

# The Role of Commission Rates and Specialization in the Determination of Real Estate Agent Income

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## Abstract

This paper explores the performance of residential real estate agents and the commission structure under which they operate. This study reveals the interrelationship among the number of properties sold by an agent, the dollar volume of sales, and real estate agent income. This research shows that the ability to generate listings is essential to generating higher levels of income in residential real estate sales. The listings become the platform from which agents leverage their human capital in the generation of income. However, the ability to generate listings is a skill related to experience, as well as to the firm and market environment.

The real estate brokerage industry is a major employer in the United States. The National Association of Realtors<sup>®</sup> (NAR) estimates there are approximately 2.5 million real estate professionals licensed by the various states. These agents are employed in 236,000 real estate broker office locations across the country. About 1.2 million real estate professionals are NAR members. In 2004, the sale of new and existing homes amounted to approximately \$1.9 trillion. The NAR estimates that the housing sector directly accounts for 15% of U.S. gross domestic product (GDP).

This paper explores the performance of residential real estate agents and the commission structure under which they operate. While numerous studies have examined broker earnings and commission rates, the current study develops a testable model that relates the number of housing transactions, sales, and commissions to the source of the listing.<sup>1</sup> In the model, agents choose to focus their efforts on developing listings, selling other agents' houses, or selling their own listings. Since these activities require specific and distinct skills, agents who perform these three activities have differing demographic characteristics, and the characteristics of firms with which the agents are affiliated differ as well. Empirical evidence from the 2005 NAR Membership Survey supports the testable model and shows that agent and firm characteristics are related to the source of the listing sale.

## The Market for Brokerage Services

Agents act on the behalf of clients in the sale and purchase of their clients' houses. In a world of perfect information where sellers know the potential buyers and maximum

prices they are willing to pay, home sellers and buyers would not need agents. In reality, however, information is far from perfect, and agents provide information to sellers and buyers in exchange for a commission rate based on the sales price of the property.

### **Firm Output, Revenue, and Listing Specialization**

A number of studies have examined production and revenue at the brokerage-firm level. Jud, Rogers, and Crellin (1994) find that the number of homes sold by residential real estate firms increases with the size of the metropolitan area, firm size and age, and MLS affiliation. For the average firm, net revenue increases 9.0% because of franchise affiliation. Operating efficiency studies of real estate firms have been undertaken by Zumpano, Elder, and Crellin (1993), Zumpano and Elder (1994), and Anderson, Fok, Zumpano, and Elder (1998) among others. Zumpano, Elder, and Crellin find a U-shaped cost curve with modest economies of scale. Zumpano and Elder report that a balanced mix of listings and sales are optimal at the firm level and minimize cost. Their study, however, does not examine specialization at the agent level. Anderson et al. find that real estate brokerage firms operate inefficiently because of suboptimal input allocations and failure to operate at constant returns to scale, and firm size is positively related to efficiency levels.

Richins, Black, and Sirmans (1987) utilize cluster analysis to explore the operations of brokerage firms. They find that firms tend to self-select one of three strategic orientations for the generation of revenue: (1) obtaining listings that are sold by other firms; (2) selling properties that are listed by other firms; and (3) selling the firm's own listings.<sup>2</sup>

### **Listing Specialization and Residential Real Estate Licensee Income**

Research relating licensee compensation to various measures of productivity is quite extensive. Most of these studies draw on human capital theory developed by Mincer (1970) and others. Studies by Follain, Lutes, and Meir (1987), Crellin, Frew, and Jud (1988), Glower and Hendershott (1988), and Sirmans and Swicegood (1997, 2000) have found that age, experience, hours worked, firm size, and technology have a positive influence on licensee earnings. Research by Munneke and Yavas (2001) has focused on compensation incentives and performance.<sup>3</sup>

A recent study by Johnson, Zumpano, and Anderson (2007) examines licensee compensation as it relates to listing specialization. Using the NAR 2001 Membership Survey data, they find that listings specialization, defined as the ratio of revenue transactions from listings to total revenue transactions, is positively related to licensee income. In their concluding section, the authors pose two important issues for further research: (1) why does specialization in listings make agents more productive; and (2) why are not all agents listing specialists? The present study addresses these issues.

