The Capitalization Effects of Development Impact Fees: Commercial and Residential Land Values

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Abstract

While a growing literature has considered the effects development impact fee programs have on new and existing home prices, the supply of residential construction, and employment growth, the nature of their effect on the price of undeveloped land remains poorly understood. This paper uses a 16 year panel data set containing residential, commercial, utility and school development impact fees to investigate the effect of these programs on the constant quality price of residentially and commercially zoned undeveloped land. Three important findings are obtained. School impact fees, which are paid by residential but not commercial developers, increase the value of commercially zoned parcels. This result confirms expectations since the adoption of school impact fees reduces the reliance on property taxes and lowers the financial burden on commercial interests. Second, asymmetric effects of impact fee programs are found across rural and metropolitan environments. This suggests impact fees may interact significantly with the pre-existing local regulatory environment. Finally, impact fee programs supporting utility systems are found to have a uniformly negative influence on land values that does not vary across urban and rural environments.

About the Author

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"With infrastructure projects that have large net benefits, therefore, the losses imposed on landowners by development fees may disappear or even turn into capital gains."

- John Yinger, "The Incidence of Development Impact Fees and Special Assessments", *National Tax Journal*, 1998.

Introduction

Dating back to contributions by Simon (1943) and Oates (1969) among others, the relationship between local revenue mechanisms and the value of real property has captured the attention of scholars and practitioners. Unsurprisingly, early capitalization studies considered the effects of property taxes on the price of existing single family homes. More recently, a number of studies have measured capitalization effects by examining the value of undeveloped land rather than built structures. The present study contributes to a small but important strand of the land capitalization literature that investigates the role of development impact fee programs.

Development impact fees are a relatively novel local revenue raising mechanism. First implemented in monetary form in the late 1970s, impact fees are one time levies a developer must remit to a local government, as a necessary condition for obtaining a building permit. [1] Revenue collected under impact fee programs is pooled over time, and must be used to pay for improvements and/or expansions to local public infrastructure systems. In many states, including Florida (where the data for the study come from), impact fee programs must satisfy a legal concept known as the "rational nexus" test. This standard ensures three criteria are met: 1) growth in the community must be clearly creating a need for new and/or expanded capital infrastructure systems, 2) there exists at least some degree of proportionality between the costs of funded projects and the size of impact fee payments, and 3) the connection between the new development and the placement of the new infrastructure is clear enough to establish that benefits accrue directly to the payers of the fees (Delaney et al. 1987). Their popularity has increased rapidly over recent decades, reaching the point where it is estimated over 1,000 local governments in the US have programs (Nelson et al. 2008). Furthermore, since rapidly expanding communities are far more likely to have impact fee programs than other communities (Jeong, 2006), the fraction of new construction projects paying impact fees is considerable.

[1] Although *impact fee* and *development fee* are the two most common labels for this fiscal instrument, terms such as *capacity fee, facility fee, system development fee, (capital) expansion fee, and (capital) mitigation fee* are also seen. Generally, when the term *exaction* is used, it refers to a community that requires direct in-kind contributions from the developer. The practice of securing dedicated open-space land, parks, streets, or other form of local public goods directly from developers has a longer history than do monetary impact fee programs.

However, even as impact fee programs have established a stronghold in local public finance, they remain controversial. Opponents claim they deter economic development and disproportionately burden low-income households.[2] Advocates argue they represent efficient Coasian bargaining between communities and developers, reducing uncertainty by establishing the rules of the game (Nelson et. al, 1992a, 1992b). Unsurprisingly, both sides of the debate are armed with evidence to support their claims. Like other local development regulations – impact fees lead to tangible costs and benefits, create distinct groups of losers and winners, and often produce new problems while helping solve others. Since a detailed review of this broad debate lies beyond the scope of the present exercise, I point interested readers to Been (2005).

While a growing literature has considered the effects impact fee programs have on new and existing home prices, the supply of residential construction, and employment growth, the nature of a more fundamental relationship – that between development impact fees and the price of undeveloped land – remains poorly understood. While early studies asserted that impact fees would unambiguously cause the price of undeveloped land to decline, Yinger (1998) establishes that circumstances could exist where impact fees do not lower the price of undeveloped land, or are even positively capitalized into prices. He focuses on the idea that new infrastructure projects may be highly valued and that impact fee revenues may reduce the pressure felt by the community to raise additional revenues through property taxes. Other studies have suggested impact fees may interact with the prevalence and/or stringency of other regulatory barriers to development. Altshuler and Gomez-Ibáñez (1993) suggest the influence of impact fee programs on land values (or other variables) critically depends upon *what they replace and/or stave off*.

