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A Statistical Analysis of the Effects of Access, Traffic Exposure, and Frontage Parameters upon Sale Price of Commercial Real Property in Kansas

Authored By:

Chris Huffman, P.E.
(Corresponding Author)
534 S. Kansas Avenue, Suite 1108
Topeka, KS 66603, USA
(888) 804-4367 (P)
(888) 804-4612 (F)
chris@huffmancorridorconsulting.com

Stanley D. Longhofer, PhD
Professor and Stephen L. Clark Chair of Real Estate and Finance
W. Frank Barton School of Business
Wichita State University
1845 Fairmount
Wichita, KS 67260-0077, USA
(316) 978-7163 (P)
(316) 978-3253 (F)
stan.longhofer@wichita,edu

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ABSTRACT
Past research has demonstrated the effectiveness of access management in improving or preserving the safety of the travelling public, the capacity and quality of the flow of traffic, and in supporting and sustaining economic activity. Nevertheless, fear of economic hardship perceived to arise from effective implementation of access management remains a barrier to mainstream implementation. Work in NCHRP 420: Impacts of Access Management Techniques (1999) shows how effective access management at the network level preserves or restores market penetration of commercial activities in a given area. Work done in Florida (1991), Iowa (1997), and Texas (1999) studied the effects of access management retrofits at the corridor level, and found minimal to positive changes in economic activity overall. Likewise, small studies of economic impacts to individual sites has been conducted in Kansas (1999), and Minnesota (2006) and have demonstrated little to positive impacts to highest and best use arising from access management retrofits.

The site (microscopic) level studies are of individual corridors or smaller data sets, and are largely qualitative analyses of economic effects of access at the microscopic level. Quantitative analysis is needed on a large data population to examine the factors that most impact sale price of income producing properties. The purpose of this paper is to present the effects of access and other transportation characteristics upon sale price of income producing real property, and to present a model that shows which variables contribute to sale price, the interactions of those variables, and the effectiveness of the model.

BACKGROUND

Research at the network (macroscopic) level has demonstrated the relationships between access management and safety, operational measures, and economic activity (*1*). Research at the corridor (mesoscopic) level done in Florida (*2*), Iowa (*3*), and Texas (*4*) have studied corridors that have undergone access retrofits, and compared the economic activities along the retrofitted corridors against control corridors and found that the retrofitted corridors outperform their comparison pairs, and generally outperform their surrounding communities in terms of economic activities. A handful of small-sample studies done in Kansas (*5*) and Florida (*2*) have examined the relationship between access modification and highest and best use at the site (microscopic) level, and found little correlation. Overall, however, there is a lack of large-sample research that examines access and other transportation variables in light of their effects upon sale price of income producing real property.

The need exists to examine the effects of a fact-based dependent variable (sale price) against a variety of land use and transportation variables in a large data set, and across a wide variety of income-producing land uses. This need arises from continuing resistance to mainstreaming access management based upon a belief that management of access has a negative economic effect upon the adjacent land uses. Work done in the past at the network (macroscopic) (*1*) and corridor (mesoscopic) (*2*, *3*, *4*, *5*, & *6*) levels has done a great deal to push back these concerns. However, these issues tend to be examined at the site (microscopic) level, and most elected and appointed officials, as well as the courts, seem to respond to the concerns of the individual property or business owner more readily than the overarching public concerns of safety and operational improvements. Thus, the work presented here represents what the authors believe to be the first quantitative analysis of a large data set developed to examine the effects of access (curb cuts), visibility (traffic volume), and other transportation characteristics along with selected site and improvement characteristics against the factual dependent variable of sale price.

Creation of the Datasets

In order to capture a statistically significant sample of sales of income producing properties in Kansas, the authors began by identifying the metropolitan and micropolitan counties among the 105 total Kansas counties. The US Office of Management and Budget has identified 38 Kansas counties in either metropolitan (those with a central place having a population in excess of 50,000) or micropolitan (those with a central place having a population from 10,000 to 49,999) areas, as depicted in Figure 1. Development of 38 counties worth of income producing property sales would have been time prohibitive, and so a smaller sub-set of the 38 was selected on the basis of geographic and demographic diversity, as well as data availability. The counties with stars represent those selected for analysis. The 17 counties selected for analysis were chosen to achieve a mixture of metropolitan (8) and micropolitan counties (9), and to assure a sufficient number of micropolitan sales records (499) so that any latent effects of the metropolitan sales records (1,145) may be identified and analyzed separately, if appropriate.

The counties selected for study also reflect the six districts of the Kansas Department of Transportation (KDOT), which are divided in order to have approximately the same number of rural state highway miles in each. This is an additional step to assure geographic distribution in the analyses, as there is a minimum of one county included in each of the KDOT Districts. The counties selected for study with respect to the KDOT districts are shown in Figure 2.

It was decided early on in the study to focus on income producing use types, as those have the greatest demands for access to public ways. Sales of vacant land and improved properties are included. This data does not, however, include multi-family (apartment) sales, nor are public (government) owned facilities unless they have sold to private interests within the timeframe of the study. Places of worship are also eliminated from this study.

A two-year period from January 1, 2012 through December 31, 2013 was selected as the study period. The reasons for this time frame include a desire to start far enough past the official end of the Great Recession to avoid dominance of the data by distressed sales, and to go far enough forward to still allow sufficient time for reporting of sales. Kansas is a reporting state for real estate transactions, but significant time lags can occur between the actual date of transfer, and the filing of the sale with the State. With these parameters in place the authors consulted with the Kansas Department of Revenue/Property Valuation Division (PVD) to obtain an understanding of the numbers of valid sales reported to the State for each of the 17 counties selected during the timeframe identified. Table 1 shows the number of valid sales reported and the percentage of each county developed for this study. The reader will note that some counties show a greater number of sales developed than are shown as "valid" for that county. The definition of valid sales for PVD purposes are those sales suitable for inclusion in computer-aided mass appraisal (CAMA) models for tax purposes, while the definition of valid sales for purposes of this study are those sales that meet the definition of open market and arm's length in the *Dictionary of Real Estate Appraisal*. Thus there are more market valid sales than CAMA valid sales in some counties. A number of factors were developed for each sale including location (latitude/longitude), site (land) characteristics, building (improvement) characteristics, and transportation characteristics including frontage information, functional classification of frontage, curb cuts, and traffic exposure (volume). A sampling of the data tables developed is found in Table 2. With these data developed, the analyses begin by grouping the data into primary use categories (retail, office, industrial, vacant), and by examining the effects of the variables identified above on the dependent variable of sale price.

