WORKING PAPER

Is Wal-Mart a Bad Neighbor? Repeat sales evidence on how property values react to a new Big-box store

by
Daniel K.N. Johnson and Kristina M. Lybecker

Colorado College Working Paper 2010-08
August, 2010

Department of Economics and Business
Colorado College
Colorado Springs, Colorado 80903-3298
www.coloradocollege.edu/dept/EC

Is Wal~Mart a Bad Neighbor?
Repeat sales evidence on how residential property values react to a new Big-box Store

Daniel K.N. Johnson
Kristina M. Lybecker

July 28, 2010

Daniel K.N. Johnson is the Gerald L. Schlessman Professor of Economics and Director of the Innovative Minds Program at Colorado College, 14 E. Cache la Poudre St., Colorado Springs, CO 80903, tel: (719) 389-6654, fax: (719) 389-6927, djohnson@coloradocollege.edu.

Kristina M. Lybecker is an Assistant Professor of Economics at Colorado College, 14 E. Cache la Poudre St, Colorado Springs, CO 80903, tel: (719) 389-6554, fax: (719) 389-6927, Kristina.Lybecker@coloradocollege.edu.

Abstract: While there is anecdotal evidence that home values decline when a big-box store (such as Wal-Mart) decides to locate in the area, there is a paucity of evidence on that effect. This paper uses a repeat sales model to compare residential property values, and the speed of sale of the property, to compare the impact that an arrival has. Results conclude that there is a 'news effect' surrounding the arrival, and that the total effect is small at most. For most specifications tested, the number of stores nearby, the arrival of new stores, and the distance to the nearest store all have insignificant impacts on both property resale value and the number of days that a property spends on the market prior to sale. In the worst-case scenario, the arrival of a Wal-Mart is associated with a decline equivalent to roughly one percent of the home's square footage and is not absorbed by those closest to the new retailer but by rather more distant neighbors.

Keywords: externality, location, real estate, residential, retail

JEL codes: N9 --- Regional and Urban History
R1 --- Urban, Rural and Regional Economics

Special thanks to Nate Banet who provided us with access to the real estate data, to Matthew Brown whose initial energies started this project in motion and to Stephen Fischer for help with the data. Financial support was provided by a Mrachek Research Fellowship, a Mellon Research Block, the Chapman Fund, and Colorado College.

I. Introduction

Critics claim that Wal-Mart is bad for local economies specifically that the stores bankrupt mom-and-pop businesses and drive down property values (e.g. Fox, 2005). Accordingly, recent Wal-Mart openings have generated large public demonstrations against the company's presence in the community and the damaging effects they assert the stores propagate. Despite the measurability of this effect, economists have yet to empirically relate Wal-Mart locations to residential property values. This study uses a repeat sales model to evaluate this claim and analyze the impact of new big-box stores on home prices.

We evaluate the spatial correlation between big-box store locations and residential property values, controlling for important aspects of a home's market value such as square footage, age and local school districts. In addition, this study uniquely captures several distinct impacts of the arrival of a new big-box store: the importance of time-since-arrival on a property's sale price, the impact of distance between the newly-arrived big-box store and a specific property on market valuation, and the influence of proliferation (the increasing number of big-box stores within a proximate distance) on the price of a home. Moreover, the impact of big-box store locations on residential property values is evaluated using two measures, sales price and the number of days a property remains on the market before sale. Presumably there is a tradeoff between price and patience and these two measures allow us to describe the effect of a new big-box store on each.

In section II of the paper, we review the literature on property valuation and the spatial impact of construction events. Section III describes the data set. Section IV explains the model utilized and Section V present the regression analyses using several measures of distance to capture the impact of a newly opened store. The final section concludes with interpretation of the results and implications for policy and further research.

II. Literature

The existing literature on property valuation is expansive and its review is beyond the scope of this paper. Here our focus is on the choice of model and the selection of the explanatory variables utilized. Of principle importance is the zoning type of the property, which is essential to a fair comparison across properties (Brigham 1965; Lafferty and Frech, 1978; Van Cao and Cory, 1982; Cervero and Duncan, 2004; Spikowski 2006; Haughwout et al., 2008). The focus of this paper is exclusively single family residential homes. As such, the variables discussed here reflect the factors that best explain home prices. The literature unarguably concludes that greater area (acreage) and square footage are clearly associated with higher property valuations (Friedman, 1975; Brueckner and Colwell, 1983; Blamire and Barnsley, 1996; Clapp, 2003; Sirmans et al., 2006). Highly correlated with these measures are home characteristics such as the number of bedrooms (Garrod and Willis, 1992) and bathrooms (Clapp, 2003; Sirmans et al., 2006), both of which are unambiguously associated with higher property values.

Essential to home valuation is time, which enters into the calculation in several ways. The date of sale is clearly important, whether directly (Garrod and Willis, 1992; Clapp and Giacotto, 1992) or indirectly via standardization against assessed values as they change over time (Cypher and Hansz, 2003; Hess and Almeida, 2007). In this study, obviously each of the dates of repeated sales is clearly important. In addition, the time since construction (age of the property) at the date of sale is also frequently included, often in a nonlinear way to represent consumer preferences for historic homes or new construction, relative to middle-aged residences (Clapp, 2003; Byrne, 2006).

In addition, studies have clearly shown that proximity to landmark neighborhood institutions has an effect on proximate property values. These have been calculated for desirable institutions such as parks (Hendon, 1971; Jackson, 2009) but are most often calculated for potentially negative pollution effects and health risks from transportation or energy sector installations (Poon, 1978; Nelson, 1982; Pennington and Ward, 1988). At the extreme, there is a branch of the literature that examines the housing price responses to hazardous waste locations or Superfund sites (Boyle and Kiel, 2001; Kiel and Williams, 2005; Kiel, 2006; Gayer and Viscusi, 2002). Occasionally, analysis focuses on the impact of

an institution with potential for either positive or negative impact, such as a sports stadium (Tu, 2005). In this vein of the literature, there is also some evidence that residential proximity to differently zoned communities (e.g. mixed use or commercial) impacts residential property values as well (Van Cao and Cory, 1982; Cervero and Duncan, 2004; Spikowski 2006; Haughwout et al., 2008).

Within this literature, three types of models are generally developed: hedonics, semiparametrics or repeated sales models. Studies most frequently utilize hedonic models (see Boyle and Kiel, 2001 for a review), although semiparametric approaches (e.g. Clapp 2003) have leveraged the hedonic model to improve on their ability to reflect unmeasurable neighborhood effects. Repeated sales models rely on a subset of observations for properties which have been valued more than once, therefore abstracting away from the hedonic treatment of property characteristics as an implicit fixed effect of the property in order to focus on changes in valuation over time (e.g. Case and Mayer, 1996; Gayner, Hamilto & Viscusi, 2002; Gayner & Viscusi, 2002).

