The Impact of Corporate Ownership on Residential Transaction Prices

*Mark G. Dotzour**
*Donald R. Levi**

Abstract. **A perception exists in the appraisal and brokerage industry that houses sold by corporate relocation firms (or corporate employers) sell at a discount in the residential market. The purpose of this article is to empirically determine if corporately owned houses do sell at a discount. A sample of 278 residential transactions in one community is used in a hedonic pricing model to test the hypothesis. The results indicate that corporate properties sold at a discount of nearly 5%.**

Introduction

The purpose of this paper is to empirically determine whether houses owned and sold by corporate employee relocation firms sell at a discount when compared to the noncorporate transactions in the same local market.

In many markets in recent years, relocation firms have been unable to sell their houses for the appraised value. While this phenomenon is not unique to the relocation industry alone, it has led to discussions between relocation companies and their appraisers about who is responsible for this situation. Appraisers suggest that relocation companies sometimes "wholesale" their acquired properties to avoid the holding costs associated with an extended marketing period [3].

There is evidence that this perception exists in the residential brokerage community as well. "For sale" signs and classified advertising often identify these properties as "corporately owned" or "corporate sellers," as if this is a unique submarket in the single-family market.

The results of this research may have significant implications for the residential appraisal industry. If corporately owned houses are found to sell at a discount in the local market, then they should be classified as atypical, nonmarket transactions and not used as comparable sales for noncorporate appraisals without making appropriate adjustments. If the results indicate no discount exists, then corporate sales could be appropriately used as comparable sales for all appraisal assignments.

Literature Review

Most appraisal texts specify that appraisers must adjust comparable sales for factors such as: nonmarket transactions, atypical financing, changing market conditions,

*Campus Box 88, Wichita State University, Wichita, Kansas 67208.
Date Revised—November 1991; Accepted May 1992.

locational differences and physical differences between the comparable sale and the subject property. Comparable sales that are identified as nonmarket transactions are not used if a sufficient number of other comparable sales exist. The sales price of these comparables must be adjusted to estimate the true market value of the comparable sale. If corporately owned houses are shown to sell at a systematic discount in the local market, then appraisers should avoid using them for comparable sales without making an adjustment to the actual sales price.

Dotzour [2] previously identified that corporate sellers may be willing to sell their homes at a discount if they can avoid the costs associated with an extended marketing period. These costs include per diem expenditures for amortization, taxes, maintenance, utilities, and insurance.[1] The relocation company may be able to minimize the total cost of the employee transfer if they sell an acquired property quickly and avoid the expected holding costs.

Models and Hypotheses

To empirically determine whether corporately owned houses sell at a discount, the following hypothesis was tested using a hedonic pricing model:

Ho: Corporate owned houses do not sell at a discount, when compared to residential sales not corporately owned.
Ha: Corporately owned houses do sell at a discount.

Hedonic pricing theory postulates that the value of a house is a function of the quantitative and qualitative attributes that are components of the house [14]. Hedonic pricing theory is usually tested using a multiple regression model (linear and/or non-linear), where:

$$Sales\ Price\ of\ a\ house = f(X_i, Y_i), \tag{1}$$

where

X_i = vector of quantitative factors such as age, size, baths, fireplaces, and garage;
Y_i = vector of qualitative factors such as neighborhood quality, physical property condition, and school district.

To test the above-stated hypothesis, a semi-log multiple regression was constructed according to the following form:

$$\text{Ln}\ (Sales\ Price) = f(X_i, Y_i, Z), \tag{2}$$

where

$Z = 1$, if house was sold by a corporate employer,
$= 0$, otherwise.

The Data

The sample data consists of residential transactions that were sold and closed in Wichita, Kansas, between December 1, 1987 and October 31, 1989. Local appraisers

Exhibit 1
Descriptive Statistics

Variable	Mean	Standard Deviation	Minimum	Maximum
LOT	10708.010	2978.710	4730	23240
AGE	5.043	3.733	0	15
ROOF	0.539	0.499	0	1
FINBSMT	34.862	29.674	0	99
SQFT	1893.859	553.059	928	3435
GAR	2.046	0.227	1	3
FIRE	1.245	0.501	0	3
Q	0.358	0.480	0	1
BRICK	0.123	0.329	0	1
LOC	0.496	0.500	0	1
STORY	0.465	0.499	0	1
TENPOOL	0.047	0.212	0	1
C	0.765	0.424	0	1
FENCE	0.447653	0.498152	0	1
CORP	0.208633	0.407064	0	1

N = 278

Source: derived by authors from the sample data

were consulted to identify two neighborhoods[2] that have a high level of corporate relocation activity. With the help of appraisers in the area, 58 relocation transactions were identified that sold and closed in the two neighborhoods within the stated time period. In addition, a random sample of 220 noncorporate transactions in the same neighborhoods was gathered. These 278 transactions represented virtually all of the market activity in the two areas during the time period under investigation, except for those not reported through the Multiple Listing Service.

