The Effect of Development Impact Fees on Housing Values

Jennifer Evans-Cowley
City and Regional Planning
Ohio State University
Columbus, OH 43210

Larry J. Lockwood
Department of Finance and Decision Sciences
The M. J. Neeley School of Business
Texas Christian University
Fort Worth, Texas 76129

Ronald C. Rutherford
Department of Finance
University of Texas at San Antonio
San Antonio, Texas 78249-0633

Thomas M. Springer
Department of Finance
Clemson University
Clemson, SC 29634

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Please address all correspondence to:
Dr. Ron Rutherford
Department of Finance
One UTSA Circle
The University of Texas at San Antonio
San Antonio, Texas 78249-0637
Phone: (210) 458-5397
E-mail: ronald.rutherford@utsa.edu

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Abstract

We examine the effects of impact fees on housing prices of 46,420 properties in 63 Texas cities, 38 of which imposed an impact fee. We control for the self-selection of the imposition of the impact fee. Findings indicate prices for new and existing homes rise 1.44% and 6.5%, respectively. Price multipliers are 1.76 and 6.03 for new and existing homes, respectively. The imposition of impact fees are associated with an increase in property values that appears to negatively impact affordability, positively impact existing homeowners equity and increases the property taxes that cities collect.

The Effect of Development Impact Fees on Housing Values

Development fees are often argued to be a mechanism for shifting the financial burden of new infrastructure onto the new residents who have created the need for the various civic improvements. The inability to increase property taxes and the imminent high costs associated with rapid growth in residential development motivated many cities to implement development impact fees. The popularity of impact fees as a means of infrastructure financing probably stems more from pressing political and fiscal considerations than from the pure public finance motives of equity and efficiency. Singell and Lillydahl (1990) suggest that impact fees were implemented because there was no other viable source of public financing. Voters were unwilling to support bond issues and homeowners were opposed to property tax increases to provide the increased revenue for additional infrastructure and development.[1]

Once cities impose impact fees, developers and builders are faced with the choice of increasing housing prices to offset the fees, paying the fees out of pocket, paying the landowner less for the raw land, or decreasing the number of new houses built. The empirical work in this area [Lawhon, 1996; Singell and Lillydahl, 1990; Delaney and Smith, 1989a,b] suggests the most probable outcome is an increase in the price of housing. Prior literature predicts that as the cost of new housing increases relative to the price of the existing housing, the existing housing stock will likely experience an increase in demand and value due to community improvements. Such an outcome would have the effect of increasing overall housing values and lead to an increase in property tax revenues without a direct increase in the tax rate.

Dotzour (1997 a,b) studied the fiscal impact of new subdivisions on the cities of San Antonio and Tyler, Texas, and found in this case that new subdivisions more than “pay their own way”: i.e., the tax revenues generated by the new subdivisions are larger than the costs of the services required for the new subdivisions. This result calls into question the need for and justification of impact fees on new construction and suggests that impact fees aren’t always economically justified. Other work by Burchell and Listokin (1994) suggests that development may not pay its own way. Sheridan (1992) argues that impact fees decrease the development of affordable housing and that such fees are regressive in nature. His view is that impact fees decrease the affordability of housing and thus a credit should be allowed against impact fees when the development is for affordable housing.

In this paper, we examine the relationship between impact fees and the price of both new and existing housing across 63 cities in Texas during 1999. Our study makes two contributions. First, our model controls for unique characteristics of the houses and contrasting growth features across cities. Second, we include cities with and without impact fees and use econometric procedures that account for the endogeneity of the imposition of the impact fee. This allows us to control for the choice by cities to use impact fees. We make these methodological refinements to isolate the independent effects of impact fees on housing prices. Without proper controls, the effects of impact fees may be confounded by other differential characteristics within the sample. We also measure the effects of impact fees on the prices of new homes and existing homes separately. Thus, we are able to test if effects of impact fees differ between new and existing homes.

The results show that a $1000 increase in impact fees results in a 1.44% increase in the price of new homes and a 6.5% increase in the price of existing homes. Thus, the issue of affordability is confirmed. Impact fees have the effect of making housing more expensive for both new and existing homes. At the same time, impact fees spur price appreciation that increases the wealth position of existing homeowners and raises revenue for the municipality both directly, through the collection of the fee, and indirectly, through the increase in assessed values.

The rest of the paper is organized into four sections. The next section discusses the existing studies relevant to the paper. The following section discusses methodology and construction of the model. Next, the results and the implications of the results are discussed. The last section provides summarizing and concluding remarks and offers suggestions for future research.

REVIEW OF EXISTING STUDIES

THEORY

There are two primary views in the theoretical literature on the incidence of impact fees. The proponents of the older view include Atshuler and Gomez-Ibanez, 1993; Delaney and Smith, 1989a,b; Downing and McCaleb, 1987; Snyder et al., 1986, Singell and Lillydahl, 1990 and Huffman et al., 1988. The general view is that impact fees should be capitalized into land values, much like property taxes. As a consequence, undeveloped land values should decrease with higher development impact fees and higher impact fees should be associated with elevated housing prices. This view predicts that the increase in the price of new houses and the decline in the price paid by developers will both be less than the amount of the fee in the short-run. In addition, since new and existing housing are close substitutes, the increased price of new houses as a result of the impact fee will result in some individuals buying an existing home and the result will be that existing home prices will increase by a smaller amount than the price of new housing.

Huffman, et. al. (1988) is representative of the older view. Their theory for how the residential housing market should respond to development impact fees is based on supply and demand equilibrium analysis. The authors predict that landowners will not bear the full burden of the impact fee. In their model, the only way landowners would bear the full burden of the fees is if every city charged an identical fee. They argue developers will not pay impact fees in the form of lower profits, since profits in a competitive economy, are already at levels of return consistent with the opportunity cost. Thus, residents of cities that assess impact fees are expected to pay the fees in the long run. Homeowners of new and existing housing ultimately pay the fees in the form of higher housing costs or lower housing quality. They indicate that both existing property owners and the city itself stand to benefit from the use of development fees. It is argued that the owners of existing improved real estate will benefit through increased housing values due to increased demand for existing housing and improvements in community facilities. Huffman et al. (1998) further suggest several benefits to a city from using impact fees. Cities may receive financial benefits if the property tax base rises as the price of the fee is capitalized into housing prices. The city may further benefit if, as a result of the increase in the price of housing, more affluent homeowners move into the city giving rise to higher taxable sales. And, if affluent residents displace lower-income residents, community expenditures for indigent services should decrease, thus releasing additional financial resources.