### **A Model of Agent Transactions, Sales, and Income**

Following Richins, Black, and Sirmans (1987), brokerage services can be classified into three categories: (1) sales by agents of their own listings; (2) sales by agents of other agents' listings; and (3) listings of an agent that are sold by other agents. In the analysis that follows, separate equations are estimated for each of the three brokerage activities because the requisite skills and talents of agents differ and each of these brokerage

functions is assumed to require different labor and capital inputs. In contrast to Richins, Black, and Sirmans, the present study is focused at the *agent* level rather than at the *firm* level.

An empirical model of brokerage service production is developed where production, or output, is measured by the quantity of home sales (see Equation (1)). The estimated brokerage production function is similar to that estimated by Jud, Rogers, and Crellin (1994). The variables used to measure the individual labor inputs include the number of hours worked (*Hrs*), the number of years of schooling (*Sch*), and the level of real estate market experience (*Exp*).<sup>4</sup> In addition, race/ethnicity (*Black*) and gender (*Female*) may influence the quantity of houses sold because of differences in the opportunity to sell properties to prospective customers. Marital status (*Married*) is included as a variable that influences an individual's motivation to generate sales.

Capital components include firm characteristics, such as firm size, technology, and franchise affiliation. Office size (*Sfsizoff*) is measured by the number of salespersons associated with a particular office and firm size (*Sfsizf*) by the number of agents in the firm. Sales agents in smaller firms may concentrate their efforts on selling their own listings because of the lack of connectivity with other agents and firms, and also, because smaller firms may be more likely to prevail in smaller markets.

The use of information technology (*Techf*) is expected to increase the quantity of houses sold.<sup>5</sup> Market size is captured by the natural log of employment (*Emp*) in the metropolitan area. The pricing strength of the housing market is captured by the change in housing prices in a specific market (*%ΔHPI*). This change is measured by the percentage change in the Office of Federal Housing Enterprise Oversight (OFHEO) index in the particular metropolitan area.

Using agent characteristics, firm characteristics, and market information, the general form of the broker's production model is defined as follows:

$$\begin{aligned} \text{Ln}(Q_i) = & f(\text{Hrs}, \text{Exp}, \text{Exp}2, \text{Sch}, \text{Black}, \text{Married}, \text{Techf}, \text{Sfsizf}, \text{Sfsizoff}, \text{Indnfr}, \\ & \text{Ln}(\text{Emp}), \% \Delta \text{HPI}). \end{aligned} \tag{1}$$

Where:

- $Q_i$  = The quantity of houses sold in 2004 by an agent categorized by: (1) sales by agents of other agents' listings (*Otherlist*); (2) sales by agents of their own listings (*Ownlist*); or (3) listings of an agent that are sold by other agents (*Elselist*);
- Hrs* = The number of hours worked per week by the sales agent in 2004;
- Exp* = The number of years of real estate experience of the sales agent;
- Exp2* = The number of years of real estate experience squared of the sales agent;
- Sch* = The number of years of schooling;
- Black* = A dummy variable for an African-American sales agent;
- Female* = A dummy variable indicating the agent is female;
- Married* = A dummy variable indicating the agent is married;
- Techf* = A factor analysis variable constructed using technology variables;<sup>6</sup>

- $Sfsizf$  = The number of agents (in thousands) in the firm of the sales agent;
- $Sfsizoff$  = The number of agents in the individual office of the sales agent;
- $Indnfr$  = A dummy variable indicating an independent, non-franchise firm;
- $Emp$  = Employment (in thousands) in the metropolitan area in December 2004; and
- $\% \Delta HPI$  = The percentage change in the OFHEO house price index during 2004.

The total home sales measured in dollars (revenue) are assumed to be defined by Equation (2). The revenue model includes characteristics of the agent, firm, and the market.