III. Data Description

This study focuses on single-family home sales within a two-mile radius of 13 big-box stores in El Paso County, Colorado between 1994 and 2005. The stores include five Wal-Mart stores, three Kmart stores, three Target stores, and two Best Buy stores. Unfortunately, the opening dates of the Target stores so closely match either the starting or ending dates in the study that only 11 properties were subject to repeat sales. In addition, all of the Kmart stores were established before 1994, eliminating Kmart stores from consideration. Given this, the study focuses only on repeat sales on either side of the opening of a Wal-Mart or Best Buy store.

A. Opening Date Data

The opening dates for the 13 big-box stores located within the city of Colorado Springs, Colorado were collected from the El Paso County Planning Department and confirmed with the national

headquarters of the retail chains and local phonebooks. The opening dates were used to determine how many *open* big-box stores were within a two-mile radius of each property at the time of each sale and which homes sold both before and after the opening of a big-box store within a two-mile radius. Finally, the opening dates were used to calculate the number of days between the opening of the store and the date of sale of the property (*dayssince*) for the newest big-box store located within the property's two-mile radius. Of the 13 big-box stores considered, six stores opened within the time period studied, between 1994 and 2005. Given this, homes within the two-mile radius of these stores may be located within two miles of an increasing number of big-box stores over time.

B. Property Data

As noted above, this study only considers single-family residential properties.[1] Data were gathered on every single-family property sold in El Paso County, Colorado between January 1, 1994 and December 31, 2005 from the Pikes Peak Multiple Listing Service (MLS).[2] For each property, data were collected on MLS number, address, property type, number of bedrooms, number of bathrooms, size of garage, finished square feet, total square feet, year built, list price, sales price, loan type, and the current days on market (*cdom*) to sale. Due to the property valuation information contained in the transaction price, the focus of the study is homes that were sold, rather than properties that were listed, withdrawn, expired or cancelled. Ultimately, a total of 102,017 sales were recorded. Of these, 12,024 properties were sold multiple times between January 1994 and December 2005 and 1,667 of these sales are characterized by the opening of a big-box store in the interim between the two sales.

While data were collected on the number of bedrooms, bathrooms and total square footage, these variables were highly correlated, so the study utilizes only total square footage and the change in total

[1] Commercial data were eliminated because of inconsistencies with many variables, including the number of rooms and bathrooms. Moreover, single family residential properties provided the greatest accuracy in matching the property location in the mapping software that provided the distance to the nearest big-box stores.

[2] We are grateful to Nate Banet of Flying Horse Realty, Colorado Springs, for providing us access to the Pikes Peak MLS system. This allowed us to gather the most accurate and complete data set available. These data were gathered between June 22 and June 26, 2009.

square footage (area added between the first and second sales).[3] This is a particularly appropriate choice given the ages of many of the properties in our sample, dating from the late 1800s when large numbers of bedrooms and bathrooms were less common, even in expansive homes. In addition, the regressions incorporate year dummies for the date of each sale, to capture the appreciation of property over time.

Using GIS mapping software, we identified the corresponding El Paso county school district for each of the properties. We had hoped to include information on the crime rates associated with each property, but this information was unfortunately not available.

C. Distance Measures

For each of the 13 big-box stores located within the county, distances (measured in feet) were calculated to each property located within a two-mile radius.[4] This allowed us to determine both how many and which stores were located within each property's two-mile radius at the time of each sale. Drawing on this information for each of the six big-box stores that opened between 1994 and 2005, we created a series of dummy variables to quantify the distance between the store and the residential property for all properties located within a two-mile radius of a new store. This enables us to capture the presence of a new big-box store as well as its distance from the home. In one series, the dummy variables were generated for the new Wal-Mart and Best Buy stores with gradation for each tenth-of-a-mile. For example, *w1* (*b1*) indicates the presence of a new Wal-Mart (Best Buy) store located within 0 and 1/10th of a mile from the home and *w2* (*b2*) indicates a new Wal-Mart (Best Buy) located between 1/10th and 2/10ths of a mile from the home. This series consists of a total of 40 variables. In a second series, dummy variables were generated for a graduation of each half-mile, larger increments than the first series. For example, *W1* (*B1*) indicates the presence of a new Wal-Mart (Best Buy) store located within one-half

[3] While the data allows us to account for changes in a home's square footage, we do not capture improvements to existing square footage.

[4] We are grateful to Stephen Fischer, the GIS Database Coordinator for the Assessor's Office of El Paso County, Colorado for providing these calculations.

mile of the home. This series consists of a total of 8 variables. These series allow us to capture the nonlinear impact of distance to a new big-box store on property valuation.

D. Cleaning and Matching

In order to maximize the number of property sales in our data, we took great efforts to clean the data prior to matching the distance data from the Assessor's Office to property data from the MLS. While the addresses from the Assessor's Office were standardized and consistent across properties, the MLS data were entered by different realtors and did not adhere to a uniform format. For example, numerically designated streets would appear as both "First Street" and "1stStreet". Simple misspellings were also a significant obstacle to matching the distance information to the sales data.

Table 1 contains a description of the variables used in the study, along with summary statistics for the 12,024 observations. Notice that beyond control variables for the age and size of the property, we include distance as a set of categorical dummy variables in order to provide for the most possible flexibility in the estimated functional form. Specifically, we account for distance in both 1/10th and one half mile increments within a two-mile radius surrounding a new store. In addition to the distance dummy variables, we include dummies for the year of first sale, the year of second sale, and the Colorado Springs school district in which the property is located.

Table 1: Description of Variables and Summary Statistics

Variable	Description (units of measurement)	Mean	St. Dev.	Min.	Max.
saleprice_diff	Difference between second and first sale price ($)	32816.65	38164.38	-1137200	1350100
cdom_diff	Difference between number of days on market at time of first and second sales (days)	-0.53	71.81	-1216	498
Sqft	Total square footage of property (ft)	1969.98	799.82	0	10417
AdditionalSqft	Change in square footage of property between first and second sales	40.22	173.64	0	4715
Age	Age of property at time of sale (years)	27.30	24.37	0	129
totalsalenumber	Total number of Big-box stores within a two mile radius of the property at the time of first sale	1.52	0.77	1	5
totalsalenumber_diff	Total number of new Big-box stores within	0.16	0.44	0	2

	a two mile radius of the property to arrive between two sales				
dayssince	Number of days between the opening of the newest Big-box store and the date of second sale (days)	2368.15	975.10	0	3745

Properties in our sample are fairly standard for North America, averaging 1970 square feet, and ranging from 800 to 10,417 square feet. The average home was a little over 27 years old at the time of sale, but our sample includes new constructions and some properties over a century old. Properties averaged one half day less on the market during their second sale than on their first, but again the variance was large, with one spending 1,216 fewer days on the market and one spending 498 more days. On average, properties sold for $32,816.65 more on their second sale than on their previous sale (an inter-sale time difference that averaged 1396 days or roughly five and one-quarter years in our sample). While the range in sales prices seems very wide, it is in fact due to only a few outliers. Less than 300 properties (two percent of the sample) increased in price by more than $100,000 between repeat sales. The outliers are accommodated using square footage at the time of each sale, and outliers are notable as dramatically different structures on the site. Regression results below are virtually identical in size and significance if outliers are removed.