Yinger (1998) provides a formal theoretical analysis of the new view. Initially, his model predicts that sales price of new housing should be unaffected by development fees. However, after considering cities using different infrastructure financing (development fees vs. special assessments vs. property taxes), his model predicts that prices of new houses will be higher in cities that finance with development fees instead of using special assessments or directly increasing property tax collections. His model also predicts that the price of undeveloped land will be lower. In general, Yinger shows that buyers of new homes will bear some of the burden of development fees, that existing homeowners will receive a gain in home equity, that owners of undeveloped land will bear some of the burden of the fees, and that "to the extent housing construction is competitive, development fees do not place any burden on developers." Yinger (1998) also concludes that 'special assessments" appear to be fairer as a financing mechanism than development fees because they ensure that the financing burden falls entirely on new residents.

EMPIRICAL EVIDENCE

Research by Altshuler and Gomez-Ibanez (1993) found that by the mid-1980s approximately 60 percent of US local governments impose impact fees. Given the wide use of impact fees, researchers have conducted empirical research on the effects of impact fees on housing prices. Existing research indicates that higher impact fees are associated with increases in both the price of housing [Ihlanfeldt and Shaughnessy, 2004; Mathur et al., 2004; Jud and Winkler, 2002; Lawhon, 1996; Singell and Lillydahl, 1990; Delaney and Smith, 1989a,b] and the price of land [Ihlanfeldt and Shaughnessy, 2004; Nelson, Lillydahl, Frank and Nicholas, 1992; Skaburskis and Qadeer, 1992]. Evans et. al. (2005) find that the price increases for developed land and remains unchanged for undeveloped land. Others have found that the impact fee may result in effects on housing construction (Burge and Ihlanfeldt, 2006; Mayer and Somerville, 2000a; McFarlane, 1997; Skidmore and Peddle, 1998).

Delaney and Smith (1989a, b) use two different samples in Florida to test whether impact fees are associated with higher prices for both new and existing homes. For new houses, their results indicate that builders were initially able to transfer the cost of impact fees to the buyers. Whereas theory suggests the imposition of fees should result in increases in new house prices across cities, their analysis shows that impact fees, over a significant period of time, resulted in increases in new house prices in only one city of four cities studied. For existing homes, Delaney and Smith (1988 b) find that prices rose in Dunedin, Florida, where impact fees were imposed, relative to a similar city, Clearwater, where no impact fees were imposed. Their results across two cities suggest that prices eventually adjust across markets and the housing price differential due to impact fees disappears.

Similar to the Dunedin study, Ihlanfeldt and Shaunessy (2004) studied the effects of development impact fees on the prices of new and existing single-family homes in Dade County, Florida between 1985 and 2000. The study included approximately 40,000 new homes and 107,000 existing homes. For both new and existing housing for each one dollar increase in impact fee the price of housing increased by $1.60.

Singell and Lillydahl (1990) evaluate the effect of impact fees by estimating a reduced form equation for 1984 housing prices in Loveland, Colorado. The statistical analysis suggests that impact fees significantly affect the price of new homes with buyers bearing the burden of the fees. A fee increase of $1,182 was found to increase the price of new housing by $3,800 (5.5 percent), while the price of existing houses increased by $7,000 (10.5 percent). Defining a price multiplier as the increase in house price per one dollar in assessed impact fee, these results suggest a price multiplier of 3.21 for new houses and 5.92 for existing houses. As Yinger (1998) suggests, when discussing this study, the result for existing houses appears large in comparison to the effect on new houses.

Lawhon (1996) reexamines the effects of development impact fees on the price of housing in the cities of Loveland and Fort Collins, Colorado, between 1983 and 1986. After controlling for population growth, the results from a hedonic price model show an insignificant coefficient for impact fees, thus no evidence of a positive price impact on either new or existing houses in Loveland, Colorado. For the same equation, the growth variable is significant at 5% with a coefficient of $2,652.61. Lawhon concludes that high growth, when associated with impact fees, tends to "exacerbate the availability of affordable housing." His results also suggest that high growth is the primary reason for the findings of Singell and Lillydahl (1992).

Mathur et al. (2004) studied single-family home sales in 38 cities in King County, Washington between 1991 and 2000. This study found that overall, for each $1 increase in impact fee resulted in a $1.66 increase in the housing sales price. The effect was found to be larger in higher-quality homes where the increase was found to be $3.58. For lower-quality homes the result was insignificant, suggesting less price elasticity at the bottom end of the housing market.

Nelson et al. (1992) studied developable land sales in Loveland, Colorado and Sarasota County, Florida to determine the effect of impact fees on land values. In Loveland, the study found that impact fees had no impact on land values. However, in Sarasota the fee was found to have a positive impact on the price of land. Sakburskis and Qadeer (1992) evaluated single-family lot sales for three suburbs of Toronto between 1977 and 1986. The results found that the impact fee increased the lot price by approximately 1.2 times the size of the impact fee, when the growth rate is zero. Skaburskis and Qadeer argue that the rise in developable land prices results in a rise in housing price as a result of the delay in construction. Evans-Cowley et al. (2005) in a study of Texas cities found that for each $1,000 increase in impact fees lot values increased by 1.3 percent, while undeveloped land values decreased by 0.042 percent. These results support the new theory.

While the above empirical studies focus on the effects of impact fees on the price of land and housing, others have argued that there is an impact on the rate of construction in communities that charge impact fees, however the empirical studies have found mixed results. Skidmore and Peddle (1998) studying DuPage County, Illinois found that cities with impact fees experienced a 25 percent reduction in building permits. This study used a fixed-effects model, examining the number of homes built in a municipality as a function of impact fees and other municipal attributes. Mayer and Somerville (2000) found that impact fees have no impact on the rate of new construction. In their study of 44 metropolitan areas between 1985 and 1996 the authors found that while metropolitan areas with more extensive regulations can have up to 45 percent fewer housing starts that impact fees specifically have no effect. The number of building permits issued was found to increase immediately before the implementation of an impact fee program (McFarlane, 1997). Burge and Ihlanfeldt (2006) in a panel study of 33 Florida metropolitan areas found that impact fees for water and sewer can result in a decrease in multifamily housing construction, while other types of impact fees result in additional construction of multifamily housing in inner suburbs. For every $1 increase in water/sewer impact fees resulted in a reduction in the square footage of multifamily housing constructed between 1,202 and 3,770 square feet depending on the location of the city. For other types of impact fees, multifamily construction increased by 2,581 square feet for each $1 increase in other types of impact fees in inner suburban communities. The authors argue that the results are due to reducing the developer's cost of obtaining project approval by helping to overcome the costs of the fees themselves in inner suburb communities.

