A Model of Real Estate Sales as a Career Choice

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Abstract. **This article develops a model of the probability that individuals choose careers in real estate sales. The model is estimated using Census data. Females are found to be significantly more likely than males to enter the field. For males, the probability of entering the field grows with schooling up through four years of college, and declines thereafter. For females, the probability falls with increased schooling beyond high school. Real estate sales is a career that is more appealing to both males and females with more labor market experience. For females, the probability of choosing a real estate career rises at a decreasing rate with experience. For males, the probability grows at an increasing rate. Both females and males are very responsive in their career choice decisions to changes in real earnings. The supply price elasticity, evaluated at the mean, is estimated to be +3.18 for males and +2.76 for females.**

Introduction

According to the Bureau of Census, the number of real estate sales professionals totaled 743,000 in 1995, up 27% from 1990.[1] The average earnings of real estate sales persons were $25,306. The factors that determine the earnings for real estate salespersons have been examined by Follain, Lutes and Meir (1987); Crellin, Frew and Jud (1988); Glower and Hendershott (1988); Sirmans and Swicegood (1997); and Jud and Winkler (1998), among others. These studies have reported that earnings are positively associated with hours worked, experience, education, firm size, franchise affiliation and employment in a metropolitan area. Earnings have been found to be negatively related to selling residential property, not having a broker's license and being female.[2]

In this article, we examine the related question of occupational choice. That is, what factors influence the probability that an individual will choose the real estate sales profession relative to others? Research on the determinants of occupational choice has investigated the choice of broad occupational categories (Boskin, 1974; Schmidt and Strauss, 1975a, b; and Orazem and Mattila, 1991). However, as far as we have been able to determine, research has not examined the factors that influence the specific occupational choice of real estate sales.

Using Census data on earnings that control for differences in gender, schooling, experience, hours worked and regional cost of living differences, we model the

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probability that an individual will choose to enter the real estate sales profession. The model allows us to explore the effects of schooling, experience, gender and expected earnings on occupational choice. Of particular note, is our finding that the choice of a real estate sales career is very elastic with respect to earnings. This finding has important implications for brokers, regulators and others interested in the future of the brokerage industry. This article provides a review of the occupational choice literature, lays out the occupational probability model, presents and discusses the empirical data and results, and concludes with a summary of findings and avenues for further research.

Literature Review

Boskin (1974) explores occupational choice using a logit model stratified by age, sex and occupational group. His model explains occupational choice with variables related to: (1) the present value of potential lifetime earnings; (2) relative training costs; and (3) expected earnings loss due to unemployment. Boskin's empirical results were consistent with the human capital hypothesis that workers choose occupations to maximize the present value of potential lifetime earnings.

Schmidt and Strauss (1975a) employ five board occupational titles (professional, white collar, craft, blue collar and menial) based on census titles. They relate the choice of these occupational categories to education, experience, race and gender. Their results, using logit analysis, indicate that gender and race strongly influence the type of job individuals select. Schmidt and Strauss (1975b) utilize a simultaneous logit model where the choice of occupation and industry are jointly determined.

More recently, Orazem and Mattila (1991) study the proportion of male high school graduates who take jobs in six broad occupational categories. Their data is drawn from twenty-three school districts in Maryland from 1951 through 1969 and follows two academic groups: vocation/technical school graduates and graduates of four-year colleges and universities. Using a multinomial logit specification, they find that average career earnings and the distribution of earnings per unit of human capital influence career choice. School quality also is found to affect occupational choice.

Occupational Probability Model

The occupational probability model developed by Schmidt and Strauss (1975a, b) provides the basis for the formation of our model. The general form of the empirical model used in this study is as follows:[3]

$$P_{I,J} = f(F_{I,J}, S_{I,J}, RE_{I,J}, \varepsilon_I), \tag{1}$$

where:

$P_{I,J}$ = The proportion of individuals in the Ith age/sex/schooling category of the Jth MSA who are real estate sales professionals;
$F_{I,J}$ = A dummy variable equal to 1 if the category is female (0 otherwise);

$E_{I,J}$ = The average number of years of general labor market experience in the Ith category;
$S_{I,J}$ = The average number of years of formal schooling in the Ith category;
$RE_{I,J}$ = The average real earnings of real estate sales professionals in the Ith category (in \$1,000s); and
ε_I = A stochastic term.

The estimated coefficient on the schooling variable can be partitioned into different levels of schooling using a spline function as follows (Greene, 1997:389):

$$P_{I,J} = \alpha + \beta_1 + \beta_2 S_{I,J} + \delta_1 d_1 (S_{I,J} - 12) + \delta_2 d_2 (S_{I,J} - 16), \quad (2)$$

where:

$d_1 = 1$ if $S_{I,J} \geq$ twelve years (0 otherwise); and
$d_2 = 1$ if $S_{I,J} \geq$ sixteen years (0 otherwise).