By construction, we only considered homes that were within two miles of a big-box store at the time of sale, but some properties were within two miles of as many as five such retail locations. The vast majority of the sample, 10,355 of 12,024, saw no change in the number of big-box stores within that two mile radius between sales. However, the remainder of the sample saw at least one new store and 312 properties saw two new stores.

Categorical distance variables set at each tenth of a mile (e.g. less than 0.1 miles to the new Wal-Mart, 0.1 or more miles but less than 0.2 miles to the new Wal-Mart) are populated by the number of properties shown in Table 2. The distance considered range from 0 to 2 miles to the new big-box stores, Wal-Mart and Best Buy respectively. As sensitivity tests, we aggregated to half-mile categories (reported

in Tables 4 and 5 below), and alternatively used the precise lot-to-lot distance measures (the latter in both linear and nonlinear specifications). While we do not report those results here, they are available from the authors and make no appreciable difference to the results of the analysis which follows.

Table 2: Number of Homes Located within 1/10th Mile Increments of a New Big-box Store, Up to 2 Miles

	1st	2nd	3rd	4th	5th	6th	7th	8th	9th	10th	11th	12th	13th	14th	15th	16th	17th	18th	19th	20th
Wal-Mart	0	0	0	8	23	23	18	29	18	26	51	77	86	78	80	81	80	91	120	98
Best Buy	0	0	3	16	18	12	16	7	128	39	45	41	45	50	39	43	33	54	64	64

IV. Model

The literature is bifurcated between hedonic and semi-parametric estimation on one hand versus repeated sales models on the other. We adopt a repeat sales model for this analysis for two reasons. First, we are interested in controlling for property-specific effects as carefully as possible, and second, we are interested in a causality story. If we can compare properties for which there was no change in retail locations nearby, to properties for which a new big-box store located nearby, we can perhaps infer some causal link by netting out the impact of initial property values. In addition, this study incorporates variables to measure the importance of the time-since-arrival of the new store, the distance between the property and the new big-box store location, and the proliferation of proximate big-box stores.

Specifically, we estimate the following four equations:

$$\begin{aligned} &Change\ in\ sales\ prices \\ &= \alpha + \beta_1 sqft + \beta_2 AdditionalSqft + \beta_3 age + \beta_4 age^2 + \beta_5 totalsalenumber + \beta_6 totalsalenumber\_diff \\ &+ \sum_{i=1994}^{2005} \alpha_i year_i + \sum_{j=1994}^{2005} \alpha_j year_j\_d + \sum_{h=1}^{4} \lambda_h\ district_h + \sum_{k=1}^{20} \delta_k w_k + \sum_{l=1}^{20} \theta_l b_l + \varepsilon \end{aligned}$$

$$\begin{aligned} &Change\ in\ sales\ prices \\ &= \alpha + \beta_1 sqft + \beta_2 AdditonalSqft + \beta_3 age + \beta_4 age^2 + \beta_5 totalsalenumber + \beta_6 totalsalenumber\_diff \\ &+ \sum_{i=1994}^{2005} \alpha_i year_i + \sum_{j=1994}^{2005} \alpha_j year_j\_d + \sum_{h=1}^{4} \lambda_h\ district_h + \sum_{m=1}^{4} \delta_m W_m + \sum_{n=1}^{4} \theta_n B_n + \varepsilon \end{aligned}$$

$$Change\ in\ days\ on\ market = \alpha + \beta_1 sqft + \beta_2 AdditonalSqft + \beta_3 age + \beta_4 age^2 + \beta_5 totalsalenumber + \beta_6 totalsalenumber\_diff + \sum_{i=1994}^{2005} \alpha_i year_i + \sum_{j=1994}^{2005} \alpha_j year_j\_d + \sum_{h=1}^{4} \lambda_h\ district_h + \sum_{k=1}^{20} \delta_k w_k + \sum_{l=1}^{20} \theta_l b_i + \varepsilon$$

$$Change\ in\ days\ on\ market = \alpha + \beta_1 sqft + \beta_2 AdditonalSqft + \beta_3 age + \beta_4 age^2 + \beta_5 totalsalenumber + \beta_6 totalsalenumber\_diff + \sum_{i=1994}^{2005} \alpha_i year_i + \sum_{j=1994}^{2005} \alpha_j year_j\_d + \sum_{h=1}^{4} \lambda_h\ district_h + \sum_{m=1}^{4} \delta_m W_m + \sum_{n=1}^{4} \theta_n B_n + \varepsilon$$

where *Sqft* is the number of square feet, improved or unimproved, encompassed in the residence;

AdditonalSqft is the change in square footage between the first and second sales;

Age is the age in years of the residence at time of sale;

TotalSaleNumber is the number of big-box stores located within a two-mile radius at time of sale;

TotalSaleNumber_diff is the difference between the number of big-box stores located within a two-mile radius of the home at the time of second sale vs at the time of first sale;

$Year_i$ is a dummy variable for the year of first sale;

$Year_j\_d$ is a dummy variable for the year of second sale;

$District_h$ is a dummy variable for each of the Colorado Springs school districts;

w_k is a dummy variable for a new Wal-Mart store located between k and k+1 tenths of a mile;

W_m is a dummy variable for a new Wal-Mart store located between m and m+1 halves of a mile;

b_l is a dummy variable for a new Best Buy store located between l and l+1 tenths of a mile; and

B_n is a dummy variable for a new Best Buy store located between n and n+1 halves of a mile.

This is a simple reduced form structure, consistent with the literature's precedents using repeated sales models (e.g. Case and Mayer, 1996).

Identical analyses were conducted for two dependent variables: change in sales price and change in current days on market (*cdom*). Recognizing that a property's market valuation may represent a trade-off between price and patience, we ran similar regressions using a property's days on the market to evaluate any big-box effect. Remarkably, the model effectively lost all of its explanatory power. The F-statistics dropped below 2 and the adjusted R^2 fell to less than 0.03. Given this result, we looked more closely at the correlation between sales price and the number of days a property spends on the market. As shown in Table 3, virtually no correlation exists between the two variables.