Properties in the sample are similar in age and construction quality. The average age was five years, ranging from zero to fifteen years old. Ninety percent of the sample was ten years old or younger. The sales prices range from $49,950 to $283,000, with a mean of $111,418. The houses range in size from 928 square feet to 3,435 square feet. Additional descriptive statistics of the sample data are presented in Exhibit 1.

Information about the corporately owned houses and the other transactions was gathered from the files of appraisers participating in the project and multiple listing service data.

Empirical Results

To examine the impact of corporate relocation ownership on transaction prices, a semi-log multiple regression model[3] of the following form was used:

$$\text{Ln}(SP) = f(LOT, AGE, ROOF, FINBSMT, SQFT, GAR, FIRE, Q, BRICK, LOC, STORY, TENPOOL, C, FENCE, CORP), \quad (3)$$

where:

Ln(SP) = the natural logarithm of sales price;
LOT = lot size in square feet;
$SQFT$ = size of the house in square feet;
AGE = actual age of the housing improvements;
$STORY$ = 1, if house was a one-story "ranch" design,
= 0, if house had more than one story;
$ROOF$ = 1, if wood roof,
= 0, otherwise;
$FINBSMT$ = percentage of basement area that is finished;
GAR = number of garage parking spaces;
$FIRE$ = number of woodburning fireplaces;
$TENPOOL$ = 1, if property has a pool or tennis court,
= 0, otherwise;
$FENCE$ = 1, if property has a fence,
= 0, otherwise;
C = 1, if condition was rated excellent (by appraiser),
= 0, if condition was rated good/fair/poor;
Q = 1, if construction quality was rated excellent,
= 0, if construction quality was rated good/fair/poor;
$BRICK$ = 1, if property has a brick or stone exterior,
= 0, if frame exterior;
LOC = 1, if property is located in the east area,
= 0, if property is located in the west area;
$CORP$ = 1, if property was corporately owned,
= 0, if property was not corporately owned.

The regression results, shown in Exhibit 2, reveal that the model explains more than 90% of the variation in the sales prices of the houses in the sample data. Many of the variables in the model were found to be significant with 95% confidence. The significant variables include square footage of the house, age, roof type, percentage of finished basement, location, and corporate ownership. These results indicate that square footage, roof type, and percentage of finished basement have a positive association with the sales price of houses in the sample. Age was found to have a negative association with sales price, as expected. The parameter estimate for the location variable (LOC) of .080376 indicates that the sale prices of properties located in the east Wichita neighborhood were 8% higher than similar houses in the west neighborhood.

The result of particular interest in this study is the relationship between the $CORP$ variable and the sales price of the houses in the sample. The parameter estimate for $CORP$ indicated that corporately owned properties in the sample sold for an average of 4.6% less than other homes in the sample (holding all other variables constant). The reported t-statistic and p-value indicate that this parameter estimate is significantly different from zero with a 98% confidence level. These findings indicate that the null hypothesis can be rejected and that corporately owned houses do sell at a discount in this local market.

The presence of collinearity among variables in hedonic pricing models can create difficulty for the real estate researcher attempting to measure the influence of one specific

Exhibit 2
Regression Results

Variable	Coefficient	Standard Error	*t*-test	*P*-Value	Variance Inflation Factor
INTERCEP	10.282	0.094988	108.255	0.0001	0.000
LOT	0.000007	0.000003	1.909	0.0581	1.731
AGE	−0.0168	0.003367	−5.001	0.0001	1.798
PROOF	0.1667	0.024012	6.944	0.0001	2.103
FINBSMT	0.0019	0.000346	5.567	0.0001	1.262
SQFT	0.0004	0.000030	15.515	0.0001	3.747
GAR	0.0608	0.048691	1.251	0.2129	1.662
FIRE	0.0183	0.017567	1.045	0.2975	1.203
Q	0.0329	0.021348	1.544	0.1245	1.499
BRICK	0.0280	0.028435	0.989	0.3255	1.377
LOC	0.0803	0.019484	4.125	0.0001	1.384
STORY	0.1490	0.023856	6.248	0.0001	2.069
TENPOOL	0.0588	0.035296	1.667	0.0974	1.232
C	−0.0107	0.020543	−0.522	0.6023	1.274
FENCE	0.0085	0.019717	0.436	0.6637	1.401
CORP	−0.0459	0.019157	−2.401	0.0092*	1.069