STATISTICAL ANALYSES

The goal is to examine the impact of site-specific transportation characteristics on the sale price of commercial parcels. As is common in the analysis of many economic phenomena, several of our variables are transformed using the natural log function to facilitate the analysis. This is done for a number of reasons. First, the natural log transformation can help reduce heteroscedasticity problems that may arise in the data. Second, because it results in relative (rather than absolute) comparisons among different variables, the natural log transformation provides a much more natural and intuitive fit for many economic data series. This can be seen in Figure 3, which shows the relationship between lot size and sale price in our data using both the raw data (Panel A) and the log-transformed data (Panel B). Since the natural log function moderates the effects of extreme values in the data, it is possible to obtain a better fit to the data using linear regression techniques. Finally, and most importantly, a log-linear specification results in regression coefficients that have very natural and intuitively appealing *relative* interpretations. While this is explained in more detail below in the presentation of regression results, one implication of this is that Ln(**Sale Price**) can be used directly as our dependent variable without first normalizing it by building or lot size ($/sq.ft.). This allows each of these factors to fully and independently affect the sale price of a parcel. In addition to Sale Price there are four explanatory variables that are log transformed: **Land Square Feet**, **Gross Building Area**, **Traffic Count** and **Total Front Feet**. The key explanatory variables of interest in this analysis will be the most recent traffic count (**Traffic Count**) near the parcel (as a proxy for visibility or exposure), whether the lot is adjacent to a signalized intersection (**Signalization**), whether the lot is a corner or double-corner lot (**Corner**), and the number of curb cuts (**Number of Curb Cuts**) categorized as Zero, One, Two or More than Two.

In addition to these, a number of other control variables are included that may affect a parcel's sale price. **Total Front Feet** is a measure of the parcel's total frontage, including both primary and secondary frontage. **Age** is calculated based on the year the oldest structure present on the parcel was built. In addition to providing a proxy for physical deterioration of the structure, this variable likely also controls for "vintage effects" associated with the design of traffic and access patterns at the time the parcel was developed. **Age** is modeled using a quadratic functional form, including both **Age** and **Age-Squared** as regression variables. This functional form allows the impact of an additional year of age to change based on the age of the property. **Inside Flood Zone** is a dummy variable taking the value 1 if part of the parcel has a type A flood zone classification. Throughout this study dummy, or indicator, variables are used to indicate the presence or absence of a particular feature. The resulting regression coefficient shows the impact this feature has on the dependent variable (in our case, sale price). Various **Primary Frontage** types are controlled using a series of dummy variables, including None, Local Street, Collector Street, Arterial and Freeway. There are also secondary frontage types for each record in the dataset. These were initially included in the analysis, but their coefficients were never significant and likelihood ratio tests suggest that these variables add no explanatory power. **Grading from Street** is a categorical variable taking three possible values: At Street Level, Above Street Level and Below Street Level. There are also topography data for each parcel. As with secondary frontage types, no evidence was found that topography impacted parcel sale prices in any of the groups. This lack of significance may reflect that fact that there is very little topographical variation among the parcels in the sample (a "hilly" parcel in Kansas shows relatively little variation in elevation across the parcel compared to those in other parts of the country). **Construction Class** is a categorical variable taking one of five possible values: Class C – Masonry-Frame, Class D – Wood-Frame, Class S – Steel-Frame, Class A/B – High-rise Structural or Various. Finally, we include a dummy variable for **Vacant Industrial Parcel**s to distinguish them from vacant parcels with a commercial highest and best use.

The final statistical model that is derived for all four use categories is expressed below as Equation 1:

$$\ln P = \beta_0 + \beta_{lsf} \ln LSF + \beta_{gba} \ln GBA + \beta_t \ln Traffic + \beta_{ff} \ln FF + \beta_a Age + \beta_{a2} Age^2 + \beta_f Flood + \mathbf{B}_{cc} CC + \mathbf{B}_{sc} S \times C + \mathbf{B}_{pf} PF + \mathbf{B}_{g} Grading + \mathbf{B}_{c} Class + \beta_{vi} VI + \mathbf{B}_{cty} County \quad (1)$$

where

P	**Sale Price** (in dollars)
LSF	**Land Square Feet**
GBA	**Gross Building Area** (in square feet)
Traffic	**Traffic Count**
FF	**Total Front Feet** (including both primary and secondary frontage)
Age	**Age** (based on the oldest structure on the parcel)
Flood	**Inside Flood Zone** (part of the parcel has an A flood zone classification)
CC	**Number of Curb Cuts** (dummy variables with One Curb Cut omitted)
S×C	**Signalization** interacted with **Corner Lot** (no Signal × non Corner Lot omitted)
PF	**Primary Frontage Type** (dummy variables with Arterial omitted)
Grading	**Grading from Street** (dummy variables with At Street Level omitted)
Class	**Construction Class** (dummy variables with Class C – Masonry-Frame omitted)
VI	**Vacant Industrial Parcel** (dummy variable)
County	**County** (dummy variables)

When categorical variables like number of curb cuts are represented using a sequence of dummy variables, one of these dummy variables will be superfluous information because it is implicitly identified by the all of the other dummy variables. In statistical parlance, the final dummy variable is perfectly collinear with the others. As a result, it is standard practice to choose one category as the “omitted” category, and the effects of the omitted category are implicitly captured by the intercept term in the regression, β_0. The coefficients of the dummy variables included in the regression, therefore, show the impact of that category relative to the omitted category. In the case of interacting variables (**Signalization** and **Parcel Type**) four dummy variable groupings are created: signalized corner lots, non-signalized corner lots, signalized non-corner lots and non-signalized non-corner lots. As discussed above, one of these groupings must be omitted from the regression model to avoid collinearity problems. We chose the non-signalized, non-corner lot as the omitted grouping, and all remaining coefficients show the impact of the grouping relative to this. Summary statistics for the non-categorical variables are presented in Table 3, while breakdowns of categorical variables are available upon request.