Table 3: Correlation between CDOM and Sales Price

Variables Examined		Correlation
Change in CDOM	Change in sales price	-0.033
Change in CDOM: subset of homes with new store in radius	Change in sales price: subset of homes with new store in radius	-0.012
First Sale CDOM	First Sale Price	0.149
Second Sale CDOM	Second Sale Price	0.099

V. Analysis

We present our analysis in two tranches, first addressing property sales prices as the dependent variable and then separately turning to the days on market as a dependent variable.

Table 4 presents the results for residential property sales prices, accounting for distance in both tenth-mile and half-mile increments. The dependent variable was the difference in the home's price between the first and second sale. Within Table 4, the columns on the left describe the results for the subset of homes characterized by the opening of a new big-box store within a two-mile radius (which we refer to hereafter as 'affected homes'). In contrast, the columns on the right describe the results for the full sample, all homes that sold repeatedly in El Paso County between 1994 and 2005.

Table 4: Impact of Big-Box Store Locations on Residential Property Sales Prices

	Affected Homes Subset 1/10th mile increments				Complete Sample 1/10th mile increments				Affected Homes Subset 1/2 mile increments				Complete Sample 1/2 mile increments		
variable	coefficient	t-stat			Coefficient	t-stat			coefficient	t-stat			coefficient	t-stat	
Initial square footage	12.86	16.29	***		13.61	32.15	***		12.74	16.53	***		13.58	32.19	***
Additional square footage	14.30	4.94	***		55.39	33.30	***		14.22	4.99	***		55.19	33.27	***
Age of property	203.49	2.03	**		210.97	5.01	***		168.98	1.74	*		209.87	5.00	***
Age of property squared	0.65	0.59			0.41	1.04			1.07	1.00			0.42	1.07	
Number of stores within 2 miles	-2727.37	-3.05	***		-710.80	-1.63			-2401.03	-2.78	**		-704.22	-1.62	
Number of new stores within 2 miles	1495.99	0.74			1152.61	0.72			1692.70	0.84			986.88	0.64	
Days since new store opened	25.32	4.70	***		14.87	4.88	***		24.77	4.63	***		14.85	4.89	***
Initial sale year1995	-9249.03	-5.88	***		-6746.12	-5.67	***		-9371.15	-6.00	***		-6806.37	-5.73	***
Initial sale year1996	-13151.53	-5.92	***		-14133.84	-11.49	***		-13510.13	-6.10	***		-14217.19	-11.60	***
Initial sale year1997	-24350.90	-9.08	***		-17962.39	-13.84	***		-23767.92	-8.93	***		-18003.10	-13.92	***
Initial sale year1998	-27812.99	-11.01	***		-21925.49	-16.64	***		-28142.35	-11.21	***		-22017.67	-16.77	***
Initial sale year1999	-30911.01	-13.67	***		-27025.61	-20.00	***		-30669.09	-13.64	***		-27078.21	-20.10	***
Initial sale year2000	-41599.33	-18.82	***		-35643.58	-25.70	***		-41406.38	-18.91	***		-35709.15	-25.85	***
Initial sale year2001	-52257.49	-24.28	***		-50289.06	-33.95	***		-52361.23	-24.54	***		-50394.96	-34.14	***
Initial sale year2002	-59972.23	-25.64	***		-53757.22	-31.53	***		-59940.88	-25.78	***		-53842.51	-31.69	***
Initial sale year2003	-58649.69	-17.54	***		-49710.01	-24.86	***		-58498.93	-17.73	***		-49876.26	-25.00	***
Initial sale year2004	-59220.21	-13.10	***		-47877.85	-21.61	***		-59382.42	-13.30	***		-48027.12	-21.71	***
Initial sale year2005	n/a				-52011.56	-15.38	***		n/a				-52067.92	-15.41	***
Subsequent sale year1995	23475.72	1.19			4294.36	0.72			20121.61	1.03			4293.80	0.73	
Subsequent sale year1996	17160.52	0.96			6503.29	1.09			15432.29	0.87			6535.71	1.09	
Subsequent sale year1997	12772.21	0.81			5164.353	0.80			11598.29	0.74			5276.27	0.82	
Subsequent sale year1998	8221.05	0.59			2726.40	0.39			7502.95	0.54			2868.03	0.41	
Subsequent sale year1999	-1527.72	-0.13			3064.99	0.40			-2394.95	-0.20			3157.53	0.41	
Subsequent sale year2000	4797.71	0.47			6676.94	0.78			4280.27	0.42			6788.19	0.79	
Subsequent sale year2001	9839.92	1.19			14815.85	1.58			9812.72	1.19			14948.66	1.59	
Subsequent sale year2002	7752.68	1.13			14426.47	1.40			7391.95	1.09			14551.28	1.41	
Subsequent sale year2003	2236.42	0.54			11406.67	1.01			1835.45	0.44			11522.35	1.02	
Subsequent sale year2004	-1635.55	-0.67			12985.04	1.06			-1727.16	-0.71			13147.66	1.07	
Subsequent sale year2005	n/a				15395.14	1.16			n/a				15527.10	1.17	
School District 11	2929.76	0.83			176.26	0.20			2620.33	0.75			178.12	0.20	
School District 12	15525.04	1.47			27286.07	13.98	***		14657.05	1.39			27348.38	14.20	***
School District 20	6078.24	1.63			2513.11	2.02	**		6388.078	1.72	*		2568.68	2.08	**
School District 49	6505.52	1.64			2113.61	1.64			5875.177	1.51			2067.08	1.61	
New Wal-Mart 0.3<x<=0.4 miles away	-4390.79	-0.62			-2918.63	-0.26			---				---		
New Wal-Mart 0.4<x<=0.5 miles away	-1072.13	-0.24			877.51	0.13			---				---		
New Wal-Mart <=0.5 miles away	---				---				-1573.70	-0.41			10.99	0.00	