This study is not the first to consider the relationship between impact fees and the price of undeveloped land. Three early studies (Nelson et al., 1992a; Nelson et al., 1992b; Skaburskis and Qadeer, 1992) as well as two more recent studies (Ihlanfeldt and Shaughnessy, 2004; Evans-Cowley et al., 2005) have taken up the question. However, the literature is conflicting - early studies suggest positive capitalization effects while the two recent papers find just the opposite. Data limitations prohibited each existing study from using panel data modeling techniques to mitigate strongly suspected endogeneity bias. Additionally, previous studies do not account for the possibility that distinct categories of impact fees may have differential effects or that impact fee programs may influence commercially zoned and residentially zoned land prices in an asymmetric manner. Finally, my study is the first to formally investigate whether impact fees have differential effects across urban and rural environments. I use data from 1,547,711 sales of residentially zoned land and 134,610 sales of commercially zoned land over a 16 year period to measure the constant quality price of undeveloped land in Florida counties. My results illustrate asymmetric effects across different impact fee categories and moving between metropolitan and rural environments. Utility related impact fees are found to lower the price of undeveloped in all environments. On the other hand, fees controlled

[2] For example, the official positions on impact fees of the National Association of Home Builders (http://www.nahb.org) and the National Association of Realtors (http://www.realtor.org) discuss these effects.

by community planning departments that fund programs otherwise paid for using property tax revenues seem to have more nuanced effects – still lowering land prices in rural areas and for commercial parcels, but showing no negative effect on residentially zoned parcels in metropolitan areas. Additionally, school impact fees, which are paid by residential but not commercial developers, are found to significantly raise the constant quality price of commercially zoned undeveloped land.

The following section develops a theoretical framework considering the relationship between development impact fee programs and the value of undeveloped land as well as reviewing the relevant literature. Section III describes the data. Section IV develops a simple two stage empirical approach. Section V presents and discusses the first and second stage empirical results. Section VI concludes.

Theoretical Framework and Existing Literature

Discussions of impact fees often follow the convention of placing early studies into the "traditional" and "new" view of impact fee incidence. While overly restrictive if pushed too far, the distinction effectively organizes the theoretical framework for this study.

The traditional view characterizes impact fees as an excise tax on new development. Examples include Snyder, Stegman, and Moreau (1986), Huffman et al. (1988), and Delaney and Smith (1989). Under this approach, impact fees act like any other tax in a competitive market and shift the short-run supply of new development upward by the amount of the fee. This leads to higher prices for developed properties, lower prices for undeveloped land, reduced profits for developers, and a reduction in the quantity of new development. The eventual effects of impact fees on various market prices are determined by the corresponding short and long-run elasticities of demand and supply. Huffman et al. (1988) outline three distinct cases: inelastic demand paired with elastic supply, inelastic demand paired with inelastic supply, and elastic demand paired with elastic supply. Regardless of the distribution of incidence in the short run, as enough time passes, developer profits return to normal levels, meaning the monetary costs of impact fees must either be passed forward to the buyers of new homes or shifted backwards to the owners of undeveloped land in the new long run equilibrium. In part, the traditional view's portrayal of the relationship between impact fees and the price of undeveloped land as unambiguous may have contributed to the relative lack of early empirical attention given to this issue.

The new view of impact fees was developed through several contributions. Yinger (1998) is due credit for accelerating this progression with a model that challenges several conclusions of the traditional view. Rather than framing impact fees as a tax on development, he argues that what happens in the broader local political environment, both before and after impact fee programs are enacted, plays a critical role in determining their causal effects. Rather than ignoring impact fee revenues once they are collected, he argues they create two direct benefits that stimulate the demand for new construction. The first is that they are rapidly used to provide valuable infrastructure to the developing areas within the community. The second is that both existing and potential residents will rationally expect impact fee programs to lower their future millage rates.[3] Still, while Yinger acknowledges that particularly valuable infrastructure projects may approach or exceed the value needed to eliminate the burden of impact fees on landowners, he concludes that for a typical project just meeting a standard cost-benefit test, as much as one quarter of the burden of the fee could fall on the owners of undeveloped land.

