price effect not only financially but also with regard to the issue of agency representation. Specifically, the price effect from *BAC* implies that a redistribution of the commission toward the buyer's agent has the potential to more than compensate for the price advantage that a buyer may receive from engaging a buyer's agent in the first place. This result arises as follows. If a buyer engages a buyer's agent, *NOBA* is zero and buyers pay, on average, 2% less compared to the case where they agree to limited dual agency or simply being a customer of the listing agent. However, if buyers' agents are attracted to houses with higher buyer's agent commissions, then buyers may pay a higher price because of that. On balance, therefore, buyers may end up not being any better off by employing a buyer's agent. This points to a potential agency problem for all properties for which the buyer's agent commission is more than one percentage point above the average. The policy conclusion from this result appears straightforward: disclosure should not be limited to the issue of who represents whom but it must include the structure of the sales commission: who gets paid what.

Conclusion

This study has used a local data set of broker-assisted MLS house sales to examine whether and to what extent the type of agency representation influences the sale price of a residential property. The major substantive finding is that the impact of agency representation varies by property size. The type of agency representation appears to play no role at all for very small and for large properties. However, for property sizes in between these extremes, some statistically significant effects can be identified. These can be summarized as follows.

First, a typical buyer of a small- to medium-sized property that is not represented by a buyer's agent is likely to pay about 2% more for a property. This finding of a price effect of the type of agent representation is consistent with popular claims of buyer brokers, but it is different from that of previous studies (Elder, Zumpano and Elder, 2000). However, the present study encompasses earlier work in the sense that it explains why that work could not identify such a relationship: it only exists for smaller properties and does not show up when hedonic price functions are estimated across all property classes. The fact that the price effect is limited to properties at the lower end of the size distribution appears plausible if one assumes that typical buyers in this market segment are likely to be less experienced and/or less aggressive in real estate dealings. Young families buying starter homes, less educated buyers with lifetime liquidity constraints, or retired couples are likely to fit into this category. It would be of interest if a similar price effect can be verified for other local data sets. If it can, then the designated agency concept may have to be re-evaluated in terms of its effect on different demographic groups of society.

Second, there is no evidence to suggest that a buyer's agent who works for a different firm than the one of the listing agent will be able to reduce the sale price for buyers. In fact, for a sizable range of the size distribution the opposite appears to be true: the sale price drops by about 3.7% if buyer's agent and listing agent come from the *same* firm. However, the fact that buyers may obtain a lower price by engaging a buyer's agent from the same firm as the listing agent raises the issue of whether or not the listing firm is shortchanging the seller. The evidence appears to suggest that the agency relationship between seller and listing agent may be compromised. Further study with a more complete data set would be useful to clarify this issue.[19]

Third, by raising the buyer's agent commission by one percentage point, the listing agent can raise the sale price of small- to medium-sized properties by almost 3%. This finding points to a potential conflict of interest between buyers and buyer's agents. The positive price effect of the buyer's agent commission suggests that buyer's agents react to higher commissions as desired by listing agents: they steer their clients toward these properties, which raises demand and sale price. When this evidence is combined with the result that a buyer's agent can lower the sale price of a small- to medium-sized house by about 2%, then, on balance, engaging the services of a buyer's agent may not be a good idea if obtaining the lowest sale price is the buyer's key objective. To guard against such an outcome or, at least, to make buyers aware of the incentives that drive buyer's agents, it would appear that disclosure rules should include the requirement for agents to lay open the structure of the sales commission that is associated with a given property.[20]

Appendix

Variance Inflation Factors

Variables	Full Sample	Small Size	Small to Medium Size	Medium to Large Size	Large Size
ln *ACRES*	1.19	1.38	1.51	1.72	1.42
ln *SQFT*	2.43	2.16	1.69	1.79	1.58
ln *YEAR*	2.11	2.87	2.34	2.30	2.03
BAC	1.08	1.15	1.52	1.22	1.08
BEDR	1.94	1.73	1.49	1.89	1.86
BATHF	2.56	2.20	2.26	2.24	3.34
BATHT	2.23	1.80	1.85	1.98	3.42
BATHH	1.18	1.49	1.35	1.34	1.27
DINK	1.12	1.25	1.22	1.26	1.15
DINF	1.09	1.22	1.21	1.17	1.17
FIREP	1.44	1.65	1.34	1.46	1.58
BASMT	1.58	1.78	1.59	1.92	1.84
GARAGE	1.62	1.93	1.64	1.92	1.42
DECK	1.12	1.27	1.20	1.23	1.15
DI15	1.91	2.41	1.83	2.44	2.26
DOREM[a]	22.54	19.70	29.34	57.21	19.88
DPROVO[a]	30.87	25.21	38.46	71.84	30.08
EARTHQK	2.64	4.72	2.87	2.50	3.11
PCTSLOPE	1.31	1.90	1.43	1.45	1.62
POPLS18[a]	45.26	72.77	42.49	55.93	48.67
POPOT65[a]	15.48	13.18	12.64	26.55	27.77
FAMILY[a]	15.31	28.03	11.77	18.11	18.49
WITHCHD[a]	49.00	58.40	48.63	70.19	57.87

Variance Inflation Factors (continued)