New Wal-Mart 0.5<x<=0.6 miles away	-9910.99	-2.27	**		-8456.95	-1.25		---				---		
New Wal-Mart 0.6<x<=0.7 miles away	-7538.58	-1.55			-5272.74	-0.69		---				---		
New Wal-Mart 0.7<x<=0.8 miles away	-12004.90	-3.03	***		-8810.53	-1.44		---				---		
New Wal-Mart 0.8<x<=0.9 miles away	-128.92	-0.03			3517.54	0.46		---				---		
New Wal-Mart 0.9<x<=1.0 miles away	-5048.89	-1.41			-3263.48	-0.59		---				---		
New Wal-Mart 0.5<x<=1.0 miles away	---				---			-6791.38	-2.92	***		-4683.70	-1.42	
New Wal-Mart 1.0<x<=1.1 miles away	-3164.83	-1.00			-1433.91	-0.30		---				---		
New Wal-Mart 1.1<x<=1.2 miles away	-4195.23	-1.50			-2040.60	-0.50		---				---		
New Wal-Mart 1.2<x<=1.3 miles away	-5547.28	-2.07	**		-2433.37	-0.62		---				---		
New Wal-Mart 1.3<x<=1.4 miles away	-6881.79	-2.50	**		-4559.48	-1.13		---				---		
New Wal-Mart 1.4<x<=1.5 miles away	-4828.68	-1.78			-3042.77	-0.76		---				---		
New Wal-Mart 1.0<x<=1.5 miles away	---				---			-4634.80	-2.44	**		-2644.80	-1.07	
New Wal-Mart 1.5<x<=1.6 miles away	-7664.81	-2.81	***		-4985.77	-1.26		---				---		
New Wal-Mart 1.6<x<=1.7 miles away	-3013.69	-1.13			-1026.37	-0.26		---				---		
New Wal-Mart 1.7<x<=1.8 miles away	-1323.80	-0.53			-219.86	-0.06		---				---		
New Wal-Mart 1.8<x<=1.9 miles away	-2218.81	-0.99			-3575.85	-1.06		---				---		
New Wal-Mart1.9<x<=2.0 miles away	-3708.70	-1.56			-2214.57	-0.61		---				---		
New Wal-Mart 1.5<x<=2.0 miles away	---				---			-3249.65	-1.96	*		-2363.67	-1.04	
New Best Buy 0.2<x<=0.3 miles away	-6665.32	-0.59			-5271.85	-0.29		---				---		
New Best Buy 0.3<x<=0.4 miles away	4164.75	0.82			5046.31	0.63		---				---		
New Best Buy 0.4<x<=0.5 miles away	-3039.52	-0.63			-2063.70	-0.27		---				---		
New Best Buy <=0.5 miles away	---				---			-1151.45	-0.34			441.07	0.08	
New Best Buy 0.5<x<=0.6 miles away	4050.49	0.69			2681.36	0.29		---				---		
New Best Buy 0.6<x<=0.7 miles away	3933.12	0.77			3208.46	0.40		---				---		
New Best Buy 0.7<x<=0.8 miles away	-5788.86	-0.76			-10688.79	-0.89		---				---		
New Best Buy 0.8<x<=0.9 miles away	-7787.43	-1.57			-3159.51	-1.13		---				---		
New Best Buy 0.9<x<=1.0 miles away	-4634.52	-1.37			-9148.35	-1.73		---				---		
New Best Buy 0.5<x<=1.0 miles away	---				---			-3226.28	-1.33			-3625.56	-1.57	
New Best Buy 1.0<x<=1.1 miles away	-1275.29	-0.40			1191.81	0.24		---				---		
New Best Buy 1.1<x<=1.2 miles away	-3569.98	-1.08			-7764.01	-1.51		---				---		
New Best Buy 1.2<x<=1.3 miles away	-2373.40	-0.73			-2172.60	-0.44		---				---		
New Best Buy 1.3<x<=1.4 miles away	-439.86	-0.14			-2653.75	-0.56		---				---		
New Best Buy 1.4<x<=1.5 miles away	468.71	0.14			-1141.22	-0.22		---				---		
New Best Buy 1.0<x<=1.5 miles away	---				---			-1495.22	-0.82			-2097.68	-0.81	
New Best Buy 1.5<x<=1.6 miles away	-597.83	-0.18			-3685.05	-0.73		---				---		
New Best Buy 1.6<x<=1.7 miles away	5750.15	1.56			2682.73	0.47		---				---		
New Best Buy 1.7<x<=1.8 miles away	-5963.76	-2.01	**		-7228.54	-1.58		---				---		
New Best Buy 1.8<x<=1.9 miles away	-3674.80	-1.34			-6769.46	-1.60		---				---		
New Best Buy1.9<x<=2.0 miles away	-2705.15	-1.01			-2938.84	-0.70		---				---		
New Best Buy 1.5<x<=2.0 miles away	---				---			-2689.05	-1.56			-4074.97	-1.66	
Constant	44654.39	8.04	***		23744.76	1.88	*	44816.49	8.18	***		23747.43	1.89	*
Observations		1667				12024			1667				12024	

F-statistic		31.05	***			87.85	***		51.84	***			145.6	***
Adj R^2		0.54				0.33			0.54				0.33	

Several of the results in Table 4 confirm our expectations. An increase in square footage uniformly increases the selling price of the property. In the analysis of the complete sample, older homes sell at higher prices and properties in District 12 (the preferred school district) sell at a significant premium. The number of days between the opening of the newest big-box store and the property's sales date (*dayssince*) is positively correlated with higher sales prices. We believe this captures the "news effect" of an additional big-box store. That is, property values drop when the store goes in, but over time the price recovers. This suggests that homeowners should wait to sell the property rather than fleeing the neighborhood immediately upon the opening of a new store.

In the analysis of the subset of properties, we find that the initial (at first sale) number of big-box stores within a two-mile radius of the home is negatively correlated with the sale price, while the opening of new big-box stores in the interim before the second sale does not have a statistically significant effect. Finally, while the arrival of a new Best Buy store does not impact the sales price in a meaningful way, a new Wal-Mart reduces the property's valuation. The results show that for homes located between one-half and two miles from a new Wal-Mart store, the sales price is reduced between $3,200 and $6,800 with the amount diminishing with greater distance from the store. These results hold true, but are somewhat more significant economically if not statistically, if we omit all distance measures from the analysis and simply ask whether a new retail outlet within two miles has an effect on property values.

Categorical variables for the year of initial sale and year of subsequent sale accord with intuition, but were included primarily to control for macroeconomic effects that may have otherwise compromised the model's ability to infer the importance of a location-specific event. In order to sell for an increased value, a home initially sold in 2004 faces a larger hurdle, a requisite price increase of $59382, than does a property initially sold in 1995, at $9371. On the other hand, 2001 was a good year for property values in the region (due to the technology boom) and stimulated values more than adjacent years. Witness the coefficients for the subsequent sale in 2001 at 9812 versus 2003's value at 1835.

Ultimately, does distance from the store (or even store type) matter? When considering the entire sample of homes that sold more than once over the period, there is no evidence that the proximity to

either type of big-box store is statistically significant. Even among homes which experienced a new retail arrival, at a fine level of distance aggregation, the distance gradation appears to defy meaningful interpretation. The coefficients for a majority of the distance measures are statistically insignificant and seem to rise and fall at random and by drastic amounts. This is seemingly true of the measures for both Wal-Mart and Best Buy stores, although Wal-Mart proximities appear more negative when significant. When aggregated to measures at the half-mile level, the pattern is more statistically significant (Wal-Mart has a negative effect, Best Buy has no effect) and for both types of store the effects are most negative between 0.5 and 1.0 miles, and taper off to half of their peak effect after two miles.