Because different land uses may be differently impacted by lot and access characteristics, separate statistical analyses were run for each of four different use types: Retail, Office, Industrial and Vacant. Use types are defined based on the parcel's land based classification system (LBCS) codes; a detailed listing of how each code was assigned to a property type is available upon request. Several parcels have multiple LBCS codes assigned to them, and as a result, some parcels may be included in more than one analysis run of the model.

The regression results for each of these types are presented in Table 4. Overall, the runs show a very strong fit (adjusted R-squares of nearly 80% for the developed property types and over 50% for vacant land), and most of the control variables have reasonable coefficients. To clarify how to interpret the regression coefficients, consider first the Retail model. Coefficients of log-transformed dependent variables are interpreted as elasticities; coefficients of non-transformed variables are interpreted as straight percentages. Thus, the 0.235 coefficient for LN(Land SF) means that a 1% increase in lot size is associated with a 0.235% increase in sale price, while the -0.170 coefficient on Grading from Street – Above Street Level means that a parcel that is above street level sells for 17% less than one At Street Level (the omitted category), all else equal.

To get a sense of the magnitude of these effects, consider the following two retail parcels from the data. Parcel A is on an 18,100 sf lot at street level and sold for $920,000; Parcel B is on a 5,700 sf lot at street level and sold for $65,000. The Retail regression results suggest that Parcel A would have sold for $2,162 more (=920,000 × 0.235 ÷ 100) if its lot had been 181 sf (1%) larger, while Parcel B would have sold for $153 more if its lot had been 57 sf larger. If Parcel A had been on a lot above street level, its sale price is predicted to have been $156,400 lower (=920,000 × -0.17), while Parcel B's sale price is predicted to have been $11,050 lower if it had been on a lot above street level. Thus we see that all of the regression coefficients are relative effects, and implicitly take into account the parcel's other characteristics (which affected its sale price).

Although we include county dummy variables (not shown in table) to control for macro locational effects, we do not find significant difference between metropolitan and micropolitan results (results not shown). The market does not appear to systematically distinguish between more rural and more urbanized areas for these use types.

All four use type regressions show that lot size is positively associated with sale price. As one would expect, the magnitude of this effect is larger for Retail and Office properties than it is for Industrial. It is largest for Vacant Land, reflecting the fact that the sale prices of these parcels include only land (and not structure) value. Similarly, building size is positive associated with sale price for all three improved use types. Age is also negatively associated with sale price in each of these regressions; the positive Age Squared coefficient means that the relative impact of age diminishes as a property gets older (an additional year of age has a bigger negative impact on a 10-year old property than it does on a 50-year old property).

Among the other control variables, there was no indication that being inside a flood zone impacted sale price; this could be a selection effect from the sample, because parcels with high remediation costs are less likely to have been developed or sold. The only significant impact of primary frontage is that retail properties with primary frontage on a freeway sell for a 36.7% discount compared to those fronting a major arterial. This, too, may reflect how the data have been constructed, because the primary frontage is set by definition as the highest classification of any frontage present, regardless of how the parcel is accessed. Thus, some of the highway frontage parcels may have great visibility but poor accessibility. Overall, grade also had very little impact on sale price, with the only significant effect being the -17.0% coefficient for retail properties above street level.

Turning to the key traffic and access variables, it is seen that signalized corner lots have a large and significant effect on the sale prices of Retail and Office parcels (36.9% and 40.8% respectively). The significant negative coefficient for signalized non-corner Office parcels should be viewed very skeptically, because there was only *one* parcel in this grouping. The lack of such parcels also helps explain why the positive 37.5% coefficient for Retail properties was not significant, as there were only 11 such retail parcels. Nonetheless, it is clear that signalized corner properties do sell at a significant premium.

The number of curb cuts, the proxy for access, is only significant for vacant parcels, with parcels with two curb cuts selling at a 44.2% premium over those with only one, while those with more than two sell for a 73.8% premium, compared to parcels with only one curb cut. The insignificant results for curb cuts on developed property types should be interpreted with caution when applied to changes in existing access, as each of the parcels in the data were likely developed taking into consideration its unique features. To fully measure the impact of such a change, one would need to conduct a controlled (or natural) experiment by adding or taking away curb cuts from existing parcels.

Finally, traffic volume appears to have a positive and significant impact on retail and vacant parcels, but not on office and industrial parcels. All else equal, a 1% increase in traffic raises the expected sale price of a retail parcel by 0.287%, while the impact of the same increase of traffic on a vacant parcel is positive 0.254%. Both of these effects are highly significant.

SUMMARY OF KEY RESULTS BY USE TYPE

The Retail Analysis

Curb-Cuts (Access)

The analysis reveals that curb cuts are not a statistically significant factor to sale price of improved retail properties. This is not to say that access is not an important factor. Reasonable access has long been the standard in determining the line between reasonable regulation and taking, and this has always been evaluated mostly on a case by case basis. Past studies done in Iowa (*3*), Texas (*4*), Kansas (*5*), and Minnesota (*6*) have shown that medial or marginal access retrofits along specific corridors or at specific sites, do not adversely impact economic activities in those areas. This study does not refute those conclusions, although it cannot be used to confirm them, either.

Frontage Characteristics
The analysis reveals that frontage upon a particular class of roadway is not statistically significant to the question of sale price of a retail property. The one exception to this is that frontage upon a freeway class facility demonstrates statistical significance, but the coefficient is negative. This is likely explained in how these data are constructed, and demonstrates a distinction between accessibility and visibility.

Parcel Type and Signalization
Signalized corner lots have a large and significant effect on the sale prices of Retail parcels with a signalized corner showing a 36.9% premium over non-corner, unsignalized retail parcels. The lack of signalized, non-corner parcels may explain why the positive 37.5% coefficient for Retail properties was not significant, as there were only 11 such retail parcels. Nonetheless, it is clear that signalized corner properties do sell at a significant premium.