Agents who possess more experience ( $Exp$ ) are likely to generate more sales through efficiency and/or by selling higher-priced houses.<sup>7</sup> The hours worked ( $Hrs$ ) variable measures the sales effort of the agent. Firm characteristics such as office size, firm size, and franchise affiliation also may influence sales volume because they provide sales agents with the infrastructure to support sales.<sup>8</sup> The use of technology is expected to increase sales. Studies by Sirmans and Swicegood (2000), Benjamin, Jud, Roth, and Winkler (2002) and Jud, Winkler, and Sirmans (2002) suggest that the use of information technology is positively related to sales revenue.

A vector of market characteristics includes market size, measured by the level of employment ( $Emp$ ), and the pricing strength of the market, measured by the percentage change in housing prices in the specific metropolitan market ( $\% \Delta HPI$ ). The rate of housing price change ( $\% \Delta HPI$ ) is measured using data compiled by OFHEO.

In addition, a vector of agent characteristics may influence the price category of houses sold by a particular agent. Agents who have fewer years of schooling ( $Sch$ ), who are African-American ( $Black$ ), who are Female ( $Female$ ), or who are married ( $Married$ ) may have clientele at different price categories.

The empirical model to estimate the dollar volume of home sales (revenue) is defined as follows:

$$Sales = f(Otherlist, Ownlist, Elselist, Hrs, Exp, Exp2, Sch, Black, Female, Married, Techf, Sfsizf, Sfsizoff, Indnfr, \ln(Emp), \% \Delta HPI). \quad (2)$$

Where:

- $Sales$  = The dollar amount of housing sales (revenue) by the agent in 2004;
- $Otherlist$  = The number of houses sold by agents in 2004 that originate from other agents' listings;
- $Ownlist$  = The number of houses sold by agents in 2004 that originate from their own listings;
- $Elselist$  = The number of houses sold by agents in 2004 that originate from their own listings but that are sold by other agents in 2004;
- $Hrs$  = The number of hours worked per week by the sales agent in 2004;
- $Exp$  = The number of years of real estate experience of the sales agent;
- $Exp2$  = The number of years of real estate experience squared of the sales agent;
- $Sch$  = The number of years of schooling of agents;
- $Black$  = A dummy variable for race indicating that the agent is African-American;
- $Female$  = A dummy variable indicating the agent is female;

- Married* = A dummy variable indicating the respondent is married;  
*Techf* = A factor analysis variable constructed using technology variables;<sup>9</sup>  
*Sfszsf* = The number of agents (in thousands) in the firm of the sales agent;  
*Sfszoff* = The number of agents in the individual office of the sales agent;  
*Indnfr* = A dummy variable indicating an independent, non-franchise firm;  
*Emp* = Employment (in 1,000s) in the metropolitan area in December 2004; and  
 $\% \Delta HPI$  = The percentage change in the standardized OFHEO index by metropolitan area (2003.4 = 100) in 2004.<sup>10</sup>

The level of income earned by the agent for a given level of sales is defined by Equation (3). Since agents are compensated on a commission system, agent income is directly related to the dollar volume of housing sales. However, while housing sales are positively related to agent income, the housing sales generated by an agent's own listings, the housing sales by an agent of listings of other agents, and the sales of an agent's listings by other agents may involve different commission rates. In addition, commission rates also are likely associated with real estate market conditions. During a strong seller's market, commission rates are likely to be lower because sellers are more easily able to sell their houses quickly and at higher prices. The housing market strength is measured by the percentage change in average housing prices ( $\% \Delta HPI$ ) in 2004. The average percentage change in each metropolitan market is determined using the OFHEO index.

The empirical model for estimating the agent income is as follows:

$$Income = f(Sales, Pownlist, Pelselist, \% \Delta HPI). \quad (3)$$

Where:

- Income* = Earnings (or income) of agents in 2004;  
*Sales* = The dollar amount of housing sales by agents in 2004;  
*Pownlist* = An interaction term of the proportion of *Ownlist* and *Sales* defined as  $Sales * (Ownlist / (Otherlist + Ownlist + Elselist))$ ,  
*Pelselist* = An interaction term of the proportion of *Elselist* and *Sales* defined as  $Sales * (Elselist / (Otherlist + Ownlist + Elselist))$ ; and  
 $\% \Delta HPI$  = The percentage change in the standardized OFHEO index by metropolitan area (2003.4 = 100) in 2004.