Along similar lines as the research housing construction rates, several researchers have explored the effects of impact fees on economic development. Jeong and Feiock (2006) using a pooled time series cross-section analysis to estimate the economic effects of impact fees in 66 Florida counties between 1991 and 2001. The study found that impact fees result in job growth. Nelson and Moody (2003) in a Florida study found a positive correlation between impact fees and job growth. The study utilizes a two-year time lag to capture the effect of impact fees. The results of these studies support the argument that while impact fees increase the cost of a business to establish an operation, the fees are invested in improving infrastructure which may create a better business environment.

Overall, the existing empirical work suggests that impact fees increase the price of both existing and new housing, but that the magnitude of the price multiplier has proven unstable. Much of the instability is easily attributed to different samples and years studied. Part of the instability may be due to the limited sample of cities examined in prior studies. Also, the results of prior research suggest that, to obtain a clear understanding of the relationship between impact fees and housing, statistical procedures should account for population growth. Additionally, the effects may be the result of the intent of the local government in assessing the impact fee. For example, one study found that the amount charged for impact fees went up if a local government believed that the impact fees were effective in acting in an exclusionary way (Gyourko, 1991), which in turn could result in a varying impact on housing prices.

In this paper, we obtain a sample from 63 cities, 38 of which have impact fees. Our model controls for the unique features of the homes as well as for the population growth characteristics of the 63 cities included in the sample. Moreover, our model accounts for the endogeneity of the decision of the city to impose an impact fee. We present the relationship as a treatment effects model, and employ both the Heckman's (1979) two-step method and maximum likelihood estimation procedures to estimate the parameters. We perform separate tests for new and existing homes to identify differences in the effects of impact fees between these two groups. We also examine the short-run and long-run effects of the impact fee by including a "years since fee" in the tests.

DATA AND SUMMARY STATISTICS

We obtained data for 46,420 houses in 63 cities in the Dallas-Fort Worth metroplex. Evans (2000) collected impact fee charges for cities in Texas during 1999. She found that the Dallas/Fort Worth area had 67 percent of all impact fee cities in Texas. We use her impact fee data and find a match of 38 cities with impact fees and 25 cities in our data without impact fees. The sale price data and property characteristics are from the multiple listing service in the Dallas-Fort Worth area.

------ *Please place Table 1 here* -------

Table 1 lists and defines the data used in our model. Table 2 provides summary statistics comparing the "no-fee" and "fee" samples. As shown in Table 2, the average selling price is $148,747 across the entire sample of 46,420 houses. Some differences are notable. For instance, comparing sampled cities with impact fees versus cities without impact fees, we find that houses in cities with impact fees sell at lower mean prices ($144,033 versus $159,789) and homes are newer (mean age = 15.39 years versus 29.27 years). Job growth rate is higher (3.92% versus 2.19%), population growth rate is higher (5.71% versus 1.51%), total population is less (165,400 versus 565,300), the labor force is smaller (93,800 versus 347,900), and the city property tax revenue per person is less ($268.39 versus $307.10). Summarizing, homes in sampled cities with impact fees are newer, less expensive, with more square footage with smaller lots, and are located in cities with higher tax rates but with lower property tax revenue per person, smaller labor force but with higher job growth rates, and smaller population but with higher population growth rates. The average impact fee for sampled homes across all 38 impact fee cities is $1,468, with a standard deviation of $805. The mean number of years since the impact fee was levied is 7.62.

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Table 3 presents summary statistics for *new* and *existing* homes. Generally speaking, newer homes are larger (2,634 square feet versus 2,025 square feet), more expensive ($207,146 versus $140,781), and are located in cities with lower tax rate (5.5% versus 5.94%) and lower property tax revenue per person ($274.79 versus $280.68). Although not included in the Table, all the differences between the new and existing full samples are statistically significant at the 0.05 level with the lone exception of the Summer 1999 variable. These findings emphasize the importance of controlling for the age of the home in subsequent tests of the effect of the impact fee on the sales price of the home.

------- Please place Table 3 here -------

The Table also provides statistics comparing the no-fee and fee samples for new homes. The analysis is repeated for existing homes in the last three columns. Some interesting results emerge. For instance, sales prices are higher for new homes in cities with impact fees versus those without impact fees ($210,054 versus $190,967). This finding contrasts with the full sample result in Table 2. Summarizing across all the statistics in the Table, new homes in sampled cities with impact fees are more expensive, with more square footage with smaller lots, and are located in cities with higher tax rates, higher property tax revenue per person, smaller labor force but with higher job growth rates, and smaller population but with higher population growth rates. The average impact fee for sampled new homes across all 38 impact fee cities is $1,720. The mean number of years since the impact fee was levied in the city is 7.33. Summary statements for the existing home sample are nearly identical to those already discussed for the full sample because the existing sample comprises a large percentage of the full sample (27,808 of the 40,848 homes).

THE MODEL AND METHODOLOGY

We propose the following model:

$$ln(sp_i) = X_i^{/}\beta + \delta D_i + \varepsilon_i \tag{1}$$

where, for home *i*, $ln(sp_i)$ is the natural log of the sales price, X_i is a vector of attributes describing the home, β is a vector of sensitivities of $ln(sp_i)$ to changes in the *x* variables.[2] The magnitude of the impact fee is one of the *x* variables. The beta coefficient on the impact fee variable measures the effect of the impact fee on $ln(sp_i)$ after controlling for the distinguishing characteristics of the home. To avoid sample selection bias, we include homes from cities with no impact fee.[3] The model is a treatment-effects model that takes into consideration the effect of D (endogenous binary choice variable) on the sales price. D, in the treatment model, is a dummy variable equal to one for a home in a city that imposes an impact fee and equal to zero otherwise. We include the dummy variable to control for systematic sales price differences between homes located in cities with and without impact fees that are not captured by the *x* variables. If we did not include the dummy variable, the effect of the amount of the impact fee (which is one of the *x* variables) may be estimated incorrectly. For example, without the dummy variable, the estimate of the impact fee coefficient might be negative if sales prices in no-impact fee cities are generally higher than sales prices in impact fee cities, and if the *x* variables do not completely capture all the distinguishing characteristics of homes in the two city categories. In fact, we find that the average home price is much higher in cities with no impact fee, so our concern is justified. Cities with higher housing prices may be less likely to impose an impact fee because their tax base is sufficiently high.