Conclusions to the Retail Analysis
For the retail analysis, the following variables show statistical significance:

1. Natural Log of Land Area
2. Natural Log of Building Area
3. Natural Log of Traffic Count
4. Building Age
5. Signalization
6. Grading Above Street Level

Overall, the 693 observations used in the retail analysis give us an adjusted R-square of 78.4%.

The Office Analysis
Curb-Cuts (Access)
Like the retail analysis, curb cuts do not show as a statistically significant variable to sale price for office properties. Also like the retail analysis, reasonableness of access has long been the test, and this will almost certainly continue. The caveats listed above in interpreting our results to this question apply here as well.

Frontage Characteristics
The analysis reveals that frontage upon a particular class of roadway is not statistically significant to the question of sale price of office properties.

Parcel Type and Signalization
As in the retail analysis, signalized corner lots sell at a significant premium – 40.8% – compared to lots with neither feature. The significant negative coefficient for signalized non-corner Office parcels should be viewed very skeptically. There was only one parcel in this grouping and, as a result, we cannot say whether this coefficient reflects the true impact of signalized non-corner

lots or some other unique characteristic of this one parcel that we did not measure. Nonetheless, it is clear that signalized corner properties do sell at a significant premium.

Construction Class
Unlike the retail analysis, the type of construction used in the office building is significant to sale price. Construction class as a variable is as taken from Marshall & Swift Valuation Services and is meant to reflect the type of construction, rather than the quality of construction or the investment classification. As defined by Marshall & Swift, Class A construction is structural steel and curtain glass, Class B is formed or tilt-up concrete and curtain glass, Class C is masonry frame, Class D is wood frame, and Class S is steel frame. Construction class is only significant for office properties, with high-rise (Class A or B) properties selling for a 78.3% premium and Wood-Frame properties selling for a 24.9% premium over Masonry-Frame properties. Interestingly, Steel-Frame properties appear to sell for a 34.7% discount, although this coefficient is only significant at the 10% level.

Conclusions to the Office Analysis

For the office analysis, the following variables show statistical significance:

1. Natural Log of Land Area
2. Natural Log of Building Area
3. Building Age
4. The Interaction of Corner Lots and Signalization, and
5. The Construction Class of the Building

The overall office analysis contains 273 observations and delivers an adjusted R-square of 78.4%.

The Industrial Analysis

Curb-Cuts (Access)
Like the retail and office analyses, curb cuts do not show as a statistically significant variable to sale price for industrial properties. Unlike retail and office properties, industrial site designs tend to be dominated by heavy truck design vehicles, and the turning radii of those vehicles will help to dictate reasonableness of access.

Frontage Characteristics
The analysis reveals that frontage upon a particular class of roadway is not statistically significant to the question of sale price of office properties.

Parcel Type and Signalization
Unlike the retail and office analyses, parcel type and signalization is not significant to the question of sale price of industrial properties.

Construction Class
Unlike the office analysis, construction class is not significant to sale price of industrial properties, though age of the improvements is highly significant.

Conclusions to the Industrial Analysis
For the industrial analysis, the following variables show statistical significance:

1. Natural Log of Land Area
2. Natural Log of Building Area, and
3. Building Age

The industrial analysis includes 381 observations, and has an adjusted R-square of 79.7%.

The Vacant Land Analysis
Curb-Cuts (Access)
Interestingly, this is the one use type that demonstrates statistical significance of access to the question of sale price. This is particularly notable given that, in so many cases of vacant land, any existing curb cuts may or may not serve the proposed use. One possible interpretation of this result is that a number of curb cuts may result in speculation that suitable curb cuts to the proposed use may be easier to permit.

Frontage Characteristics
The analysis reveals that frontage upon a particular class of roadway is not statistically significant to the question of sale price of vacant land. It must be noted, however, that the natural log of traffic volume is highly significant, just as in the retail analysis. It is apparent that visibility to higher volumes of traffic is an important characteristic of the sale price of vacant land.

Parcel Type and Signalization
It may be surprising that no combination of parcel type and signalization is significant to the question of sale price for vacant land. It should be noted, however, that with vacant land signalization may often be added or changed after the parcel is developed into its final use.

Conclusions to the Vacant Land Analysis
The dummy variable for Vacant Industrial Parcels shows that these sold for a 58.8% discount compared to commercial parcels. This effect is not surprising, given the anecdotal evidence of differences in commercial and industrial land sale prices found in the market. For the vacant land analysis, the following variables show statistical significance:

1. Natural Log of Land Area
2. Natural Log of Traffic Count, and
3. Number of Access Points (Curb Cuts)
4. Whether the vacant parcel is coded for an industrial land use

The vacant land analysis includes 324 observations and has an adjusted R-square of 51.2%.

CONCLUSIONS

While further research would be valuable to confirm that our results would translate to markets outside of Kansas, it seems reasonable to expect that our conclusions would be applicable to many markets across the U.S. Our data span a variety of urban area types, from small, rural cities to large metropolitan areas. Moreover, tests to see whether there was a systematic difference between metropolitan and micropolitan area counties (beyond the effects captured by county dummy variables) showed none. The only significant limitation to our data is that we have no observations from the urban core of extremely large metropolitan areas such as Los Angeles, Chicago or New York. As such, we would hesitate to speculate on whether our results would apply to parcels in these areas.

From these analyses and interpretations, it is concluded that differences in access (curb cuts) do not significantly affect the sale price of improved, income-producing properties. This does not imply, however, that changes in existing access would not affect these parcels, as they have likely been improved to optimally use whatever access was present, or permitted at the time of development. Access does appear to affect the sale price of vacant land, consistent with the idea that access does affect the feasible uses for a parcel and hence its value for development.