The spline function permits the effect of schooling on the proportion of individuals choosing the real estate profession to differ for various levels of schooling such as primary, secondary, undergraduate and graduate school.

General labor market experience is captured using the traditional human-capital approach as follows:

$$\text{Experience } (E) = \text{Age} - \text{Schooling } (S) - 5.$$

To examine the possibility of a nonlinear relationship, we introduce both experience (E) and experience squared (E^2) into the probability equation.

The use of proportions data as the dependent variable creates some problems when using a regression approach (Greene, 1997). One complication is heterskedasticity between the error term (ε_I) and the independent variables. A second more serious problem is that the predictions from the model given by $\beta' x$ (where β' is the vector of estimated regression coefficients and x is the vector of independent variables) cannot be constrained to a zero-one interval. Greene (1997:874) indicates this produces nonsensical probabilities and negative variances.

Boskin (1974) and Schmidt and Strauss (1975a, b) address the shortcomings of the regression approach through the use of a logistical probability (or logit) model.[4] This model addresses the aforementioned statistical problems associated with using regression analysis with proportion data.

Data

The data for this research are obtained from the Bureau of the Census, *Census of Population and Housing 1990* (1994).[5]

Exhibit 1 presents the descriptive statistics for full-time real estate sales professionals with the total sample in Panel A and gender-based sub-samples in Panels B and C. The total sample includes 3,079 observations from 61 MSAs; these observations are the proportions of individuals in real estate with the associated personal characteristics of gender, schooling, experience and average earnings.

The nominal earnings figures taken from the Census report are deflated by the American Chambers of Commerce Research Association (ACCRA, 1989) regional

Exhibit 1
Descriptive Statistics

Variable	Mean	Std. Dev.	Min.	Max.
Panel A: Descriptive Statistics for Full Sample				
Proportion, P_l	0.013	0.020	0.000	0.379
Female, F_l	0.485	0.500	0.000	1.000
Experience, E_l	25.363	14.870	0.000	55.000
Experience Squared, E_l^2	864.319	811.476	441.000	3,025.000
Schooling, S_l	14.065	2.548	8.000	18.000
College, $d_1(S_l - 12)$	2.338	2.146	0.000	6.000
Grad. Sch., $d_2(S_l - 16)$	0.291	0.705	0.000	2.000
Real Earnings, RE_l	32.930	26.293	0.311	721.332
Panel B: Descriptive Statistics for Male Sample				
Proportion, P_l	0.012	0.017	0.000	0.379
Experience, E_l	25.823	15.105	0.000	55.000
Experience Squared, E_l^2	894.862	832.868	0.000	3,025.000
Schooling, S_l	14.164	2.631	8.000	18.000
College, $d_1(S_l - 12)$	2.458	2.178	0.000	6.000
Grad. Sch., $d_2(S_l - 16)$	0.325	0.738	0.000	2.000
Real Earnings, RE_l	39.490	31.648	0.311	721.332
Panel C: Descriptive Statistics for Female Sample				
Proportion, P_l	0.015	0.021	0.000	0.291
Experience, E_l	24.873	14.605	0.000	55.000
Experience Squared, E_l^2	831.831	787.063	0.000	3,025.000
Schooling, S_l	13.961	2.455	8.000	18.000
College, $d_1(S_l - 12)$	2.211	2.106	0.000	6.000
Grad. Sch., $d_2(S_l - 16)$	0.255	0.667	0.000	2.000
Real Earnings, RE_l	25.952	16.347	1.526	260.708

Note: Panel A: $N = 3{,}079$; Panel B: $N = 1{,}587$; and Panel C: $N = 1{,}492$.

cost of living index to adjust for regional differences in the cost of living. The ACCRA index measures the relative cost of consumer goods and services in MSAs across the country.

Real estate sales professionals comprise on average about 1.33% of the total workforce in the 61 MSAs in our sample. Approximately 48.5% or real estate sales professionals are female. The average real earnings of all sales professionals are $32,930. Males earn $39,490, while females earn $25,952, or about 66% of their male counterparts. Males, however, have slightly more experience and education.[6]

Empirical Results

Exhibit 2 presents the findings for the OLS regression and logit models. The OLS regression shows a statistically significant adjusted R^2 of 34%. The error term, however, in the OLS model is heteroskedastic with respect to the independent variables, and the independent variable coefficients have suspect values. Predictions from the OLS model are not constrained to the 0–1 interval (Greene, 1997:875).[7]

Exhibit 2
Logit Model Results for Full Sample:
Real Estate Profession versus Other Occupations