In Equation (3), the estimated coefficient on the *Sales* variable provides an estimate of the average commission rate received by agents who sell the listings of other agents. The coefficients on the *Pownlist* and *Pelselist* variables provide estimates of the marginal increase in the commission rate received by agents who sell their own listings or agents whose listings are sold by others.

## Data and Empirical Results

The data for this study are obtained from 2005 NAR Membership Survey. The survey was sent to 120,000 members; 8,450 usable responses were generated, which represents about a 7.0% response rate. The survey includes demographic data, business activities,

characteristics of brokerage firms, the use of technology, and income and expenses for 2004. The means and standard deviations of all variables used in the analysis are shown in the Appendix (Exhibit A.1).

Exhibit 1 shows the three regression estimates for Equation (1). All of the equations are estimated using the White (1980) procedure for consistent standard errors in the presence of heteroscedasticity of unknown form. The regressions have adjusted R-square values between 0.167 and 0.235, and all regressions are statistically significant at the 0.01 level.

The number of hours worked per week is positively related to the number of houses sold. Each hour of additional work per week corresponds to about a 2% increase in the number of houses sold. The increase is similar for all three categories of listing sales.

The findings for the experience (*Exp*) indicate a much stronger positive relation with *Elseelist* than for *Otherlist* or *Ownlist*. For agents' listings that are sold through other agents (*Elseelist*), there is an 8.6% increase in listings sold per year of experience with the first year of experience.<sup>11</sup> For agents who sell other agents' listings (*Otherlist*), the increase is 5.9% for the first year of experience, while agents selling their own listings (*Ownlist*) show a 4.7% increase the first year. With the fifth year of experience, for agents' listings

Exhibit 1. Number of Home Sales in 2004 ( $Q_i$ )

Independent Variables	Dependent Variables					
	ln( <i>Otherlist</i> )		ln( <i>Ownlist</i> )		ln( <i>Elseelist</i> )	
	Coeff.	t-Statistic	Coeff.	t-Statistic	Coeff.	t-Statistic
<i>Constant</i>	1.3207	5.25**	1.0239	3.15**	0.5689	2.15**
<i>Hrs</i>	0.0198	12.17**	0.0197	9.26**	0.0197	11.06**
<i>Exp</i>	0.0624	7.25**	0.0487	4.77**	0.0898	10.33**
<i>Exp2</i>	-0.0015	-5.79**	-0.0009	-2.96**	-0.0019	-7.66**
<i>Sch</i>	-0.0231	-1.98*	-0.0235	-1.53	-0.0102	-0.82
<i>Black</i>	0.0387	0.36	0.1632	1.20	-0.2900	-2.35**
<i>Female</i>	-0.0109	-0.22	-0.1485	-2.49**	-0.0178	-0.35
<i>Married</i>	0.0278	0.53	0.1141	1.85*	0.0815	1.50
<i>Techf</i>	0.1115	4.02**	0.0383	1.19	0.0865	3.10**
<i>Sfsizf</i>	-0.0001	-0.87	-0.0002	-2.39**	-0.0001	-1.08
<i>Sfsizoff</i>	0.0027	1.55	-0.0032	-1.45	0.0025	1.27
<i>Indnfr</i>	-0.0554	-1.07	0.0457	0.72	-0.0754	-1.37
<i>Log(Emp)</i>	-0.0286	-1.21	-0.0837	-2.91**	-0.0221	-0.91
<i>%ΔHPI</i>	-0.0024	-0.75	-0.0030	-0.81	0.0016	0.46
<i>R</i> <sup>2</sup>	0.200		0.178		0.243	
Adj. <i>R</i> <sup>2</sup>	0.193		0.167		0.235	
S.E. of regression	0.858		0.927		0.875	

Note: The equations are estimated using the White (1980) procedure for consistent standard errors in the presence of heteroscedasticity of unknown form. Number of observations: *Otherlist* = 1,338; *Ownlist* = 1,025; *Elseelist* = 1,255.