The decision of a city to impose an impact fee is a choice variable, dependent on various endogenous factors. For instance, a larger population may make it more likely for a city to use impact fees if population influences marginal infrastructure costs. A large growing population makes it more costly to provide additional services and instead of increasing the per-capita tax burden, cities may elect to impose an impact fee to place the costs onto new residents. If not addressed in the econometric model, the self-selection problem can lead to biased parameter estimates. In other words, the inclusion of the dummy variable, *D*, may not properly control for the decision of a city to impose an impact fee if the homes in the city would have had a higher price regardless of imposition of the impact fee. If homes in cities with impact fees would have had higher (lower) sales prices regardless of imposition of an impact fee, then the estimate of δ would overestimate (underestimate) the true effect of the impact fee. We endogenize the decision variable as a function of several observable characteristics of the city in which the home is located along with the *x-variables***.** To control for the endogeneity of the decision variable, we model the self selection decision of a city to impose an impact fee as follows:[4]

$$D_i^* = T_i^{/} \gamma + u_i , \tag{2}$$

where D_i in Equation *(1)* will equal 1 if the latent variable D_i^* from Equation *(2)* is positive; otherwise D_i equals zero. T is a vector of treatment effect variables presumed to affect the decision of a city to impose an impact fee. In our model, the T-vector includes all the x variables from Equation *(1)* with the addition of the following variables: city population growth rate, city labor force, city property tax revenue per person, city debt per person, and total city population. While the coefficient on the impact fee magnitude in Equation (1) is our main focus, Equation (2) corrects for any self selection bias and endogeneity of the decision to impose an impact fee.

To identify the effects of the selectivity problem, first note that the conditional expectation for ln(sp) is:[5]

$$E[ln(sp_i) \mid D_i=1; X_i, T_i] = X_i^{/} \beta + \delta + E[\varepsilon_i \mid D_i =1, X_{i,} T_i] \tag{3}$$

$$E[ln(sp_i) \mid D_i=0; X_i, T_i] = X_i^{/} \beta + E[\varepsilon_i \mid D_i = 0, X_{i,} T_i]. \tag{4}$$

From Equation *(2),* we know $D_i = 1$ when $D_i^* = T_i^{/} \gamma + u_i > 0$, or $u_i > - T_i^{/} \gamma$, so that Equations (3) and (4) can be written alternatively as:

$$E[ln(sp_i) \mid D_i=1; X_i, T_i] = X_i^{/} \beta + \delta + E[\varepsilon_i \mid u_i > - T_i^{/} \gamma] \tag{5}$$

$$E[ln(sp_i) \mid D_i=0; X_i, T_i] = X_i^{/} \beta + E[\varepsilon_i \mid u_i \leq - T_i^{/} \gamma]. \tag{6}$$

As shown by Heckman (1979):

$$E[\varepsilon_i \mid u_i > -T_i' \gamma] = \rho\sigma_\varepsilon \left[\frac{\phi(-T_i'\gamma)}{1-\Phi(-T_i'\gamma)} \right] \tag{7}$$

$$E[\varepsilon_i \mid u_i \le -T_i' \gamma] = \rho\sigma_\varepsilon \left[\frac{-\phi(T_i'\gamma)}{1-\Phi(T_i'\gamma)} \right], \tag{8}$$

where ρ is the correlation between ε_i and u_i, and ϕ and Φ are the normal probability density function and cumulative distribution function for the standardized u_i. By symmetry, the final term $\left[\frac{\phi(-T_i'\gamma)}{1-\Phi(-T_i'\gamma)} \right]$ equals $\left[\frac{\phi(T_i'\gamma)}{\Phi(T_i'\gamma)} \right]$ and is called the failure rate, hazard function, or inverse Mills' ratio. The difference in conditional means in Equations *(3)* and *(4)* equals:

$$E[\ln(sp_i) \mid D_i=1, X_i] - E[\ln(sp_i) \mid D_i=0, X_i] = \delta + \rho\sigma_\varepsilon \left[\frac{\phi(T_i'\gamma)}{\Phi(T_i'\gamma)[1-\Phi(T_i'\gamma)]} \right].^{6} \tag{9}$$

Therefore, when estimating the differences in conditional means for *ln(sp)*, ordinary least squares performed on Equation *(1)* omits the second term in Equation *(9)*, ignoring the selectivity correction.

We obtain parameter estimates using Heckman's (1979) 2-step approach. In the first step, a probit model for D is used to estimate γ in Equation *(2)*, and the inverse Mills ratio [ϕ/Φ for D = 1 and $-\phi/(1-\Phi)$ for D = 0] is estimated for each observation using the γ estimate. In the second step, generalized least squares estimates (to correct for heteroskedasticity) are obtained for the parameters in Equation *(1)* by regressing ln(sp) on X, D, and the estimated inverse Mills ratio (*IMR*).[7] The final model becomes:

$$\ln(sp_i) = X_i'\beta + \delta D_i + \beta_\lambda IMR_i + v_i. \tag{10}$$

For comparison, we also obtain maximum likelihood estimates for the parameters of our model (Equations 1 and 2). The results are similar using two-step or maximum likelihood procedures.

RESULTS

Table 4 presents the regression results. Most of the t-statistics are statistically significant even after accounting for the large size of the sample using Bayesian statistics. For example, as the sample size grows large, the standard errors fall, and the t-statistics rise to extreme values. The lower standard errors lead to greater statistical power (rejecting a false null hypothesis), but leaves the size of the test (probability of rejecting a true null hypothesis) unchanged. Instead, Bayesian statistics can be used to calculate the posterior odds of the null hypothesis, thus adjusting the size of the test for the large sample size. For example, with a sample size of 40,000, Bayesian posterior odds will favor rejection of the null hypothesis when the t-statistic exceeds 3.26 in absolute value, which nearly all of our test statistics exceed. Please see appendix for derivation of the appropriate critical value.