Variables	Full Sample	Small Size	Small to Medium Size	Medium to Large Size	Large Size
ALONE65[a]	10.20	11.26	9.46	15.71	13.87
PERHH[a]	11.00	5.43	12.77	13.83	13.63
NWHITRAT	7.03	9.30	9.44	6.60	7.18
VRATE	1.68	1.85	1.95	1.84	2.35
FORRENT	3.36	4.99	4.10	3.23	3.91
FORSALE	3.89	6.84	4.89	4.39	3.96
NOBA	1.14	1.34	1.17	1.28	1.21
BASFIRM	1.10	1.32	1.22	1.24	1.22
AIREL	1.24	1.57	1.25	1.29	1.37
AIRGAS	1.14	1.54	1.48	1.20	1.14
FLHAR	1.07	1.32	1.13	1.15	1.15
FLTIL	1.07	1.29	1.15	1.21	1.09
EXTU	1.50	1.40	1.38	1.55	1.96
EXBRI	1.25	1.44	1.26	1.39	1.32
EXALU	1.45	1.58	1.74	1.60	1.50
EXFRA	1.11	1.28	1.25	1.28	1.12
LOTSPR	1.20	1.37	1.27	1.32	1.30
SCHOOLD1[a]	22.32	23.30	30.46	40.56	19.22
SCHOOLD2[a]	8.04	10.25	9.88	9.92	9.36

Notes:
[a] Variables have variance inflation factors above the critical level of ten. Their *t*-values in Exhibits 2 and 3 should be interpreted with caution.

Endnotes

1 About twenty states have already enacted laws that are designed to abrogate the common law of agency and to replace it with statutory laws that involve some form of designated agency (*Realty Times*, Sept. 14, 2000).

2 The potential role of the buyer's agent commission for evaluating agency representation issues has recently been highlighted by Zietz and Newsome (2001).

3 This argument is typical for consumer advocacy groups (*Realty Times*, May 21, 1999) and representatives of the National Association of Exclusive Buyer Agents' (*Realty Times*, April 5, 2000).

4 One way for the agent to prod the seller into accepting a lower price is to cut the commission to close to what could be obtained if a buyer's agent were involved. This

way the agent would do his/her part of lowering the price and this willingness to take a pay cut could put significant pressure on the seller to do his/her part in reducing the price.

[5] Utah law recognizes three types of agency arrangements: (1) a buyer's agency in which the agent represents solely the buyer; (2) a seller's agency in which the agent represents solely the seller; and (3) limited agency in which the agent represents both buyer and seller in the same transaction and works to assist in negotiating a mutually acceptable transaction while remaining neutral in the representation of buyer and seller. All real estate agency agreements need to be put in writing before any offer is presented by the agent.

[6] Average income is not added because this variable has not been made available.

[7] For a number of properties, listing agents offered buyer's agents a flat fee rather than a percentage. This flat fee has been converted to a percentage of the listing price.

[8] The exact percentage change in sale price is calculated by taking the exponent of the estimated coefficient and subtracting one.

[9] See Zietz (2001) for a recent discussion of the relationship between neglected parameter heterogeneity and statistical adequacy tests, such as those for heteroscedasticity.

[10] As suggested by a reviewer, the sensitivity of the coefficient estimates is also checked with respect to the inclusion of the variable ''time-on-the-market.'' The inclusion of this variable has no impact on the three variables of interest, *BAC*, *NOBA* and *BASFIRM*. This applies to the full data set as well as to all subsamples introduced in the next section.

[11] A table in the Appendix provides variance inflation factors for all variables and all data sets used in this study.

[12] See Brock and Durlauf (2001) for some of the general economic theory underlying social interactions and their importance for the development of behavioral patterns within and among social groupings.

[13] If one wants to allow for parameter variation by price, the appropriate technique would be quantile regression, as discussed by Koenker and Bassett (1978).

[14] It is apparent that *SIZE* can be a sensible proxy only for some not all buyer characteristics. One may argue that *SIZE* is likely to proxy some key buyer characteristics, such as income and family size.

[15] The MAC2 test suggested by Thursby (1992) is used. A standard Chow test is inappropriate because Exhibit 2 suggests that heteroscedasticity may be present at least at the 5% level of statistical significance.

[16] It is important to note in this context that statistically viable regressions similar to those of Table 3 *do not emerge for* reasonably sized subsets of the data if the data are not sorted or if the data are sorted by square footage, or by other variables. This point is important because it implies that the regression results of Exhibit 3 are not of the hit-and-miss type. In other words, there are any number of alternative subdivisions of the data that also produce statistically viable regressions but that have potentially different results.

[17] A jackknife approximation is used, as discussed in Davidson and MacKinnon (1993: 552–56).

[18] This finding is similar to that reported in Zietz and Newsome (2001) for a much smaller data set and far fewer explanatory variables.

[19] Any reexamination would have to check the sensitivity of the results with regard to agency size, as discussed in Benjamin, Jud and Sirmans (2000a,b), and those characteristics of the buyer that are not captured by the size variable, such as the willingness of the buyer to bargain.

[20] One may note that the price effect of the buyer's agent commission also raises some doubts about claims by exclusive buyer's agents that they do not have a conflict of interest in their relationship with buyers. The key question in this context is whether exclusive buyer brokers are immune to the incentives provided by above-average buyer's agent commissions.

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