It is also concluded that frontage characteristics (frontage width and functional classification) are not statistically significant to the question of sale price. The one exception to this is that retail frontage upon a freeway has a significant effect, but the coefficient is negative. This is likely explained by the way in which the data were constructed, with primary frontage assigned on the basis of functional classification rather than the route of access. This result is likely the difference between visibility and accessibility. Finally, signalization is significant for retail and office properties that are on a corner, while traffic volume is statistically significant for retail and vacant parcels.

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LIST OF TABLES AND FIGURES

FIGURE 1: Metropolitan / Micropolitan and Developed Counties

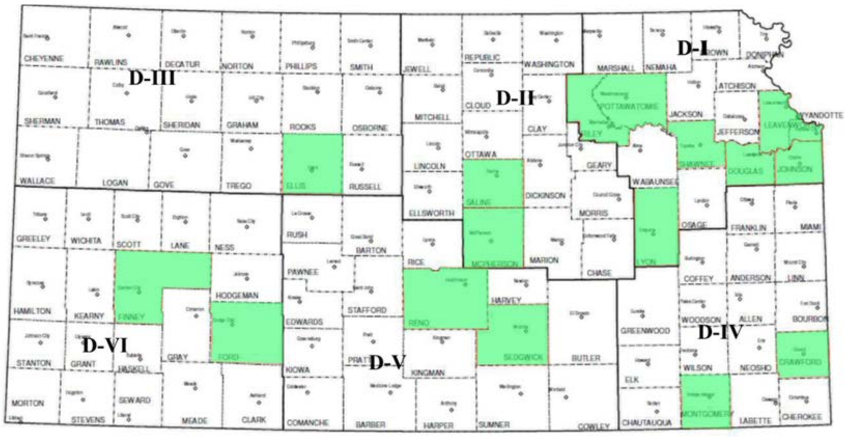

FIGURE 2: Counties Developed With Respect to KDOT Districts

TABLE 1: Valid Sales by County & Percentage of Sample Developed

County	2012 Valid Sales #	2013 Valid Sales #	Total Valid Sales	DP Developed Sales #	% of Population Developed
Crawford (019)	30	21	51	44	86%
Douglas (023)	37	36	73	117	160%
Ellis (026)	26	26	52	56	108%
Finney (028)	30	21	51	48	94%
Ford (029)	26	8	34	40	118%
Johnson (046)	149	140	289	269	93%
Leavenworth (052)	18	23	41	45	110%
Lyon (056)	21	15	36	42	117%
McPherson (059)	26	25	51	41	80%
Montogmery (063)	33	22	55	62	113%
Pottawatomie (075)	14	14	28	19	68%
Reno (078)	53	47	100	100	100%
Riley (081)	32	22	54	56	104%
Saline (085)	28	36	64	66	103%
Sedgwick (087)	217	218	435	447	103%
Shawnee (089)	56	58	114	104	91%
Wyandotte (105)	57	71	128	101	79%
Totals:	853	803	1656	1657	100%