------ Please place Table 4 here ------

For all (new and existing) houses, the results show that the $1000 impact fee causes home prices to increase by $e^{0.0267} - 1$, or 2.706 percent. This translates to an increase of $5722 for a home with a sales price of $144,033 and impact fee of $1468, which are the averages for cities with impact fees in our sample reported in Table 2. This would translate to a price multiplier for the full sample of 3.90, but note that we also included a *Years Since Fee* variable in the model. Therefore, this initial interpretation holds for homes in cities that initiated the impact fee in the year of the sale of the home. The slope on the *Years Since Fee* variable equals 0.0013 and the average *Years Since Fee* for all homes in fee cities equals 7.62 (reported in Table 2). Therefore, for the average home in fee cities, the effect of a $1000 impact fee equals $exp(0.0267 + 7.62 \text{ x } 0.0013) - 1 = e^{0.03661} - 1$, or 3.728 percent per $1000, which translates to an impact fee of 0.0372 x $144,033 x 1.47 = $7893, for a percent change of 5.48 percent and a price multiplier of $7893/$1470 = 5.37.

The effects of impact fees are different for new versus existing homes. The impact fee slope equals 0.0311 for new homes versus 0.0268 for existing homes, but the sign on the *Years Since Fee* variable is negative for new homes (-0.0031) and positive (0.0023) for existing homes. Therefore, the results indicate there are differences between short-run and long-run effects of impact fees. Consider the average new home selling for $210,054 in a Fee city 7.33 years after the fee is imposed in the city (i.e., the averages reported in Table 3). For the average new home, a $1000 impact fee causes sales prices to increase by $exp(0.0311 - 7.33 \times 0.0031) - 1 = e^{0.0084} - 1$, or 0.84 percent. This translates to an increase of $3035 for a home with a sales price of $210,054 and impact fee of $1720, which are the averages for cities with impact fees in our new home sample reported in Table 3. Thus, for new homes, the average percent change and price multipliers are 1.44 percent and 1.76, respectively.

For existing homes, the average *Years Since Fee* equals 7.67, as reported in Table 3. Thus, a $1000 impact fee causes the average existing home price to increase by $exp(0.0268 + 7.67 \times 0.0023) - 1 = e^{0.0444} - 1$, or 4.54 percent. This translates to an increase of $8623 for a home with the sales price of $132,819 and impact fee of $1430, which are the averages for cities with impact fees in our existing home sample reported in Table 3. Thus, for existing homes, the average percent change and price multiplier are 6.5 percent and 6.03, respectively.

If we did not control for time since imposition, the price multiplier would be approximately 2.50 for existing homes ($e^{0.0268} - 1$, or 2.71 percent, for an increase of $3,607, then divide by $1,430). These results for the new and existing home subsets can be compared to those of Singell and Lillydahl (1990) who also use subsets, but have a much smaller data set and do not control for differences between cities. Singell and Lillydahl found a lower price multiplier for new homes (3.21) versus existing homes (5.92). Similarly, we also find a lower price multiplier for new homes (1.76) versus existing homes (6.03). While the existing home price multipliers for the two studies are very similar, our new home price multiplier is lower. As we note, however, the prices of newer homes in our sample are much higher than those of existing homes and may be the result of population and job growth and other differentiating characteristics between new and existing homes for which we control in our study.

Our results for new homes are consistent with the results found in more recent studies such as Ihlandfeldt and Shaunessy (2004) for new homes (1.68 multiplier) and Mathur et al. (2004) across new and existing housing (1.66 multiplier). By controlling for factors that may also drive up new home prices, our model provides a more robust test of the marginal effects of the impact fee. In this manner, our study demonstrates the importance of controlling for tax rate and population and job growth differentials between cities as suggested by Lawhon (1996).

The results for the other coefficients are fairly typical for this type of model. Notably, higher property tax rates are associated with lower housing prices and higher population growth is associated with higher housing prices.

CONCLUSIONS AND IMPLICATIONS

This paper provides an empirical analysis of the effect of impact fees on the price of 46,420 new and existing homes across 63 cities in Texas during 1999. We develop and test a housing price model that controls both for the unique characteristics of the homes and for the contrasting growth features of the cities used in the study. We examine new and existing homes separately. We also used econometric procedures to control for the self selection of the imposition of the impact fee by the cities.

The results show that a $1000 increase in impact fees results in a 1.44% increase in new homes and a 6.5% increase in the price of existing homes after controlling for number of years since the fee was implemented. This percentage increase results in a multiplier of 1.76 for new homes and 6.03 for average existing homes. These results suggest that impact fees increase not only new housing values, but also existing housing values. The increase for existing houses may be a result of the improvements in public facilities or simply a capitalization of the impact fee due to increased demand for existing houses. The increase in value for new and existing housing indicates that housing is less affordable in the presence of impact fees. In addition, current homeowners receive an increase in home equity due to increased property values.

In Texas, appraisal assessments are required to reflect market value. Although existing home owners experience price appreciation associated with the use of impact fees, they would need to sell the home to obtain the benefits of the capital gain. However, existing home owners likely experience an increase in property taxes because of the increased valuation. Thus, the increase in property values associated with impact fees suggests that cities receive increased property tax revenue without directly increasing the property tax millage rate. Cities experiencing fiscal pressures and taxpayer resistance may find impact fees an attractive way to generate revenue (Singell and Lillydahl, 1992).[8]

The move to impact fees, away from traditional property tax increases and bond financing of new infrastructure, coincides with voter resistance to increased property taxes and bond financing. Although impact fees cannot be used in the general budget, tax revenues as a result of increases in property value can. It is not clear that cities intended to increase the tax burden of property owners, but the results of this analysis suggest that in addition to revenue generated from the impact fee to offset cost of new development, cities may be obtaining windfall property taxes on existing homes, based on the increased values associated with the use of impact fees.

Yinger (1998) offers an alternative explanation that the increase in prices for new houses reflects the infrastructure benefits associated with the impact fees. The price of existing housing increases, not because of increased demand for older houses, but due to lower property tax rates than would have been possible without the impact fees. Existing housing prices experience price appreciation based on the capitalized benefits associated with the relatively lower property tax rates. Even if this view is taken, existing homeowners may have lower property tax rates, but end up paying more in property taxes as a result of increases in value associated with the impact fee. The city can impose impact fees without voter approval and by using impact fees are in effect increasing city property tax revenues without direct voter input.

Generalizing our results across our entire sample of impact fee cities (aggregating new and existing homes) with the average house price of $144,033, the average impact fee of $1470 and the estimated price multiplier of 5.37, we can estimate that $11,370 ($144,033 * 0.0147 * 5.37) of the average house value in the sample is a result of the imposition of the impact fee. Thus, for the average city in the sample, the property tax revenue gained from imposing an average impact fee on the average house in the sample is $67.31 (an average tax rate of 0.00592 * $11,370). For the cities in Tarrant County, Texas, in 1999 this would amount to approximately $33.66 million (500,000 houses times $67.31), which is not an insignificant amount. It is no small wonder that city administrators and politicians often favor impact fees.