This result corresponds to the intuition surrounding the convenience-nuisance duality that accompanies a big-box store. Close proximity to the store ensures convenient access, but also provides for greater traffic, noise and light pollution. Greater distance from the store location diminishes the convenience aspect, while also reducing the pollution nuisance. This result presumably suggests that the least desirable combination of convenience and nuisance characterizes properties just over 0.5 miles from the store: the reduction in pollution nuisance is insufficient to make up for the loss of convenience.

To put the coefficient values in perspective, let us consider the worst-case scenario: a context of only homes who have seen a new retail store open within 2 miles, where we focus attention on a home located between 0.5 and 1.0 miles from a new Wal-Mart. That home suffers a decline in value of $6,791 (or roughly 5 percent of the average home value), a value well within the margin of error accepted by realtors when listing a home. That effect can be further ameliorated by waiting for news of the new store to abate, and within nine months all negative effects will have disappeared. Of course, all of these calculations presuppose the worst case possible, and interestingly, that worst case is not felt by the immediate neighbors of the Wal-Mart, but by those who live just over 0.5 miles from the new retailer.

Turning now to consider “days on market” (or CDOM, in the parlance of realtors), Table 5 presents results to parallel Table 4. The variable list is largely insignificant, with a few years associated with slower or faster sales but few other variables showing statistical significance. In particular, the presence of existing big-box stores, or the arrival of new stores, seems unassociated with the days that

particular property remains on the market before sale. That is true across virtually all distances, and shows no pattern linked with either proximity or store brand.

Table 5: Impact of Big-Box Store Locations on Residential Property Days on Market

	Affected Homes Subset 1/10th mile increments				Complete Sample 1/10th mile increments			Affected Homes Subset 1/2 mile increments				Complete Sample 1/2 mile increments		
variable	coefficient	t-stat			Coefficient	t-stat		Coefficient	t-stat			Coefficient	t-stat	
Initial square footage	-2.19x 10^{-3}	-0.78			-5.04 x 10^{-3}	-5.28		-2.78 x 10^{-3}	-1.01			-5.06 x 10^{-3}	-5.31	
Additional square footage	1.54 x 10^{-3}	0.15			-4.56 x 10^{-3}	-1.22		1.32 x 10^{-3}	0.13			-4.49 x 10^{-3}	-1.20	
Age of property	0.53	1.47			0.77	8.14		0.69	2.01	**		0.78	8.27	
Age of property squared	-4.21 x 10^{-3}	-1.07			-6.31 x 10^{-3}	-7.04		-6.03 x 10^{-3}	-1.58			-6.40 x 10^{-3}	-7.16	
Number of stores within 2 miles	1.85	0.58			-0.48	-0.48		1.80	0.58			-0.38	-0.39	
Number of new stores within 2 miles	7.93	1.10			3.46	0.96		6.9[8]	0.97			3.60	1.04	
Days since new store opened	3.37 x 10^{-2}	1.76			6.42 x 10^{-3}	0.94		0.03	1.77	*		6.55 x 10^{-3}	0.96	
Initial sale year1995	0.72	0.13			-5.90	-2.20		0.42	0.08			-5.89	-2.20	
Initial sale year1996	-6.20	-0.78			-3.75	-1.35		-6.61	-0.84			-3.66	-1.32	
Initial sale year1997	-9.58	-1.00			-10.45	-3.58		-9.95	-1.05			-10.34	-3.55	
Initial sale year1998	-15.77	-1.75			-17.33	-5.84		-16.03	-1.79	*		-17.23	-5.82	
Initial sale year1999	-19.98	-2.48	**		-15.67	-5.15		-20.46	-2.55	**		-15.58	-5.13	
Initial sale year2000	0.93	0.12			-4.71	-1.51		0.68	0.09			-4.59	-1.47	
Initial sale year2001	8.95	1.17			7.02	2.10		6.72	0.88			6.89	2.07	
Initial sale year2002	-6.23	-0.75			4.53	1.18		-5.88	-0.71			4.87	1.27	
Initial sale year2003	-27.37	-2.30	**		-14.16	-3.14		-30.33	-2.58	**		-14.20	-3.16	
Initial sale year2004	13.60	0.84			-0.67	-0.13		13.72	0.86			-0.32	-0.06	
Initial sale year2005	n/a				-31.69	-4.16		n/a				-31.71	-4.16	
Subsequent sale year1995	112.48	1.60			-5.44	-0.41		113.35	1.62			-5.40	-0.40	
Subsequent sale year1996	106.22	1.67	*		-4.53	-0.34		104.47	1.65	*		-4.89	-0.36	
Subsequent sale year1997	68.73	1.22			-8.57	-0.59		67.80	1.21			-8.88	-0.61	
Subsequent sale year1998	69.19	1.39			-0.98	-0.06		68.09	1.38			-1.35	-0.09	
Subsequent sale year1999	64.66	1.50			-11.90	-0.68		63.39	1.48			-12.32	-0.71	
Subsequent sale year2000	27.23	0.75			-20.89	-1.08		26.54	0.74			-21.31	-1.11	
Subsequent sale year2001	16.03	0.54			-27.20	-1.28		14.58	0.50			-27.70	-1.31	
Subsequent sale year2002	9.57	0.39			-23.19	-1.00		9.21	0.38			-23.70	-1.02	
Subsequent sale year2003	14.37	0.97			-22.65	-0.89		14.10	0.96			-23.07	-0.91	
Subsequent sale year2004	6.84	0.79			-23.73	-0.86		6.67	0.77			-24.32	-0.88	
Subsequent sale year2005	n/a				-14.08	-0.47		n/a				-14.65	-0.49	
School District 11	-5.17	-0.41			-0.32	-0.16		-4.09	-0.33			-0.40	-0.20	
School District 12	-18.26	-0.48			-2.36	-0.56		-13.08	-0.35			-2.47	-0.56	
School District 20	-10.42	-0.78			3.55	1.27		-10.43	-0.79			3.20	1.15	
School District 49	-15.26	-1.08			-2.53	-0.87		-10.64	-0.77			-1.77	-0.61	
New Wal-Mart 0.3<x<=0.4 miles away	0.18	0.01			8.47	0.33		---				---		
New Wal-Mart 0.4<x<=0.5 miles away	-10.28	-0.65			-4.43	-0.29		---				---		
New Wal-Mart <=0.5 miles away	---				---			-4.14	-0.30			2.54	0.19	