$R^2 = 0.9124$
Adjusted $R^2 = 0.9043$
F-ratio = 112.506

*one-tailed test
Source: derived by authors from the sample data

variable in a regression model on the variation in sales price. If the specific variable of interest is highly correlated with other variables in the model, hypothesis testing of the influence of the specific variable becomes problematic.

Consequently, even though the regression results indicate that corporately owned houses do sell at a discount, further investigation is warranted to determine if these results have been degraded by the influence of collinearity.

First, the correlation matrix of the variables was analyzed to determine if the *CORP* variable was highly correlated with other variables in the model. The correlation matrix is presented in Exhibit 3. The correlation matrix reveals that the *CORP* variable is not highly correlated with any of the other independent variables in the model, indicating that the parameter estimate for the *CORP* variable may not be heavily influenced by collinearity.

The absence of high simple correlation between the *CORP* variable and the other independent variables is not sufficient evidence of a lack of collinearity however, because it is possible that *CORP* may be correlated in a multidimensional fashion with a linear combination of two or more other variables in the data. Analysis of the correlation matrix will not reveal correlation of linear combinations of the variables.

The variance inflation factors for the variables in the sample data were analyzed to determine if the *CORP* variable was correlated with any linear combination of other

Exhibit 3
Pearson Correlation Matrix

	LOT	*AGE*	*ROOF*	*FINBSMT*	*SOFT*	*GAR*
LOT	1.000					
AGE	0.095	1.000				
ROOF	0.189	−0.298	1.000			
FINBSMT	0.120	0.260	−0.001	1.000		
SQFT	0.365	−0.348	0.625	−0.138	1.000	
GAR	0.429	−0.197	0.158	−0.055	0.368	1.000
FIRE	0.230	0.006	0.122	0.078	0.162	0.342
Q	0.147	−0.255	0.319	−0.023	0.356	0.244
BRICK	0.325	0.220	0.117	0.125	0.130	0.175
LOC	0.280	−0.025	0.153	−0.071	0.351	0.143
STORY	−0.090	0.345	−0.326	0.206	−0.618	−0.160
TENPOOL	0.162	0.025	0.066	−0.002	0.055	0.029
C	−0.024	−0.352	0.189	−0.037	0.156	0.113
FENCE	−0.008	0.493	−0.310	0.180	−0.261	−0.089
CORP	0.093	0.140	0.083	0.067	0.010	0.011

	FIRE	*Q*	*BRICK*	*LOC*	*STORY*	*TENPOOL*
FIRE	1.000					
Q	−0.012	1.000				
BRICK	0.103	0.061	1.000			
LOC	−0.023	0.272	0.114	1.000		
STORY	−0.033	−0.210	0.147	−0.264	1.000	
TENPOOL	−0.007	0.100	0.228	−0.085	−0.000	1.000
C	0.081	0.399	0.003	−0.011	−0.089	0.045
FENCE	−0.030	−0.251	0.064	−0.033	0.241	0.145
CORP	−0.057	0.110	0.076	0.056	0.035	0.053

	C	*FENCE*	*CORP*
C	1.000		
FENCE	−0.184	1.000	
CORP	−0.070	0.089	1.000

Source: derived by authors from the sample data

variables in the sample. The variance inflation factor for the *CORP* variable is defined as

$$VIF_{corp} = \frac{1}{1 - R^2_{corp}}, \tag{4}$$

where R^2_{corp} is the multiple correlation coefficient of *CORP* regressed on the remaining independent variables. Variables with a high measured *VIF* are highly correlated with other variables in the sample. The variance inflation factors for the sample data are presented in Exhibit 2. The lower bound for *VIF* is unity, when there is no multiple correlation between the variable in question and the remaining variables. The upper