Our findings confirm and extend the results of past studies and show that impact fees, while providing an alternative funding source for municipal improvements, also result in increased property values. The net effects of these higher property values are less affordable housing, increased capital gains to existing homeowners and increased property valuations for tax purposes.

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Appendix[9]
Bayesian Posterior Odds

As the sample size increases, the standard error likely falls. This is especially relevant if the sample size is very large as they are in our tests (over 40,000 observations). Consequently, the test statistics (e.g., estimated t-statistics) are likely to be large. So, the probability of rejecting a false null hypothesis (statistical power) increases as the sample size increases, but the probability of rejecting a true null hypothesis (the significance level or size of the test) remains unchanged. Mann (1994) suggests the use of posterior odds to adjust the size of the test for large samples.

Define $P(H_0|\hat{\gamma})$ as the probability that the null hypothesis is true, given the vector of parameter estimates (i.e., the coefficient estimates in our model) and $P(H_1|\hat{\gamma})$ as the probability that the alternative hypothesis is true, given the vector of parameter estimates. And, define $P(\hat{\gamma}|H_0)$ as the probability of deriving the estimated values in $\hat{\gamma}$, conditional on the null hypothesis being true and $P(\hat{\gamma} \mid H_1)$ as the probability of deriving the estimated values in $\hat{\gamma}$, conditional on the null hypothesis being false. According to Bayes' rule, the posterior odds ratio equals the product of the prior odds ratio and the Bayes factor (the ratio of the posterior probabilities):

$$\text{Posterior Odds} = \frac{\mathrm{P}(\mathrm{H}_0 \mid \hat{\gamma})}{\mathrm{P}(\mathrm{H}_1 \mid \hat{\gamma})} = \frac{P(H_0)}{P(H_1)} \cdot \frac{\mathrm{P}(\hat{\gamma} \mid \mathrm{H}_0)}{\mathrm{P}(\hat{\gamma} \mid \mathrm{H}_1)} \tag{A.1}$$

The Bayesian decision rule is to choose H_0 if the posterior odds exceeds one (e.g., that $P(H_0|\hat{\gamma}) > P(H_1|\hat{\gamma})$) As explained by Mann (1994), Jeffreys (1947) argues for the use of Cauchy priors and shows for equal prior odds for large samples that the posterior odds ratio is:

$$\text{Posterior odds} = \exp[\frac{1}{2}\ln(n) - \frac{1}{2}t^2] \tag{A.2}$$

where t is the test statistic for testing the null hypothesis. In our case, the null hypothesis is that the parameter equals zero. The test statistic is the t-statistic. For a posterior odds equal to one and n=40000, t equals 3.256:

$$1.0 = \exp[\frac{1}{2}\ln(40000) - \frac{1}{2}t^2]$$

$$\ln(1) = \frac{1}{2}\ln(40000) - \frac{1}{2}t^2$$

$$t = [\ln(40000) - 2\ln(1)]^{0.5}$$

$$t = [10.6 - 2(0)]^{0.5} = 3.256$$

Therefore, to reject the null hypothesis with a sample size of 40000, the estimated t-statistic must exceed 3.256 in absolute value.

Table 1
Variable Legend

Variable:	Definition:
Sales price	Sales price of the house,
Dom	Days on the market,
Square Feet	Number of square feet divided by 100,
Bedrooms	Number of bedrooms,
Bathrooms	Number of bathrooms,
Fireplace	Number of fireplaces,
Garage	One if the house has a garage, 0 otherwise,
Pool	One if the property has a pool, 0 otherwise,
Vacant	One if the house is vacant, 0 otherwise,
Tenant	One if the house is tenant occupied, 0 otherwise,
Lgt1hacre	One if land is greater than ½ acre, 0 otherwise,
County 1	One if located in Collin county, 0 otherwise,
County 2	One if located in Dallas county, 0 otherwise,
County 3	One if located in Denton county, 0 otherwise,
County 4	One if located in Tarrant county, 0 otherwise,
County 5	One if located in Johnson county, 0 otherwise,
County 6	One if located in Rockwall county, 0 otherwise,
County 7	One if located in Ellis county, 0 otherwise,
County 8	One if located in Grayson county, 0 otherwise,
County 9	One if located in Hood county, 0 otherwise,
County 10	One if located in Parker county, 0 otherwise,
Winter 1999	One if the house was sold during the 1st quarter of 1999, 0 otherwise, this is the holdout
Spring 1999	One if the house was sold during the 2nd quarter of 1999, 0 otherwise,
Summer 1999	One if the house was sold during the 3rd quarter of 1999, 0 otherwise,
Fall 1999	One if the house was sold during the 4th quarter of 1999, 0 otherwise,
City tax rate	City tax rate per $1,000 of assessed value, (http://www.window.state.tx.us/taxinfo/proptax/proptax.html),
Job growth rate	Average annual labor force growth rate over the last five years times 100,
Years since fee	Number of years since imposition of the impact fee,
Impact fee	Impact fee in thousands of dollars for a typical lot in the city where the house is located,
Fee in city	1 if house is located in city with impact fee, 0 otherwise,
Age	Age in years (used only in the new house model with age equal to 0, 1, 2 in that sample),
Age dummies$_n$	Set of dummy variables; one for each set of homes in 3-year categories (a total of 26 dummy variables, not reported in the means or the models, but used in estimation of the models, 0-2 years of age is the holdout dummy in the full sample and the sample with existing homes),
Population	City population July 1999 divided by 10,000 from the Texas State Data Center at Texas A&M University.
Population growth rate	Average annual population growth rate over the last five years times 100,
Labor force	City labor force 1999 divided by 10,000,
Property tax rev per person	(Total city tax revenue divided by total population), all data from the Texas Municipal League 1999 report, (http://www.tml.org/),
Debt per person	(Total debt divided by total population), all data from the Texas Municipal League 1999 report. (http://www.tml.org/)

Table 2
Summary Statistics for Full Sample and No-Fee Versus Fee Sample

This table reports means and standard deviations for the sample of all homes (Full Sample). Means are then reported for the sample of homes in cities with no impact fee (No-Fee Sample) and for the sample of homes in cities with impact fees (Fee Sample). The last column provides the *t*-statistic for the difference in means between the No-Fee sample and the Fee sample.