New Wal-Mart 0.5<x<=0.6 miles away	-24.20	-1.56			-17.43	-1.14		---				---		
New Wal-Mart 0.6<x<=0.7 miles away	5.63	0.32			11.75	0.69		---				---		
New Wal-Mart 0.7<x<=0.8 miles away	-5.22	-0.37			-2.13	-0.15		---				---		
New Wal-Mart 0.8<x<=0.9 miles away	16.24	0.93			13.93	0.81		---				---		
New Wal-Mart 0.9<x<=1.0 miles away	-11.77	-0.92			-7.83	-0.63		---				---		
New Wal-Mart 0.5<x<=1.0 miles away	---				---			-7.45	-0.90			-2.60	-0.35	
New Wal-Mart 1.0<x<=1.1 miles away	-19.67	-1.73	*		-17.84	-1.67	*	---				---		
New Wal-Mart 1.1<x<=1.2 miles away	11.57	1.16			12.54	1.37		---				---		
New Wal-Mart 1.2<x<=1.3 miles away	-7.10	-0.74			-5.31	-0.60		---				---		
New Wal-Mart 1.3<x<=1.4 miles away	-0.17	-0.02			0.59	0.07		---				---		
New Wal-Mart 1.4<x<=1.5 miles away	-6.55	-0.68			-4.75	-0.52		---				---		
New Wal-Mart 1.0<x<=1.5 miles away	---				---			-5.51	-0.81			-2.42	-0.43	
New Wal-Mart 1.5<x<=1.6 miles away	2.41	0.25			4.04	0.45		---				---		
New Wal-Mart 1.6<x<=1.7 miles away	-2.07	-0.22			0.26	0.03		---				---		
New Wal-Mart 1.7<x<=1.8 miles away	-4.72	-0.53			-4.98	-0.59		---				---		
New Wal-Mart 1.8<x<=1.9 miles away	-19.14	-2.40	**		-17.18	-2.26	**	---				---		
New Wal-Mart1.9<x<=2.0 miles away	-6.56	-0.77			-4.95	-0.61		---				---		
New Wal-Mart 1.5<x<=2.0 miles away	---				---			-7.88	-1.33			-5.79	-1.13	
New Best Buy 0.2<x<=0.3 miles away	51.25	1.27			46.27	1.13		---				---		
New Best Buy 0.3<x<=0.4 miles away	-7.74	-0.43			-9.27	-0.51		---				---		
New Best Buy 0.4<x<=0.5 miles away	18.94	1.11			14.36	0.84		---				---		
New Best Buy <=0.5 miles away	---				---			13.17	1.08			9.10	0.76	
New Best Buy 0.5<x<=0.6 miles away	-2.43	-0.12			-8.68	-0.42		---				---		
New Best Buy 0.6<x<=0.7 miles away	-16.68	-0.91			-25.34	-1.40		---				---		
New Best Buy 0.7<x<=0.8 miles away	1.58	0.06			-3.24	-0.12		---				---		
New Best Buy 0.8<x<=0.9 miles away	3.12	0.18			-2.74	-0.43		---				---		
New Best Buy 0.9<x<=1.0 miles away	18.17	1.51			15.52	1.30		---				---		
New Best Buy 0.5<x<=1.0 miles away	---				---			6.67	0.77			-1.32	-0.25	
New Best Buy 1.0<x<=1.1 miles away	0.99	0.09			-0.21	-0.02		---				---		
New Best Buy 1.1<x<=1.2 miles away	9.17	0.78			7.65	0.66		---				---		
New Best Buy 1.2<x<=1.3 miles away	8.07	0.70			7.84	0.70		---				---		
New Best Buy 1.3<x<=1.4 miles away	0.03	0.01			0.19	0.02		---				---		
New Best Buy 1.4<x<=1.5 miles away	5.53	0.45			2.19	0.18		---				---		
New Best Buy 1.0<x<=1.5 miles away	---				---			4.48	0.69			2.51	0.43	
New Best Buy 1.5<x<=1.6 miles away	2.60	0.22			1.39	0.12		---				---		
New Best Buy 1.6<x<=1.7 miles away	7.34	0.56			5.31	0.41		---				---		
New Best Buy 1.7<x<=1.8 miles away	-4.35	-0.41			-4.80	-0.47		---				---		
New Best Buy 1.8<x<=1.9 miles away	21.41	2.19	**		20.13	2.11	**	---				---		
New Best Buy1.9<x<=2.0 miles away	7.44	0.78			4.07	0.43		---				---		
New Best Buy 1.5<x<=2.0 miles away	---				---			8.54	1.39			6.11	1.10	
Constant	3.78	0.19			27.93	0.98		3.62	0.19			28.21	0.99	
Observations		1667				12024			1667				12024	

F-statistic		1.62	***			7.95	***		2.09	***			15.50	***
Adjusted R^2		0.02				0.04			0.02				0.04	

VI. Conclusion

Using a large dataset of repeated residential property sales, this paper evaluates the claim that the arrival by a big-box store (the most notable example being Wal-Mart) reduces adjacent home values. We control as carefully as possible for changes in the macroeconomic climate and neighborhood effects, finding virtually no evidence to support the claim of reduced property values. Indeed, the Wal-Mart effects look only slightly worse than Best Buy effects (and only if held in isolation from properties which experienced a new arrival of neither one), and even in their worst incarnation they subside within a year and no more painful than a slight measurement errors by a listing realtor when offering a home for sale. Further, there seems to be no statistical relationship between the presence of a store, the arrival of a store, or the distance from a store, and the number of days that a property remains on the market before sale.

To our knowledge, this is the first quantitative evidence of Wal-Mart's causal effects on property values. Further work could of course extend this analysis to other areas, or address level effects rather than changes (e.g. does Wal-Mart choose to enter different neighborhoods because of prevailing property values?). Meanwhile, we hope that this work puts to rest a commonly held misconception about big-box stores and their impact on home values.

References

Blamire, P. A. and M.J. Barnsley (1996) "Inferring urban land use from an analysis of the spatial and morphological characteristics of discrete scene objects." Proceedings of the 22nd Annual Conference of the Remote Sensing Society, 529–536.

Boyle, M.A. and K.A. Kiel (2001) "A Survey of House Price Hedonic Studies of the Impact of Environmental Externalities." Journal of Real Estate Literature 9(2): 117-144.

Brigham, E.F. (1965) "The Determinants of Residential Land Values." Land Economics 41(4): 325-334.

Brueckner, J.K. and P.F. Colwell (1983) "A Spatial Model of Housing Attributes: Theory and Evidence." Land Economics 59(1): 58-69.

Byrne, P.F. (2006) "Determinants of Property Value Growth for Tax Increment Financing Districts." Economic Development Quarterly 20(4): 317-329.