Exhibit 4
Condition Indexes of the Data

Principal Component	Eigenvalue	Condition Number
1	10.11325	1.000
2	1.24628	2.848
3	1.06142	3.086
4	0.73325	3.713
5	0.67289	3.876
6	0.50233	4.487
7	0.45471	4.716
8	0.28628	5.943
9	0.26901	6.131
10	0.20272	7.063
11	0.17705	7.557
12	0.13968	8.508
13	0.08658	10.808
14	0.03771	16.376
15	0.01288	28.021
16	0.00406	49.933

Source: derived by authors from the sample data

bound of the *VIF* distribution is unbounded as the multiple correlation approaches unity. The variable *CORP* has a *VIF* of 1.069, indicating that the multiple correlation coefficient of the *CORP* variable is less than 7%, and that the parameter estimate for *CORP* is not greatly influenced by collinearity.

Belsley, Kuh and Welsch [1] developed a rigorous two-step process to determine if a specific regression parameter estimate has been "degraded" by the presence of collinearity among the variables in a sample data set. They concluded that "it is the joint condition of a high variance-decomposition proportion for two or more regression coefficients associated with a high condition index that signals the presence of degrading collinearity."[4]

Their suggested method for assessing the impact of collinearity on regression parameter estimates is a two-step process. First, a principal components analysis is completed to identify the eigenvalues of the data matrix. Then, each eigenvalue is measured by a "condition" index that measures the dispersion between a specific eigenvalue and the largest eigenvalue in the sample. The condition index for a specific eigenvalue "*i*" is defined as

$$CI_i = \frac{\text{Max } eigenvalue}{Eigenvalue_i}. \tag{5}$$

If the sample data were completely orthogonal, the condition index for each eigenvalue would be unity. As the collinearity among the sample data increases, the condition indexes for some of the eigenvalues increase as well. Consequently, eigenvalues with high condition indexes are associated with collinear variables. The eigenvalues and the measured condition numbers of the sample data are presented in Exhibit 4. Weak dependencies are associated with condition indexes around 5 to 10, while moderate to

Exhibit 5
Regression-Coefficient Variance Decomposition

	Eigenvalue 13	Eigenvalue 14	Eigenvalue 15	Eigenvalue 16
LOT	0.0321	0.8434	0.0000	0.1096
AGE	0.0908	0.0072	0.1496	0.0788
ROOF	0.0188	0.0165	0.2340	0.0172
FINBSMT	0.0033	0.0029	0.0026	0.0001
SQFT	0.0334	0.0477	0.9111	0.0000
GAR	0.0059	0.0059	0.0966	0.8893
FIRE	0.7410	0.0020	0.0096	0.0262
Q	0.0082	0.0006	0.0054	0.0138
BRICK	0.0001	0.0410	0.0785	0.0118
LOC	0.0717	0.0308	0.0113	0.0129
STORY	0.0069	0.0030	0.2202	0.0176
TENPOOL	0.0118	0.0216	0.0003	0.0086
C	0.0174	0.0153	0.0495	0.0008
FENCE	0.0038	0.0210	0.0000	0.0004
CORP	0.0109	0.0060	0.0082	0.0002
INTERCEPT	0.0064	0.0221	0.1210	0.8488

Source: derived by authors from the sample data

strong relations are associated with indexes of 30 to 100.[5] The condition indexes for the sample indicate the presence of collinearity within the data.

Exhibit 6
Regression-Coefficient Variance Decomposition

	Eigenvalue 4	Eigenvalue 5
LOT	0.0001	0.0001
AGE	0.0006	0.0003
ROOF	0.0008	0.0001
FINBSMT	0.0004	0.0012
SQFT	0.0003	0.0000
GAR	0.0001	0.0000
FIRE	0.0020	0.0002
Q	0.0001	0.0041
BRICK	0.1994	0.3176
LOC	0.0000	0.0287
STORY	0.0111	0.0011
TENPOOL	0.1550	0.1594
C	0.0070	0.0001
FENCE	0.0148	0.0044
CORP	0.4412	0.4411
INTERCEPT	0.0001	0.0000

Source: derived by authors from the sample data

To determine which parameters in the regression model have been degraded by the presence of collinearity, the second step in the Belsley, et al. [1] technique is utilized. This step, called regression-coefficient variance decomposition, measures the proportion of the variance of each regression coefficient associated with each eigenvalue of the data. Evidence that collinearity has degraded the reliability of regression parameters is found when a high proportion of the variance of the parameter estimates of two or more variables is associated with an eigenvalue with a "high" condition number. The results of the regression-coefficient variance decomposition are presented in Exhibit 5. Eigenvalues numbered 13–16 were identified as having moderately high condition numbers (over 10). Analysis of the regression-coefficient variation decomposition shows that only 1% of the variance of the regression parameter for *CORP* is associated with eigenvalue 13, and that less than 1% of the *CORP* parameter variance is associated with eigenvalues 14, 15 and 16.