\* Statistically significant at the 5% level, one-tailed test.

\*\* Statistically significant at the 1% level, one-tailed test.

that are sold through other agents the marginal increase is 7.1%, while for agents who sell other agents' listings and agents selling their own listings, the gain is 4.8% and 4.0%, respectively.

The schooling variable (*Sch*) has a negative impact on home sales in all three of the equations in Exhibit 1, but it is statistically significant at the 0.05 level only in the *Otherlist* equation. This suggests that brokers with more formal schooling tend to sell fewer properties listed by other agents.

Marital status appears positively associated with the number of houses sold, but it is statistically significant at the 0.05 level only for *Ownlist*. The racial variable (*Black*) is negative and statistically significant only in the *Elselist* equation. The gender variable (*Female*) is negative but statistically significant at the 0.05 level only for *Ownlist*. These findings could be consistent with discrimination by other agents and/or buyers; however, other explanations also are plausible.<sup>12</sup>

The estimated coefficients on the technology variable (*Techf*) are statistically significant in the *Otherlist* and *Elselist* regressions at the 0.01 level, but not significant in the *Ownlist* equation. The importance of information technology as a factor affecting agent sales conforms to the results for income reported by Benjamin, Jud, Roth, and Winkler (2002) and Jud, Winkler, and Sirmans (2002).

Firm size (*Sfsizf*) is not statistically significant in the *Otherlist* and *Elselist* regressions. It has a negative and significant effect on agent sales of their own listings (*Ownlist*). An increase of 1,000 agents in the firm is estimated to reduce agent sales of their own listings by 20.0%. This finding provides evidence that the selling activities of agents in a firm differ as the firms become larger.

Office size (*Sfsizoff*) is not statistically significant in any of the equations in Exhibit 1. The estimated coefficient is negative only in the *Ownlist* equation. Also, whether or not an agent is affiliated with an independent, non-franchised firm does not have a statistically measurable impact on the number of houses sold. The estimated coefficients are negative for *Otherlist* and *Elselist*.

The *Emp* variable measures the size of the metropolitan area. *Emp* is negatively related to houses sold for all three regressions, but statistically significant only in the *Ownlist* equation.<sup>13</sup> The rate of housing price inflation as measured by  $\% \Delta HPI$  does not have a statistically significant effect on the number of houses sold in any of the three regressions in Exhibit 1.

Exhibit 2 presents the estimates from the *Sales* equation. The adjusted R-square value is 0.372. Of the three categories of sales listings, *Elselist* has the greatest influence on dollar sales. Total sales volume increases by \$83,592 for agents' listings sold by other agents. In comparison, sales increase by \$20,318 for agents who sell their own listings, and for other agents' listings sold by an agent, sales increase by \$36,402. The dominance in size of coefficient for *Elselist* suggests that a strategy of leveraging one's human capital as an agent by letting other agents sell one's listings can lead to a higher dollar volume of housing sales.

Hours worked (*Hrs*) and real estate market experience (*Exp*) exert strong positive impacts on the dollar volume of sales reported by agents. An additional hour of work per week

## Exhibit 2. Dollar Value of Home Sales in 2004 (Sales)

Independent Variables	Coeff.	t-Statistic
<i>Constant</i>	-3,847,307.0	-5.37**
<i>Otherlist</i>	36,402.4	2.32**
<i>Ownlist</i>	20,317.5	1.14
<i>Elselist</i>	83,591.5	7.59**
<i>Hrs</i>	29,204.7	4.90**
<i>Exp</i>	164,921.0	4.69**
<i>Exp2</i>	-3,598.6	-3.42**
<i>Sch</i>	111,774.3	3.28**
<i>Black</i>	-732,149.1	-2.86**
<i>Female</i>	-25,024.2	-0.17
<i>Married</i>	171,054.1	1.16
<i>Techf</i>	418,958.7	4.49**
<i>Sfsizf</i>	595.4	2.41**
<i>Sfsizoff</i>	790.0	0.16
<i>Indnfr</i>	205,586.7	1.39
<i>Log(Emp)</i>	137,401.4	2.06*
<i>%ΔHPI</i>	46,265.5	4.34**
Observations	1,458	
<i>R</i> <sup>2</sup>	0.379	
Adj. <i>R</i> <sup>2</sup>	0.372	
S.E. of regression	2,579,934	

Note: The equation is estimated using the White (1980) procedure for consistent standard errors in the presence of heteroscedasticity of unknown form.