TABLE 2: Sample of Attributes Analyzed

																Primary Frontage			Secondary Frontage				
Map Latitude	Map Longitude	Land Sq Ft	Parcel Type	Topography	Grade	Flood Zone	LBCS	Zoning Code	GBA	Year Built	Construction Class	Ceiling Height	Traffic Count	Signalization?	Type	Feet	Curb Cuts	Type	Feet	Curb Cuts	Sale Date	Adjusted Sale Price
38.912259	-94.759678	77,370	Interior	Level	At Street Level	X	2510	CP-2	10,672	2005	C	16	33225	No	Other Principal Arterial	334.00	0	None	0	0	12-31-2013	$2,025,000
38.935872	-94.636146	17,016	Mid-Block	Level	At Street Level	X	2401	CP-2	2,562	1978	D	10, 12	3250	No	Local Road	145.00	0	None	0.00	0	12-31-2013	$340,000
38.930681	-94.634542	262,222	Corner	Level	At Street Level	X	2401	CP-O	73,198	1979	C	11	990	No	Local Road	451.62	2	Local Road	571.04	0	12-23-2013	$4,600,000
38.883063	-94.800277	9,800	Mid-Block	Level	At Street Level	X	2401	C-1	756	1939	D	8	50	No	Local Road	70.00	1	None	0.00	0	12-23-2013	$50,000
38.882848	-94.648471	56,192	Mid-Block	Level	Above Street Level	X	2401	SD-CR	6,859	2014	D and S	22	20655	No	Minor Arterial	52.00	1	None	0.00	0	12-23-2013	$900,000
38.982814	-94.673748	14,927	Mid-Block	Level	At Street Level	X	2175	DFD	3,960	1977	D	13	5300	No	Local Road	110.00	1	None	0.00	0	12-19-2013	$155,000
38.937314	-94.796138	390,209	Double Corner	Level	Above Street Level	X	2401	BP	104,812	2007	A	14	13515	Yes	Minor Arterial	320.33	1	Local Road	490.65	0	12-18-2013	$19,900,000
38.910627	-94.669287	559,987	Through Lot	Level	At Street Level	X	2107	CP-2	175,355	1996	C	12-25	27855	Yes	Other Principal Arteral	1,638.00	1	Minor Arterial	1,532.00	3	12-13-2013	$29,300,000
38.993733	-94.720943	5,188	Interior	Level	At Street Level	X	2404	CN	5,188	1991	C	14	28140	No	None	0.00	0	None	0.00	0	12-12-2013	$475,000
38.941033	-94.703186	397,464	Corner	Level	Above Street Level	X	2106	CP-2	78,000	1976	C	10	13460	Yes	Minor Arterial	258.00	0	Local Road	214.00	2	12-03-2013	$2,825,000
38.85211	-94.817113	83,965	Corner	Level	At Street Level	X	2510	CP-2	10,342	2005	C and D	16	70100	Yes	Interstate	356.00	0	Other Principal Arterial	214.00	0	12-03-2013	$1,000,000
38.979903	-94.850518	51,029	Mid-Block	Level	At Street Level	X	3640	PI	7,200	2001	S	19	1700	No	Local Road	136.00	1	None	0.00	0	11-26-2013	$1,075,000
38.971828	-94.735423	290,815	Double Corner	Level	At Street Level	X	2105	CP1	63,108	1984	D	9	25030	No	Other Principal Arterial	664.00	2	None	0.00	0	11-21-2013	$3,710,000
38.884812	-94.673989	87,623	Corner	Level	At Street Level	X	2102	CP-2	20,902	2006	C and D	18	69800	No	Other Freeway/Exprssway	278.00	0	Other Principal Arterial	877.00	0	11-21-2013	$4,690,000
38.881236	-94.821002	2,987	Mid-Block	Level	At Street Level	X	2101	C-2	3,484	1955	C	13	6745	No	Minor Arterial	23.00	0	None	0.00	0	11-20-2013	$210,000
39.015793	-94.722503	11,760	Mid-Block	Level	At Street Level	X	2401	CH	1,690	1955	D	8	1400	No	Local Road	98.00	1	None	0.00	0	11-19-2013	$113,500
38.885199	-94.792025	35,213	Corner	Level	At Street Level	X	2650	C-3	0	N/A	N/A	N/A	1800	No	Local Road	194.00	1	Local Road	178.00	1	11-15-2013	$125,000
38.948327	-94.768383	169,167	Corner	Level	At Street Level	X	3640	BP-2	114,025	1987	B	24	1209	No	Local Road	514.00	2	Local Road	300.00	0	11-15-2013	$4,700,000
38.809437	-94.943883	35,503	Interior	Level	At Street Level	X	3640	M-1	10,744	1975	S	18	6165	No	None	0.00	0	None	0.00	0	11-13-2013	$400,000
38.980241	-94.961262	14,734	Mid-Block	Level	At Street Level	X	3610	M-1	5,800	1975	D	12	350	No	Local Road	245.00	2	None	0.00	0	11-08-2013	$190,000
38.894244	-94.786724	118,613	Mid-Block	Level	At Street Level	X	2111,	CP-3	8,717	1956	C	16	99100	No	Local Road	352.00	1	None	0.00	0	11-08-2013	$2,100,000
39.015101	-94.705409	82,744	Mid-Block	Level	At Street Level	X500	6511	SMPCHO	10,585	2014	D	16	35950	No	Local Road	175.00	2	None	0.00	0	11-07-2013	$880,000
38.928533	-94.768505	109,200	Corner	Level	At Street Level	X	3610	BP2	31,840	1980	B	24	1080	No	Local Road	420.33	1	Local Road	259.97	1	11-06-2013	$1,125,000
38.890784	-94.668556	114,127	Corner	Level	Above Street Level	X	2401	CP-O	31,985	1999	A	14	22670	Yes	Minor Arterial	253.06	1	Local Road	450.00	1	11-01-2013	$4,691,787
38.958778	-94.741783	39,261	Corner	Level	Above Street Level	X	2401	NPO	10,138	1986	C	9	7750	No	Minor Arterial	163	0	Local Road	215.41	1	10-31-2013	$825,000
39.02276	-94.648333	15,522	Mid-Block	Level	At Street Level	X	2101	MS1	9,008	1920	D	10	12180	No	Minor Arterial	114.00	0	None	0.00	0	10-31-2013	$489,000
38.929263	-94.637192	42,937	Interior	Level	Slightly above street	X	2401	CP-O	15,499	1971	C	10	996	No	Local Raod	150.00	1	None	0.00	0	10-31-2013	$900,000
38.844541	-94.813205	92,986	Interior	Level	At Street Level	X	9920	M-2	0	N/A	N/A	N/A	50	No	None	0.00	0	None	0.00	0	10-30-2013	$280,000