Additional results in Exhibit 6 show that 44% of the variance of the regression coefficient for *CORP* is associated with the fourth eigenvalue, and another 44% is associated with the fifth. Both of these eigenvalues have low condition numbers, 3.7 and 3.8 respectively. No other variables are highly associated with these eigenvalues. Consequently, the conclusion can be made that collinearity is present in the sample data set, but that the regression parameter estimate for *CORP* is not degraded by its presence.

Summary and Conclusions

The purpose of this article was to empirically test whether houses owned and sold by corporate relocation companies sell at a discount when compared to houses not owned by corporate relocation firms.

Using a hedonic pricing model, a semi-log multiple regression was used to test the hypothesis. The regression results indicated that the null hypothesis was rejected and that corporately owned houses do sell at a discount of approximately 4.6% of the average sales price of houses in the sample. A rigorous analysis of the sample data indicated that a degree of collinearity was present in the data, but that the regression coefficient of interest was not heavily affected by it.

The results of this study indicate that corporate relocation sales may be atypical transactions that should not be used for comparable sales by appraisers if other sufficient data is available. Further research in other cities should be undertaken to determine if this occurs uniformly, or if it varies in magnitude between local markets. The magnitude of this adjustment would have to be measured in each local market, because it could vary between markets depending upon the local supply and demand conditions. For example, in markets where demand is relatively high in relation to current supply, the amount of discounting by relocation firms may be negligible. In such a market, the volume of corporate relocation activity may be low because the transferred employees can sell their houses without corporate assistance. However, in a market where the supply of available houses exceeds demand, the price discounting by relocation companies may be more substantial as they seek to divest themselves of their acquired inventory. If the discount is measurable and predictable, then these transactions could be used by appraisers as reliable comparable sales (after appropriate adjustment for the observed discount).

However, if the discount varies over time, then these transactions should not be used if other data is available.

Notes

[1]For a complete discussion of the costs associated with employee relocation, see [2].

[2]One neighborhood was located in east Wichita, while the other was in west Wichita. These neighborhoods have different schools, shopping, recreational opportunities, and other locational differences. Hence, a binary variable was used in the hedonic model to explicitly measure these locational differences *between* neighborhoods.

Some locational and neighborhood differences of houses *within* each of the two neighborhoods exist, but additional data was not available to measure these differences. However, the size of the neighborhoods was restricted to minimize within-neighborhood locational differences.

The two neighborhoods used in this study were identified specifically because of the high level of corporate relocation activity within them. Houses in these neighborhoods are newer, larger, and more expensive than the average for the entire city. It is possible that the high level of corporate sales activity in these areas could influence the degree of price competition in the individual neighborhoods. Consequently, the results of this study may not be applicable to corporately owned houses that are sold in other neighborhoods where the volume of corporate relocation activity is smaller.

[3]Other variables such as air-conditioning, heating, carpet, dishwasher, disposal, and existence of a basement were not included in the model, because every house in the sample had these features. Inclusion of these variables would have caused the matrix to be non-singular. Local appraisers advised that the trend in property values was stable over the period of time in which the sample properties were sold. Hence, no time adjustment was included in the model. To confirm this, the regression residuals were regressed against the month in which the houses were sold. The results indicated no relationship between the residuals and time of sale.

[4][1], page 112.

[5][1], page 105.

References

[1] D. Belsley, E. Kuh and R. Welsch. *Regression Diagnostics: Identifying Influential Data and Sources of Collinearity*. New York: John Wiley and Sons, 1980.

[2] M. Dotzour. Quantifying Estimation Bias in Residential Appraisal. *Journal of Real Estate Research* 3:3 (1988), 1 16

[3] ——— and D. Levi. Reducing the Cost of Corporate Employee Relocation. *Journal of Real Estate Research* 4:3 (1989), 157 68.

[4] R. Edmonds. A Theoretical Basis for Hedonic Regression: A Research Primer. *AREUEA Journal* 12:1 (1984), 72–85.