Case, K.E. (2000) "Real Estate and the Macroeconomy." Brookings Papers on Economic Activity 2: 119-162.

Case, K.E. and C.J. Mayer (1996) "Housing price dynamics within a metropolitan area." Regional Science and Urban Economics 26: 387-407.

Case, K.E. and R.J. Shiller (1987) "Prices of Single Family Homes Since 1970: New Indexes for Four Cities." NBER Working Paper 2393.

Case, K.E. and R.J. Shiller (1989) "The Efficiency of the Market for Single-Family Homes." American Economic Review 79(1): 125-137.

Case, K.E. and R.J. Shiller (1990) "Forecasting Prices and Excess Returns in the Housing Market." NBER Working Paper 3368.

Clapp, J.M. (2003) "A Semiparametric Method for Valuing Residential Locations: Application to Automated Valuation." Journal of Real Estate Finance & Economics 27(3): 303-320.

Clapp, J.M. and C. Giaccotto (1992) "Estimating Price Indices for Residential Property: A Comparison of Repeat Sales and Assessed Value Methods." Journal of the American Statistical Association 87(418): 300-306.

Cervero, R. and M. Duncan (2004) "Neighbourhood Composition and Residential Land Prices: Does Exclusion Raise or Lower Values?" Urban Studies 41(2): 299-315.

Cypher, M.L. and J.A. Hansz (2003) "Does assessed value influence market value judgments?" Journal of Property Research 20(4): 305-308.

Friedman, J.P. (1975) "Valuation of Encumbered Acreage." Appraisal Journal 43(3):410-420.

Fox, Ken. "Wal-mart: The High Cost of Low Price: Review" TVGuide online, 2005. Available at: http://movies.tvguide.com/wal-mart-high/review/195873

Garrod, G. and K.G. Willis (1992) “Valuing goods' characteristics: An application of the hedonic price method to environmental attributes” Journal of Environmental Management 34: 59–76.

Gayer, T. and W.K. Viscusi (2002) “Housing price responses to newspaper publicity of hazardous waste sites.” Resource and Energy Economics 24: 33-51.

Gayer, T., J.T. Hamilton and W.K. Viscusi (2002) “The Market Value of Reducing Cancer Risk: Hedonic Housing Prices with Changing Information.” Southern Economic Journal 69(2): 266-289.

Haughwout, A., J. Orr and D. Bedol (2008) “The Price of Land in the New York Metropolitan Area.” Current Issues in Economics & Finance 14(3): 2-7.

Hendon, W.S. “The Park as a Determinant of Property Values.” American Journal of Economics & Sociology 30(3): 289-300.

Hess, D.B. and T.M. Almeida (2007) “Impact of Proximity to Light Rail Rapid Transit on Station-area Property Values in Buffalo, New York.” Urban Studies 44(5/6): 1041-1068.

Jackson, T.O. (2009) “When Good Things Happen to Bad Properties.” Appraisal Journal 77(2): 112-116.

Kiel, K.A. (2006) “Environmental Contamination and House Values.” College of the Holy Cross, Department of Economics, Faculty Research Series, Working paper no. 06-01.

Kiel, K.A. and K. T. McClain (1995) “House Prices during Siting Decision Stages: The Case of an Incinerator from Rumor through Operation.” Journal of Environmental Economics and Management 28: 241-255.

Kiel, K.A. and M. Williams (2005) “The Impact of Superfund Sites on Local Property Values: Are All Sites the Same?” College of the Holy Cross, Department of Economics, Faculty Research Series, Working paper no. 05-05.

Lafferty, R.N. and H.E. Frech III (1978) “Community Environment and the Market Value of Single-Family Homes: The Effect of the Dispersion of Land Uses” Journal of Law & Economics 21(2): 381-394.

Lake, I.R., A.A. Lovett, I.J. Bateman, and I.H. Langford (1998) “Modeling environmental influences on property prices in an urban environment.” Computers, Environment and Urban Systems 22(2):121-136.

Langbein, L. and K. Spotswood-Bright (2004) “Efficiency, Accountability, and Private Government: The Impact of Residential Community Associations on Residential Property Values.” Social Science Quarterly 85(3): 640-659.

Leichenko, R.M., N.E. Coulson, and D. Listokin (2007) “Historic Preservation and Residential Property Values: An Analysis of Texas Cities.” Urban Studies 38(11): 1973-1987.

Lewis, W.C. and P.I. McNutt (1979) “The Incidence of Property Taxes on Single-Family Housing.” AREUEA Journal: Journal of the American Real Estate & Urban Economics Association 7(3): 344-361.

McMillan, M. and R. Carlson (1977) “The Effect of Property Taxes and Local Public Services Upon Residential Property Values in Small Wisconsin Cities.” American Journal of Agricultural Economics 59(1): 81-87.

Nelson, J. P. (1982) “Highway noise and property values: A survey of recent evidence.” Journal of Transport Economics and Policy 16: 117–138.

Netusil, N.R. (2005) “The Effect of Environmental Zoning and Amenities on Property Values: Portland, Oregon.” Land Economics 81(2): 227-246.

Oates, W.E. (1969) “The effects of property tax and local public spending on property values: An empirical study of tax capitalization and the Tiebout Hypothesis.” Journal of Political Economy 77: 957-71.

Pennington, G., N. Topham and R. Ward (1988) “Aircraft noise and residential property values adjacent to Manchester International Airport” Salford Papers in Economics 88–7.

L.C.L. Poon (1978) “Railway Externalities and Residential Property Prices.” Land Economics 54(2): 218-227.

Samaha, S.A. and W.A. Kamakura (2008) “Assessing the Market Value of Real Estate Property with a Geographically Weighted Stochastic Frontier Model.” Real Estate Economics 36(4): 717-751.

Sirmans, G., L. MacDonald, D. Macpherson and E. Zietz (2006) “The Value of Housing Characteristics: A Meta Analysis.” Journal of Real Estate Finance & Economics 33(3): 215-240.

Spikowski, W.M. (2006) “The Complete Guide to Zoning: How Real Estate Owners and Developers Can Create and Preserve Property Value.” Journal of the American Planning Association 72(36): 376-377.

Van Cao, T. and D.C. Cory (1982) “Mixed Land Uses, Land-Use Externalities, and Residential Property Values: A Re-evaluation.” Annals of Regional Science 16(1): 1-24.

Tu, C.C. (2005) “How Does a New Sports Stadium Affect Housing Values? The Case of FedEx Field.” Land Economics 81(3): 379-395.

Wood, S. (1976) “Combining Forecasts to Predict Property Values for Single-Family Residences.” Land Economics 52(2): 221-229.