38.816198	-94.946186	61,516	Corner	Level	At Street Level	X	9950	CP-2	0	N/A	N/A	N/A	22840	No	Major Collector	239.07	0	None	0	0	10-23-2013	$736,111
38.927041	-94.717629	49,691	Corner	Level	At Street Level	X	9950	CP-2	0	N/A	N/A	N/A	22840	No	Minor Arterial	204.16	0	None	0	0	10-23-2013	$594,006
39.033122	-94.61665	12,067	Corner	Level	At Street Level	X	2211	B-1	2,788	1965	D	10	26850	Yes	Other Principal Arterial	148.00	0	Local Road	90.00	1	10-16-2013	$790,000
39.034707	-94.608191	107,649	Double Corner	Gently Sloping	Above Street Grade	X	2401	CP-O	48,962	1966	A	12	21000	Yes	Other Principal Arterial	206.00	0	Major Collector	326.00	0	10-09-2013	$7,200,000
38.939117	-94.757628	286,558	Mid-Block	Level	At Street Level	X	3610	BP2	126,589	1978	B	22	10000	No	Local Road	595.00	3	None	0.00	0	10-04-2013	$4,132,000
38.879782	-94.667342	96,080	Mid-Block	Level	At Street Level	X	2105	CP-2	15,830	2008	D and S	16	24650	No	Minor Arterial	443.00	0	None	0.00	0	09-30-2013	$2,400,000
38.834076	-94.670796	43,560	Mid-Block	Level	At Street Level	X	3640	PRB-3J	4,000	1987	C and D	10	500	No	Local Road	149.00	1	None	0.00	0	09-27-2013	$290,000
39.039277	-94.684701	11,810	Mid-Block	Level	At Street Level	X	3610	C-3	6,739	1945	C	12	92	No	Minor Arterial	115.50	0	None	0.00	0	09-27-2013	$115,000
38.992632	-94.703799	20,239	Mid-Block	Level	Above Street Level	X	2174	CP-2	442	1989	C	13	28140	No	Minor Arterial	120.00	1	None	0.00	0	09-25-2013	$250,000
38.945438	-94.756099	172,498	Mid-Block	Level	At Street Level	X	3610	BP2	56,000	1975	C	24	2960	No	Major Collector	385.47	2	None	0.00	0	09-24-2013	$2,240,000
38.931695	-94.77015	156,347	Mid-Block	Level	At Street Level	X	3640	BP2	32,390	1984	C and D	17	1100	No	Local Road	344.41	1	None	0.00	0	09-24-2013	$1,260,000
38.934016	-94.748609	39,351	Corner	Level	Above Street Level	X	3610	BP2	9,669	1985	C	20	1160	No	Local Road	356.73	1	None	0.00	0	09-23-2013	$798,500
39.021697	-94.66688	13,895	Mid-Block	Level	Above Street Level	X	2102	M-1	1,500	1946	C	10	14012	No	Minor Arterial	0.00	0	Local Road	60.18	1	09-20-2013	$293,966
38.879311	-94.819677	15,159	Corner	Level	Above Street Level	X	2102	C-1	2,332	1920	D	11	6745	No	Local Road	128.50	1	Local Road	90.75	0	09-19-2013	$210,000
38.954819	-94.685808	27,700	Mid-Block	Level	Above Street Level	X	9950	CP-2	0	N/A	N/A	N/A	16190	No	Minor Arterial	173.05	3	Local Road	160.00	1	09-18-2013	$405,000
38.9179	-94.78657	762,648	Mid-Block	Hilly - Uneven	At Street Level	X	3610	BP-2	238,000	1998	C	32	150	No	Local Road	709.39	2	Local Road	1002.5	2	09-17-2013	$10,400,000
39.009294	-94.769823	99,273	Corner	Level	Below Street Level	X	3610	CH	6,717	1999	C	16	32445	Yes	Other Freeways/Exprsways	287.34	0	Major Collector	339.36	0	09-11-2013	$1,125,000
38.8818	-94.818857	6,489	Mid-Block	Level	Above Street Level	X	2404	C-2	6,489	1965	C and D	19	2000	No	Local Road	85.60	0	None	0.00	0	09-09-2013	$850,000
38.98718	-94.6697	10,518	Mid-Block	Level	At Street Level	X	2401	DFD	2,970	1964	C and D	11	5000	No	Local Road	75	1	None	0	0	8/30/2013	$220,000
38.91489	-94.7023	253,084	Interior	Level	Below Street Level	X	2151	CP-1	55,812	1988	C	17	70500	No	None	0	0	None	0	0	8/26/2013	2,905,426.00
39.02185	-94.6486	42,993	Double Corner	Level, Low	Above Street Level	X	2105,	MS2	11,343	1955	C and D	15	12180	Yes	Minor Arterial	105.91	0	Minor Arterial	221.35	2	8/23/2013	1,797,700.00
38.81133	-94.9279	21,575	Corner	Level	Above Street Level	X	2102	C-1	1,200	1963	D and S	12	8220	Yes	Other Principal Arterial	171.05	2	Minor Arterial	110.45	1	8/21/2013	$230,000
38.882869	-94.64281	43,241	Mid-Block	Level	Above Street Level	X	2105	SD-CR	8,421	2002	C	12	28720	No	Other Principal Arterial	215	0	Local Road	201	1	8/15/2013	$1,500,000
38.8621	-94.8285	42,757	Mid-Block	Level	Slightly above street	X	3640	M-2	9,880	1990	C	20	258	No	Local Road	191.17	1	None	0	0	8/14/2013	$675,000
38.98419	-94.673	11,332	Mid-Block	Level	Slightly above street	X	2101	DFD	1,930	1955	C	11	5730	No	Local Road	100.2	0	None	0	0	8/13/2013	$200,000
38.92628	-94.701	46,539	Mid-Block	Level	Slightly above street	X	2102	CP-2	7,958	1982	C and D	12	816	No	Local Road	285	2	None	0	0	8/9/2013	$850,000
38.83333	-94.8169	143,103	Corner	Level	Slightly above street	X	2174	M-2	18,000	1998	D	24	21800	No	Other Principal Arterial	415.58	0	Local Road	376.78	1	8/6/2013	$1,700,000
38.975511	-94.779373	1,234,770	Corner	Level, Rolling	Slightly above street	D	9950	CC	0	N/A	N/A	N/A	70000	No	Interstate	917.2	0	Minor Arterial	506.23	0	8/6/2013	$3,300,000
38.84344	-94.8151	69,669	Mid-Block	Level	Below Street Level	X	3620	M-2	15,525	1987	C, D and S	17	29700	No	Other Freeways/Exprsways	173.53	1	None	0	0	8/5/2013	$825,000
38.97834	-94.7151	111,014	Mid-Block	Hilly - Uneven	Above Street Grade	AE	2401	BP2	24,538	1974	C	15	2400	No	Local Road	376.02	2	None	0	0	8/1/2013	$1,450,000