\* Statistically significant at the 5% level, one-tailed test.

\*\* Statistically significant at the 1% level, one-tailed test.

generates \$29,205 in sales revenue per year. Likewise, an additional year of experience increases sales by \$157,724 (\$164,921 - \$7,197) after the first year as an agent. Sales reach a maximum with 23 years of experience. Firm size (*Sfsizf*) is statistically significant at the 0.01 level. The estimated coefficient suggests that sales increase \$595 per year with each additional agent in the firm. In contrast, office size (*Sfsizoff*) and non-affiliated firm (*Indnfr*) are statistically insignificant as determinants of agent sales.

Schooling (*Sch*) has a pivotal role in human capital theory. The schooling coefficient in the *Sales* equation is statistically significant at the 0.01 level and above. The coefficient is positive and indicates an increase in sales of \$111,774 per year of formal schooling. The positive effect appears to arise from the higher-priced homes sold by agents with more formal schooling, not because agents with more schooling sell more homes (the coefficients on *Sch* in Exhibit 1 are all negative).

The effects of race (*Black*) and gender (*Female*) are found to be negative, but the effects of gender are not statistically significant. Marital status (*Married*) has a positive impact on sales but also is not statistically significant.



The use of information technology (*Techf*) exerts a strong positive impact on agent sales. The technology factor variable consists of both individual- and firm-related technologies, so there is a combinational relationship in how the use of information technology increases sales.

Sales volume is higher in areas with greater housing price appreciation ( $\% \Delta HPI$ ). Larger metropolitan areas, defined by total employment (*Emp*), also are positively and significantly related to the dollar volume of housing sales. When these findings are compared with Exhibit 1, it is evident that the percentage change in house prices appear to positively influence the dollar volume of sales to a greater extent than the quantity of houses sold. Agent dollar sales volumes are larger in bigger metropolitan areas, even though they may sell fewer properties.

Exhibit 3 reports the estimates of the *Income* equation. The adjusted R-square value is 0.392. All coefficients are statistically significant at the 0.01 level or above except  $\% \Delta HPI$ . The *Sales* coefficient indicates that the average commission rate is about 1.6% on sales of homes listed by other agents. For agents who sell their own listings, the average commission rate increases by 1.8% to 3.4%. For agents who cooperate by letting other agents sell their listings, the commission rate increases by 0.8% over the base rate to 2.4%.

The findings shown in Exhibits 1-3 clearly resolve the paradox reported by Johnson, Zumpano, and Anderson (2007): Agents earn more money by concentrating on listings because the commission structure rewards such specialization. But not all agents can be listing specialists because not all agents possess the knowledge, experience, and other characteristics to be successful. These results accord with the work of Munneke and Yavas (2001) showing how incentives affect agent performance and effort.

**Exhibit 3. Income in 2004 (Income)**

Independent Variables	Coeff.	t-Statistic
<i>Constant</i>	15,278.190	3.10**
<i>Sales</i>	0.016	8.02**
<i>Pownlist</i>	0.018	4.81**
<i>Pelselist</i>	0.008	2.61**
$\% \Delta HPI$	543.699	1.56
Observations	1,116	
R-squared	0.392	
Adjusted R-squared	0.390	
S.E. of regression	92,269	

Note: The equation is estimated using the White (1980) procedure for consistent standard errors in the presence of heteroscedasticity of unknown form.

\* Statistically significant at the 5% level, one-tailed test.

\*\* Statistically significant at the 1% level, one-tailed test.