Variable:	Full Sample Mean	Full Sample Stdev.	No-Fee Sample Mean	Fee Sample Mean	Diff. No-Fee versus Fee T-statistic
Sales price	$148,747	$92,961.	$159,789	$144,033	-16.77
Dom	51.29	56.27	53.36	50.41	-5.18
Square Feet	20.98	7.74	20.21	21.21	9.90
Bedrooms	3.37	0.65	3.24	3.42	29.67
Bathrooms	2.31	0.70	2.25	2.34	13.32
Fireplace	0.95	0.50	0.88	0.97	17.48
Garage	1.72	0.82	1.51	1.80	35.76
Pool	0.16	0.37	0.16	0.16	0.85
Vacant	0.24	0.43	0.25	0.24	-3.47
Tenant	0.04	0.19	0.05	0.03	-5.98
Lgt1hacre	0.14	0.35	0.20	0.12	-23.14
County 1	0.17	0.37	0.08	0.21	34.98
County 2	0.36	0.48	0.72	0.21	-120.00
County 3	0.11	0.32	0.01	0.16	45.96
County 4	0.29	0.46	0.05	0.40	81.95
County 5	0.01	0.11	0.02	0.01	-9.83
County 6	0.01	0.10	0.00	0.02	14.86
County 7	0.01	0.10	0.04	0.00	-34.54
County 8	0.01	0.10	0.04	0.00	-34.21
County 9	0.01	0.10	0.03	0.00	-33.61
County 10	0.01	0.09	0.02	0.00	-22.30
Winter 1999	0.21	0.41	0.22	0.21	-2.15
Spring 1999	0.29	0.45	0.30	0.29	-1.45
Summer 1999	0.28	0.45	0.27	0.28	2.10
Fall 1999	0.22	0.42	0.22	0.23	1.44
City tax rate	5.89	1.38	5.80	5.92	8.47
Job growth rate	3.40	2.42	2.19	3.92	74.49
Years since fee	5.34	4.14	0.00	7.62	336.59
Impact fee	1.03	0.95	0.00	1.47	214.93
Fee in city	0.70	0.46	0.00	1.00	---
Age	19.54	16.58	29.27	15.39	-89.45
Population	28.51	35.78	56.53	16.54	-130.00
Population growth	4.46	5.66	1.51	5.71	77.98
Labor force	16.98	21.97	34.79	9.38	-130.00
Property tax revenue per person	279.97	73.17	307.10	268.39	-53.80
Debt per person	1,275.49	703.04	1,656.48	1,112.83	-81.58
Observations	46,420		13,889	32,531	

Table 3

Summary Statistics for New Homes versus Existing Homes

The table provides the means for new home sales and existing home sales broken down into an impact fee subsample and a no impact fee subsample. The t-statistic is for the difference between the means of the two samples (mean nofee minus mean fee).

Variable:	New homes Sample **Mean**	New homes Nofee Sample **Mean**	New homes Fee Sample **Mean**	New homes Diff. nofee versus fee **T-statistic**	Existing Sample **Mean**	Existing Nofee Sample **Mean**	Existing Fee Sample **Mean**	Existing Diff. nofee versus fee **T-statistic**
Sales price	207,146.00	190,967.00	210,054.00	-4.90	140,781.00	157,759.40	132,819.30	26.85
Dom	78.78	85.35	77.60	2.83	47.54	51.28	45.79	9.88
Square Feet	26.34	23.19	26.91	-12.19	20.25	20.26	20.24	0.16
Bedrooms	3.79	3.50	3.84	-14.67	3.31	3.22	3.36	-21.12
Bathrooms	2.71	2.54	2.75	-7.26	2.26	2.23	2.27	-6.29
Fireplace	1.04	0.93	1.06	-9.72	0.93	0.88	0.96	-14.00
Garage	2.01	1.81	2.05	-8.03	1.68	1.49	1.76	-31.81
Pool	0.05	0.05	0.06	-0.83	0.18	0.17	0.18	-3.53
Vacant	0.56	0.56	0.56	0.07	0.20	0.23	0.19	11.61
Tenant	0.01	0.01	0.01	0.39	0.04	0.05	0.04	4.30
Lgt1hacre	0.16	0.29	0.14	10.40	0.14	0.19	0.11	21.94
County 1	0.29	0.19	0.31	-7.02	0.16	0.07	0.19	-32.35
County 2	0.13	0.28	0.10	14.34	0.39	0.75	0.22	116.44
County 3	0.17	0.02	0.19	-12.25	0.11	0.01	0.15	-43.59
County 4	0.31	0.03	0.36	-19.87	0.29	0.04	0.41	-80.07
County 5	0.02	0.09	0.01	16.28	0.01	0.02	0.01	5.41
County 6	0.03	0.00	0.03	-5.04	0.01	0.00	0.01	-13.30
County 7	0.02	0.15	0.00	29.35	0.01	0.03	0.00	28.11
County 8	0.01	0.04	0.00	14.25	0.01	0.03	0.00	31.49
County 9	0.02	0.11	0.00	24.39	0.01	0.03	0.00	28.54
County 10	0.01	0.08	0.00	18.92	0.01	0.02	0.00	17.97
Winter 1999	0.19	0.21	0.18	1.95	0.21	0.22	0.21	1.19
Spring 1999	0.25	0.24	0.25	-0.60	0.30	0.30	0.30	0.73
Summer 1999	0.27	0.26	0.27	-0.31	0.28	0.27	0.28	-2.27
Fall 1999	0.30	0.29	0.30	-0.81	0.21	0.22	0.21	0.48
City tax rate	5.50	5.29	5.54	-4.80	5.94	5.84	5.99	-10.36
Job growth rate	4.51	3.03	4.78	-17.93	3.25	2.14	3.77	-69.62
Years since fee	6.21	0.00	7.33	-79.15	5.22	0.00	7.67	-328.89
Impact fee	1.46	0.00	1.72	-56.61	0.97	0.00	1.43	-208.05
Fee in city	0.85	0.00	1.00	---	0.68	0.00	1.00	---
Age	0.76	0.69	0.77	-2.73	22.10	31.13	17.87	84.36
Population	13.46	20.92	12.12	11.95	30.56	58.85	17.29	124.47
Population growth rate	7.96	2.79	8.89	-22.50	3.98	1.43	5.19	-72.80
Labor force	7.55	12.80	6.60	14.06	18.27	36.22	9.86	130.22
Property tax revenue per person	274.79	262.58	276.99	-5.89	280.68	309.99	266.93	56.90
Debt per person	1,175.61	1,611.00	1,097.34	20.72	1,289.12	1,659.44	1,115.56	78.08
Number of observations:	**5,572**	**849**	**4,723**		**40,848**	**13,040**	**27,808**	

Table 4
Regression Results

This table reports the results of a treatment effects model used to control for the choice to use an impact fee in a city. Statistically significant estimates using the Large Sample Bayesian Posterior Odds t-statistic are denoted with an asterisk.