Variable	OLS Regression Coefficient[a]	Logit Coefficient	Logit Slope Coefficient[a]
Constant	−1.941	−9.847	−6.856
	−4.077	−123.453	−126.221
Female, F_I	0.337	0.270	0.188
	5.660	55.191	55.556
Experience, E_I	−0.029	0.029	0.020
	−3.803	36.701	36.913
Experience Squared, E_I^2	0.002	0.001	0.001
	12.649	13.982	13.964
Schooling, S_I	0.137	0.290	0.202
	3.364	43.164	43.667
College, $d_1(S_I - 12)$	0.277	0.040	0.028
	5.312	5.479	5.473
Grad. Sch., $d_2(S_I - 16)$	−0.771	−0.637	−0.444
	−13.115	−130.357	−132.795
Real Earnings, RE_I	−0.001	0.002	0.001
	−1.030	14.530	14.53

Note: The log-likelihood for the OLS regression is −8387 and −1110062 for logit. The adjusted R^2 for the OLS regression is .3347.
[a]Regression and logit slope coefficients have been multiplied by $10E + 2$ to reduce the number of leading zeros.

The logit results are shown in the second and third columns of Exhibit 2. The log-likelihood in column 2 indicates a statistically significant model. All coefficients are statistically significant at the 0.01 level; *t*-ratios are shown below the coefficients.

The coefficient estimates obtained from the logit model, reported in Exhibit 2, are not interpretable as changes in the dependent variable per unit change of the independent variable. For that, the marginal effects (logit slope coefficients) must be computed by taking the derivative of the logit equation with respect to each independent variable, evaluated at the mean. These results are shown in the third column of Exhibit 2.[8]

All logit slopes (marginal effects) reported in Exhibit 2 are statistically significant at the 0.01 level. Interpreting the logit slope, the probability that an individual will be in the real estate sales profession (relative to other occupations in the workforce) is 0.19% larger for females than for males, holding constant experience, education and earnings.

General labor market experience (E) has a positive influence on the choice of a real estate sales career. Individuals with more work experience have a higher probability of entering real estate sales than those with less experience. In addition, because the squared experience term is positive, the effect of experience rises at an increasing rate. For example, an individual with five years of labor market experience is 0.10% more likely to be in real estate sales than a new labor market entrant.

The influence of elementary and secondary schooling as measured by the logit schooling slope coefficient (S) indicates a 0.20% increase in the probability per year of elementary and secondary schooling. For example, a high school graduate with twelve years of schooling is 0.80% more likely to be in real estate sales than an individual with only eight years of schooling. (Note that the minimum level of schooling in our sample was eight years.)

For individuals completing some college, the probability increases an additional 0.03% per year of college completed. Therefore, an individual with four years of college is 0.92% more likely to be in real estate sales than an individual with only a high school degree.

Schooling beyond college reduces the probability that an individual will be in real estate sales. The marginal probability falls −0.44% for every year of schooling beyond four years of college. For example, an individual with two years of graduate training is 0.43% less likely to be in real estate sales than an individual with only four years of college.

Higher real earnings increase the probability that an individual will choose a career in real estate sales. It is estimated that a one-thousand-dollar increase in real earnings raises the probability of being in real estate sales by 0.0013% per thousand dollars. (Note that OLS regression finds a non-statistically significant real earnings coefficient.) The supply price elasticity of being in real estate sales can be calculated as the percentage change in the probability divided by the percentage change in earnings

[that is, (% chg. $P_{I,J}$)/(% chg. $RE_{I,J}$)]. Evaluating this elasticity at the mean of the full sample yields an elasticity coefficient of +3.07%, which indicates that the occupational choice decisions of individuals choosing a career in real estate sales are highly responsive to changes in earnings.

While Exhibit 2 provides interesting insights, the statistical significance of the female dummy variable (F) in Exhibit 2 indicates that the female and male subsamples may have substantially different logit and slope coefficients. Exhibit 3 reports the logit and slope (marginal effects) coefficients by gender. The results suggest the two subsamples do indeed respond to the independent variables in substantially different ways. With the exception of the experience variable for the male subsample, all logit and slope coefficients are statistically significant at the 0.01 level.

General labor market experience increases the probability of females choosing the real estate profession by 0.05% per year; however, because the squared term is negative, the probability increases at a decreasing rate. For males, the coefficient on the experience term (E) is negative but not statistically significant at the 0.05 level. However, the coefficient on the experience-squared term is a positive and significant 0.00045. Thus, a male with five years of experience has about a 0.01% higher probability of being in real estate sales than an individual with no experience, and the probability rises with experience at an increasing rate.