## Implications and Conclusions

This study examines the interrelationships among the type of listing sales with respect to the number of houses that are sold, total dollar sales, and income of agents. The number of hours worked has the largest impact on the number of properties sold by agents. The effect of real estate market experience is most pronounced in fostering the ability of agents to generate listings for other agents to sell. Working for a large firm and in a large office has a negative effect on the ability of agents to sell their own listings. Stated differently, larger offices tend to foster agent cooperation. Surprisingly, there is no evidence that franchise affiliation affects the number of home sales. However, the use of Internet technology has a very strong effect on the number of homes sold.

The dollar volume of agent sales is highest for agents' listings that are sold by other agents. Agents who sell their own listings and those who sell other agents' listings trail significantly those who have other agents sell their listings. Also, agents with more experience generate greater dollar sales. Experience increases both the quantity of houses sold and the selling of higher-priced houses. In addition, sales volume is higher in larger metropolitan areas with greater housing price appreciation.

The earnings of agents are directly related to the generation of sales, but the source of the listing greatly affects agent income. While earnings increase by about 1.6% per dollar of housing sales that are listed by others, agents who sell their own listings and those who let other agents sell their listings earn higher marginal commission rates of 1.8% and 0.8%, respectively. This research shows that the ability to generate listings is essential to generating high levels of income in residential real estate sales. The listings become the platform from which agents can leverage their human capital in the generation of income. However, the ability to generate listings is a skill related to experience, as well as to the firm and market environment.

## Appendix

**Table A1. Means and Standard Deviations of Sample Variables**

	Mean	Median	Maximum	Minimum	Std. Dev.	Obs.
<b>Dependent Variables</b>						
<i>Elselist</i>	7.85	5.00	282.00	0.00	11.06	4,185
<i>Income</i>	75,685.71	42,500.00	1,000,000.00	10,000.00	109,897.90	6,136
<i>Otherlist</i>	9.93	7.00	303.00	0.00	12.60	4,180
<i>Ownlist</i>	4.75	2.00	230.00	0.00	9.34	4,209
<i>Sales</i>	2,987,798.00	1,750,000.00	15,000,000.00	125,000.00	3,341,490.00	4,241
<b>Independent Variables</b>						
<i>%ΔHPI</i>	10.14	6.97	38.32	0.53	7.86	2,760
<i>Black</i>	0.04	0.00	1.00	0.00	0.20	6,136
<i>Emp</i>	0.06	0.00	1.00	0.00	0.23	6,136
<i>Exp</i>	11.45	8.00	40.00	1.00	10.59	6,092
<i>Exp2</i>	243.07	64.00	1,600.00	1.00	364.12	6,092
<i>Female</i>	0.55	1.00	1.00	0.00	0.50	6,136
<i>Hrs</i>	41.55	40.00	100.00	1.00	16.10	6,136
<i>Indnfr</i>	0.49	0.00	1.00	0.00	0.50	6,136
<i>Married</i>	0.73	1.00	1.00	0.00	0.45	6,136

**Table A1. Means and Standard Deviations of Sample Variables  
(continued)**

	Mean	Median	Maximum	Minimum	Std. Dev.	Obs.
<i>Pelselist</i>	1,130,178.00	583,333.30	15,000,000.00	0.00	1,574,235.00	3,789
<i>Pownlist</i>	577,842.40	187,500.00	15,000,000.00	0.00	1,087,161.00	3,789
<i>Sch</i>	14.62	14.00	20.00	10.00	1.98	6,131
<i>Sfsizf</i>	210.11	38.00	1,000.00	1.00	336.16	6,136
<i>Sfsizoff</i>	22.87	15.50	51.00	3.50	15.81	5,828
<i>Techf</i>	0.00	-0.03	3.52	-2.57	1.00	4,451