Variable names:	Regression results for all houses	Regression results for new houses	Regression results for existing houses
Constant	11.058	11.0678	10.9762
	(956.43)*	(464.45)*	(886.80)*
Square feet	0.0431	0.0432	0.0432
	(144.19)*	(71.44)*	(130.96)*
Residual from Logdom model	-0.0133	0.0052	-0.0164
	(-14.45)*	(2.98)	(-16.07)*
Bedrooms	-0.0539	-0.0554	-0.0554
	(-22.63)*	(-11.44)*	(-21.25)*
Bathrooms	0.0697	0.0372	0.0781
	(24.16)*	(6.74)*	(24.48)*
Fireplace	0.1074	0.1236	0.1020
	(39.66)*	(18.185)*	(35.13)*
Garage	0.0488	0.0332	0.0515
	(31.66)*	(9.74)*	(30.80)*
Pool	0.0832	0.0658	0.0810
	(26.61)*	(6.43)*	(24.52)*
Vacant	-0.0766	0.0023	-0.0944
	(-29.39)*	(0.42)	(-32.23)*
Tenant	-0.0944	-0.0565	-0.0972
	(-15.21)*	(-1.80)	(-17.00)*
Lgt1hacre	0.0361	0.0338	0.0355
	(10.84)*	(4.74)*	(9.79)*
County 1	-0.0094	-0.0611	0.0121
	(-1.18)	(-3.66)*	(1.38)
County 2	0.0458	0.0364	0.0533
	(12.77)*	(4.07)*	(13.89)*
County 3	0.0551	-0.0067	0.0721
	(10.48)*	(-0.59)	(12.56)*
County 5	-0.1440	-0.1906	-0.1226
	(-13.39)*	(-9.77)*	(-10.05)*
County 6	0.0062	-0.0394	0.0163
	(0.60)	(-2.41)	(1.33)
County 7	-0.2249	-0.1262	-0.2204
	(-19.26)*	(-6.57)*	(-16.31)*
County 8	-0.2508	-0.2374	-0.2554
	(-24.97)*	(-8.19)*	(-23.65)*
County 9	0.0984	-0.1154	0.1313
	(7.86)*	(-5.07)*	(9.19)*
County 10	-0.2167	-0.1668	-0.2068
	(-16.30)*	(-6.78)*	(-13.80)*
Spring 1999	0.0132	-0.0011	0.0127
	(4.27)*	(-0.16)	(3.82)*
Summer 1999	0.0210	0.0015	0.0219
	(6.67)*	(0.21)	(6.46)*
Fall 1999	0.0295	0.0217	0.0283
	(8.94)*	(3.06)	(7.88)*
Age (ages 0,1,2, used only for new houses)		-0.0068	
		(-1.99)	
City tax rate	-0.0196	-0.0135	-0.0224
	(-19.06)*	(-6.00)*	(-20.05)*
Job growth rate	0.0154	0.0156	0.0131
	(11.90)*	(5.97)*	(9.07)*
Years since fee	0.0013	-0.0031	0.0023
	(2.71)	(-3.04)	(4.14)*
Impact fee	0.0267	0.0311	0.0268
	(12.94)*	(8.36)*	(11.33)*
Fee in city	-0.289	-0.1928	-0.2860
	(-43.90)*	(-12.10)*	(-38.88)*
Inverse mills ratio	0.136	0.074	0.131
	(37.80)*	(8.64)*	(33.77)*
Number of houses	46,420.00	5,572.00	40,848.00
Wald chi-square	213,116.70	36,530.15	170,225.88

Endnotes

[1]In Texas, the 1987 Legislature adopted legislation (Senate Bill 336) to provide the basis for comprehensive impact fee legislation. Floyd (1990) discusses the Senate Bill and provides an overview of the enactment of Bill 336.

> "The Texas law empowers political subdivisions to adopt impact fees for capital facilities or facility expansion. The act defines >capital facilities= as water supply facilities, wastewater facilities, storm water, drainage and flood control facilities, or roadway facilities with a life expectancy of three or more years, owned and operated by, or on behalf of, the political subdivision. The act specifically prohibits impact fees from being used to upgrade, update, expand, or replace existing capital improvements to serve existing development. Impact fees are further required to be necessitated by, and attributable to, the development and the cost assessed to new development is based on a set of land-use assumptions prepared by a licensed professional engineer. The act also specifies that any new development paying an impact fee is entitled to permanent use and benefit from services and if the funds are not expended within a five year period, they shall be refunded. The act also established the point in the development stage at which the impact fee may be collected."

Additional details on the legal issues surrounding the use of impact fees to fund infrastructure are also discussed in Gilliland et al. (1991) and Denbo (1994).

[2] Our model includes an intercept (i.e., $x_{i1} = 1$).

[3] For a discussion of the biases arising from the sample selection problem see Heckman (1976) and Green (2003).

[4] See Greene (2003, pages 787-788) for a discussion of the biases corrected by the treatment effects model.

[5] The proof assumes bivariate normality between *ln (sp)* and D^*.

[6] Under the assumption of standard normal distribution, $\phi(T_i^{/}\gamma) = \phi(-T_i^{/}\gamma)$ and $\Phi(T_i^{/}\gamma) = 1 - \Phi(-T_i^{/}\gamma)$. The interested reader can consult Maddala (1983) for further discussion, distributions, and applications.

[7] We use the Treatreg procedure from STATA. The error term, v, is a function of the correlation between ε and u and the inverse mills ratio for each observation, inducing heteroskedasticity into the model.

[8] This describes the situation in Texas. Gilliland (1995) finds that property tax burdens more than doubled between 1983 and 1992, even though Texas experienced a severe real estate depression during this period. Gilliland indicates that some limits exist on property taxation and the tax burdens are at historical highs in Texas. He also suggests that an active property tax revolt on a broad basis may become a reality.

[9] We thank Steve Mann for these explanations and for the references provided in our Appendix.