Exhibit 3
Logit Model Results by Gender: Real Estate Profession versus Other Occupations

	Male Sample		Female Sample	
	Logit Coefficient	Slope Coefficient[a]	Logit Coefficient	Slope Coefficient[a]
Constant	−8.958	−5.739	−10.585	−8.070
	−89.091	−90.813	−81.142	−82.364
Experience, E_I	−0.002	−0.001	0.062	0.048
	−1.690	−1.689	50.486	51.793
Experience Squared, E_I^2	0.001	0.001	−0.001	−0.001
	35.290	35.286	−14.300	−14.375
Schooling, S_I	0.235	0.151	0.350	0.267
	27.691	27.979	31.983	32.272
College, $d_1(S_I - 12)$	0.156	0.100	−0.083	−0.064
	16.653	16.592	−7.132	−7.141
Grad. Sch., $d_2(S_I - 16)$	−0.710	−0.455	−0.573	−0.437
	−118.932	−121.903	−65.154	−65.947
Real Earnings, RE_I	0.002	0.001	0.002	0.002
	11.157	11.155	6.851	6.852

[a]Slope coefficients have been multiplied by 10E + 2 to reduce the number of leading zeros. The log-likelihood for the male sample is −633105. The log-likelihood for the female sample is −474875.

Each year of primary and secondary schooling increases the probability by 0.27% for females and only 0.15% for males. Interestingly, with college education, the probability drops to 0.20% per year for females and increases to 0.25% for males. Graduate school appears to reduce the probability by roughly similar magnitudes for both males and females.

The real earnings coefficients for both males and females are positive and statistically significant. The supply price elasticity, evaluated at the mean of each sample, is +3.18 for males and +2.76 for females.

Summary and Conclusions

These findings have important implications for the real estate profession. Females are significantly more likely than males to enter the field. In reference to schooling, while individuals who are in the field of real estate may regard themselves as professionals, individuals with advanced degrees are not as likely to choose a real estate sales career. For males, the probability of entering the field grows with schooling up through four years of college, and declines thereafter. For females, the probability falls with increased schooling beyond high school.

Real estate sales is a career that is more appealing to both males and females with more labor market experience. For females, the probability of choosing a real estate career rises at a decreasing rate with experience. For males, the probability grows at an increasing rate.

Both females and males are very responsive in their career choice decisions to differences in real earnings. The supply price elasticity, evaluated at the mean, is estimated to be +3.18 for males and +2.76 for females.

Our study has enabled us to estimate how schooling, experience and earnings influence real estate sales as a career choice. Because of the limitations of the Census data, we have not been able to explore how decisions to enter and leave the real estate field are influenced by such factors as marital status, household size, race and other factors. We believe this remains an area that merits additional research.

Endnotes

[1] Bureau of the Census, Statistical Abstract of the United States, 1998 (Table 793).

[2] See Benjamin, Jud and Sirmans (forthcoming).

[3] A variable for race was not available due to limitations of the Census data. When sample sizes are too small, the Bureau of Census does not provide detailed data for subgroups.

[4] This model is a transformation of the regression approach as follows (Greene, 1997:895):

$$P_i = F(\beta'\mathbf{x}_i) + \varepsilon_i \text{ and}$$

$$F^{-1}(P_i) = z_i = \beta'\mathbf{x}_i + \mu$$

with

$$E[\mu_i] = 0 \text{ and } \text{Var}[\mu_i] = \frac{F_i(1 - F)}{nif_i^2}$$

Where n_i is the number of individuals who are real estate professionals. Weighted least squares is performed to produce the minimum chi-squared estimates of β using the following weights:

$$w_i = [n_i \Lambda_i (1 - \Lambda_i)]^{1/2},$$

with Λ indicating the logistic distribution function.

The inverse for the logistic model is obtained as follows:

$$\pi_i = \frac{\exp(\beta' \mathbf{x}_i)}{1 + \exp(\beta' x_i)}$$

and

$$\ln\left(\frac{\pi_i}{1 - \pi_i}\right) = \beta' \mathbf{x}_i$$

[5] The data contains survey information from 1989. More recent census data will not be available until presumably 2004.

[6] For an analysis of the earnings of real estate professionals, see Jud and Winkler (1998).

[7] We also examined a fixed-effects and random effects model using MSA as the classification variable. The fixed-effects model provided minimal changes in the coefficient values and adjusted R^2 in comparison to t he specification reported in Exhibit 2 (without fixed effects). A Hausman test comparing the fixed- and random-effects model specifications rejects the fixed-effects model in favor of the random effects model (H = 7.57). However, given the problems of linear regression using proportions data, none of these regressions is appropriate.

[8] Because the marginal effects are estimated using a cross-sectional model, the standard precautions should be applied when using these estimates in any forecasts.

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