### Endnotes

- <sup>1</sup> See Benjamin, Jud, and Sirmans (2000) for a comprehensive review of real estate brokerage studies.
- <sup>2</sup> However, on an individual listing basis, while firm and individual agents provide advice to sellers, the seller decides on the listing price. Sellers signal their motivation to sell through setting listing prices and the inclusion of contractual provisions in their listing agreements (Benjamin and Chinloy, 2000). The authors find that houses selling at or below market benefit from more listing activity and sell faster, while above market price properties have a longer time on the market. The longer time is not justified by the minimal additional yield even with the additional market exposure.
- <sup>3</sup> Studies of economics efficiency have motivated numerous studies of commissions and contractual arrangements including Anglin and Arnott (1991), Miceli (1991, 1995), Yavas (1996), Buttimer (1998), and Rutherford, Springer, and Yavas (2005). In a study of flat-fee and fixed-rate commissions, Yavas (1996) demonstrates that both systems maximize the number of houses sold but minimize the surplus of buyers and sellers, while net listings provide a greater surplus but result in fewer houses sold. Rutherford, Springer, and Yavas (2005) examine the agency conflict arising from the percentage commission structure by comparing price premiums and time on the market for agents who sell their own houses versus those of clients. They find that while agent-owned houses sell no quicker, they do sell at a price premium of about 4.5%, suggesting the existence of an agency problem.
- <sup>4</sup> In the framework of strategic orientation at the individual level, agents who work more hours should also be more competitive; however, experience should be a moderating factor on competitiveness.
- <sup>5</sup> Sirmans and Swicegood (2000), Benjamin, Jud, Roth, and Winkler (2002), and Jud, Winkler, and Sirmans (2002) find a positive relationship between the use of technology and licensee income.
- <sup>6</sup> The technology factor variable is constructed using four variables: (1) the number of third party web-listings; (2) the existence of a personal webpage for business purposes; (3) the existence of a firm webpage for firm listings; and (4) the proportion of real estate transactions using email, wireless email, and instant messaging, respectively.
- <sup>7</sup> Studies by Follain, Lutes, and Meier (1987), Glower and Hendershott (1988), and Crellin, Frew, and Jud (1988) support a positive and statistically significant relationship of experience and schooling with income while the negative coefficient of minority status is confirmed by Crellin, Few, and Jud. While sales and sales agent income are quantitatively different variables, the strong relation between sales agent income and sales suggests that firm size and franchise affiliation may also have a positive and significant relationship with sales.

- <sup>8</sup> Sirmans and Swicegood (2000) find a positive and statistically significant relation between firm size and income; however, franchise is not statistically significant in its relation to sales agent income.
- <sup>9</sup> The technology factor variable is constructed using six variables: (1) the number of third party web-listings; (2) the existence of a personal webpage for business purposes; (3) the existence of a firm webpage for firm listings; (4) the proportion of real estate transactions using email; (5) the proportion of real estate transactions using wireless email; and (6) the proportion of real estate transactions using instant messaging. The first factor has an eigenvalue of 1.66 with 27.66% of explained variation. The second eigenvalue is 1.57 with 26.10% of explained variation. All other eigenvalues are less than 1.0. Only the first factor was used in the regression because it had the expected factor pattern of all positive coefficients for the six underlying technology variables. The factor pattern for the variables is shown in parentheses as follows: (1) the number of third party web-listings (0.6569); (2) the existence of a personal webpage for business purposes (0.6381); (3) the existence of a firm webpage for firm listings (0.4845); and (4) the proportion of real estate transactions using email (0.3908), wireless email, (0.4818) and instant messaging (0.4486), respectively.
- <sup>10</sup> OFHEO indexes do not share a common starting point for each metropolitan area. Therefore, it is necessary to transform the index to create indexes with a common starting year and quarter. The common starting point is the fourth quarter of 2003; that is, the base for all metro price indexes is  $2003.4 = 100$ .
- <sup>11</sup> The percentage increases are estimated by taking the first derivative of the regression dependent variable with respect to the experience variable (*Exp*).
- <sup>12</sup> This study has not controlled for other extraneous influences such as the number of listings per agent, the characteristics of listed properties, and the location of listed properties, for example, to identify the reason for the negative Black coefficient.
- <sup>13</sup> Larger metropolitan areas likely have more competition; therefore, there are fewer houses on average are sold by an individual agent. However, house prices in larger metropolitan areas are also higher.

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*We thank the National Center for Real Estate Research at the National Association of Realtors® for use of the 2005 NAR Member Survey data and Ellen Roche and Paul Bishop for their help. We also thank the managing editor, the editor, and the anonymous referees for their insightful comments.*

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