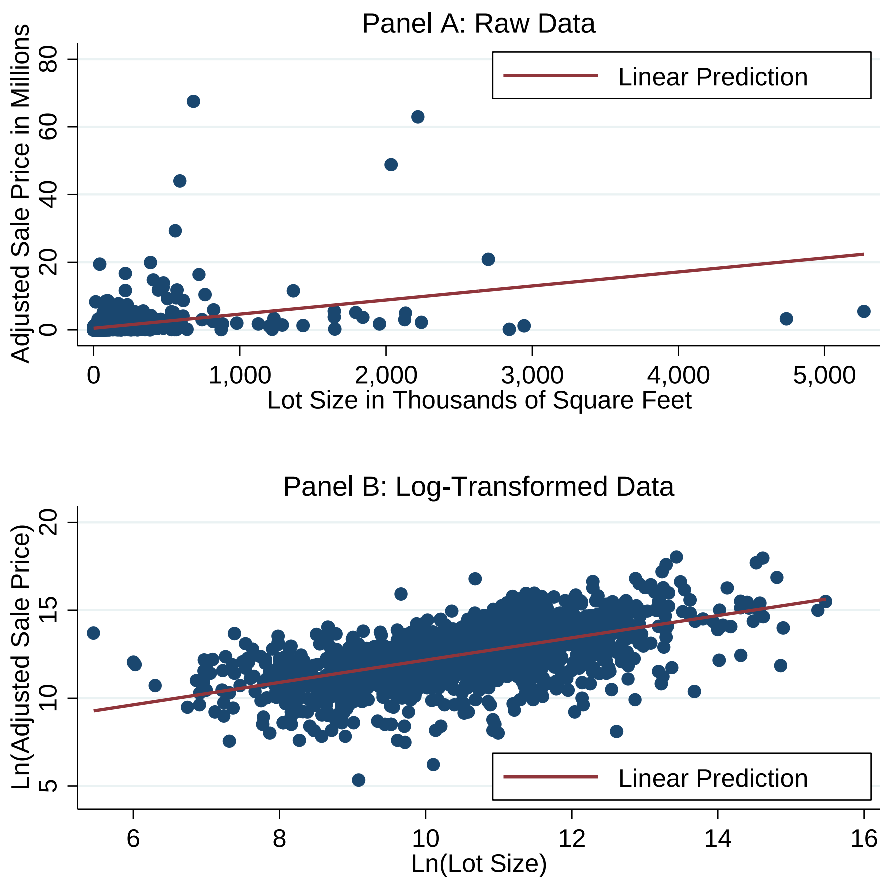

FIGURE 3: Linear vs. Log-Linear Model Specifications

TABLE 3 – Summary Statistics

Variable	**Obs.**	**Median**	**Mean**	**Std. Dev.**	**Min.**	**Max.**
Sale Price	1,644	235,000	910,553	3,324,787	100	67,500,000
Land SF	1,644	31,970	99,867	292,274	234	5,269,889
Gross Building SF	1,644	4,200	14,144	44,890	0	1,107,000
Year Built	1,326	1973	1967	32	1868	2014
Age	1,326	39	46	32	0	144
Traffic Count	1,644	6,922	10,518	14,016	44	153,000
Front Feet	1,644	233	335	374	0	3,179
Signalization	1,644	0	0.116	0.321	0	1
Corner Lot	1,644	0	0.417	0.493	0	1
Inside Flood Zone	1,644	0	0.052	0.221	0	1

Notes: Front Feet is the sum of primary and secondary front feet; Corner Lot includes double corner lots.

TABLE 4 –Regression Results by Use Type

	Retail	Office	Industrial	Vacant
LN(Land SF)	0.235 ***	0.225 ***	0.124 ***	0.601 ***
	(0.055)	(0.062)	(0.039)	(0.072)
Ln(Gross Building Area)	0.511 ***	0.559 ***	0.602 ***	
	(0.039)	(0.057)	(0.042)	
Ln(Traffic Count)	0.287 ***	0.022	0.012	0.254 ***
	(0.036)	(0.039)	(0.027)	(0.068)
Ln(Total Front Feet)	-0.065	-0.014	0.063	0.045
	(0.067)	(0.093)	(0.052)	(0.110)
Age	-0.037 ***	-0.039 ***	-0.018 ***	
	(0.003)	(0.006)	(0.004)	
Age Squared	0.000201 ***	0.000262 ***	0.000060	
	(0.000028)	(0.000055)	(0.000043)	
Inside Flood Zone	0.221	-0.199	0.246	0.145
	(0.150)	(0.262)	(0.153)	(0.297)
Signalization x Corner Lot:				
- No x Yes	0.052	0.121	0.039	-0.004
	(0.087)	(0.117)	(0.080)	(0.193)
- Yes x No	0.375	-1.220 *		0.034
	(0.242)	(0.692)		(1.296)
- Yes x Yes	0.369 ***	0.408 **	0.149	0.093
	(0.106)	(0.171)	(0.173)	(0.253)
Number of Curb Cuts:				
- Zero	0.114	0.034	0.037	0.187
	(0.097)	(0.155)	(0.136)	(0.179)
- Two	-0.033	0.022	0.065	0.442 *
	(0.085)	(0.106)	(0.082)	(0.241)
- More than Two	0.077	0.198	0.164	0.738 **
	(0.115)	(0.175)	(0.100)	(0.316)
Primary Frontage:				
- None	-0.626	-0.098	0.178	0.748
	(0.400)	(0.458)	(0.315)	(0.661)
- Local Street	-0.106	-0.125	-0.104	-0.158
	(0.091)	(0.131)	(0.096)	(0.198)
- Collector Street	0.076	-0.119	-0.076	-0.292
	(0.122)	(0.168)	(0.121)	(0.331)
- Freeway	-0.367 **	0.144	0.155	-0.243
	(0.166)	(0.402)	(0.168)	(0.366)
Grading from Street:				
- Above Street Level	-0.170 *	-0.072	-0.066	-0.100
	(0.093)	(0.127)	(0.104)	(0.246)
- Below Street Level	0.272	-0.018	-0.242	-0.034
	(0.199)	(0.220)	(0.177)	(0.472)

TABLE 4 –Regression Results by Use Type

	Retail	Office	Industrial	Vacant
Construction Class:				
- Class D - Wood-Frame	-0.034	0.249 **	-0.102	
	(0.087)	(0.120)	(0.122)	
- Class S - Steel-Frame	-0.081	-0.347 *	-0.008	
	(0.141)	(0.180)	(0.085)	
- Class A/B - High-rise Structural	-0.360	0.783 ***	0.048	
	(0.567)	(0.254)	(0.293)	
- Various	0.004	0.089	-0.121	
	(0.076)	(0.125)	(0.096)	
Vacant Industrial Parcel				-0.588 **
				(0.232)
Constant	4.199 ***	5.146 ***	4.153 ***	1.702 *
	(0.493)	(0.776)	(0.451)	(0.965)
County Dummies	Yes	Yes	Yes	Yes
Observations	693	273	381	324
Adjusted R-Square	0.784	0.784	0.797	0.512

Notes: Standard errors are shown in parentheses below the estimates.

*** Coefficient significant at the 1% level.
** Coefficient significant at the 5% level.
* Coefficient significant at the 10% level.

The dependent variable is the natural log of the Sale Price of the parcel. Vacant Industrial Parcel is a dummy variable for vacant parcels indicating an industrial land-use code; all other vacant parcels have a commercial (office or retail) land-use code.

Omitted categories for categorical variables are as follows:

- Signalization x Corner Lot: No x No
- Number of Curb Cuts: One
- Primary Frontage Type: Arterial Street
- Grading from Street: At Street Level
- Construction Class: Class C – Masonry-Frame

County dummy variables are included in all model specifications; results available upon request.