Brueckner (1997) compares an optimally determined impact fee to multiple alternative mechanisms of funding public infrastructure growth and finds impact fees to be preferred. The value of undeveloped land plays a role in his model. Importantly, he predicts that when switching to an impact fee regime, the price of land could increase, decrease, or remain the same, depending upon whether or not the community has already fully exhausted the economies of scale inherent in the production of local public services. More recently, Turnbull (2004) considers how two alternative development policies – impact fees and growth boundaries – will affect the dynamic pace of urban development. Impact fees that fully internalize the external cost associated with new development are found to be efficient in both steady state equilibrium and along the transitional growth path. On the other hand, an urban growth boundary that is efficient in the steady-state generates inefficiently rapid development along the transition path. An important contribution is that Turnbull formally models a case where impact fees are used as an alternative to other regulatory interventions. Burge and Ihlanfeldt (2006b) argue that impact fees may increase the supply of developable land parcels. By providing a direct monetary benefit associated with approved development proposals, a community with fees may willingly zone a larger percentage of undeveloped land for residential and/or commercial development.

The Link between Impact Fee Programs and other Growth Controls

The effects of impact fees on the price of undeveloped land should largely be driven by whether communities use impact fee programs as growth controls or as growth management tools. In addressing this question, scholars have highlighted the importance of identifying the counterfactual. Altshuler and Gomez-Ibáñez (1993) point out that "exactions look better or worse – in terms of equity, efficiency, or political acceptability – depending on the specific alternatives one considers most relevant analytically or most probable in reality." While variation in the counterfactual surely exists across communities, several scholars have taken the position that rapidly growing communities tend to adopt impact fee programs as a growth management strategy, potentially as a substitute for other growth controls that have been routinely shown to have significant impacts on the market for undeveloped land.[4] Fischel (1990) offers a hypothetical example, asking what would happen if a community adopted an impact fee that was

[3] The prediction that impact fee programs will lower future millage rates has since been empirically verified by Ihlanfeldt and Shaughnessy (2004).
[4] Several existing studies have considered the relationship between growth controls and the market for undeveloped land. Examples include Brueckner (1990), McMillen and McDonald (2002), and Cunningham (2007). Readers interested in a review of this literature should see Cunningham.

quickly struck down in court. He posits "the question is, would the community go back to its old ways of cheaply accommodating developers, or would it adopt more strict land use regulations that forestalled nearly all development? If prohibition of fees makes the community opt for more stringent regulations, then it seems to me that the impact fee is progrowth."

Gyourko (1991) formalizes the idea that impact fees represent a price based contract for entry into a community. He argues once impact fees are levied, the stringency of other exclusionary barriers – that are generally far more difficult to observe – may be lessened. Ladd (1998) contends that, without impact fee programs, local officials in rapidly expanding communities may have no effective response when faced with pressure from anti-growth contingencies. With impact fee programs in place, she argues local officials have more useful ammunition when trying to appease anti-growth pressures.

Impact Fees and Land Prices: Current Evidence

The empirical literature concerning the effects of impact fees on the price of undeveloped land is both thin and conflicting. Nelson et al. (1992a; 1992b) use data on sales of undeveloped land from Loveland, CO and Sarasota County, FL.[5] The nature of the identification strategy differs across the two samples. In Sarasota, impact fee levels did not change over the duration of their sample (July 1981 to June 1987), but variations were present in the level of impact fees paid in different geographic zones of the county. Impact fees in Loveland were applied uniformly across areas but changed over time. For both cases, they regress logged sale price on a variable reflecting the level of impact fees and other control variables. In the Loveland sample they find no evidence that impact fees influence the price of undeveloped land. On the other hand, they find in the Sarasota regressions that impact fees had a positive and statistically significant coefficient. Skaburskis and Qadeer (1992) use data from three suburban municipalities near Toronto over the period 1977-1986. They investigate the determinants of residentially zoned land prices and find their value increases in the presence of impact fees. Specifically, they find residential lot prices rise by about 1.2 times the size of the impact fee levied.

Ihlanfeldt and Shaughnessy (2004) use time-series data from Dade County, FL. spanning January 1985 to December 2000. Impact fee levels were $0 at the start of their panel and subsequently increased eight times, reaching a level of $5,239 for a typical single family home. After estimating the constant quality price of land over time, they find that impact fees lowered the price of land by roughly the size of the impact fee levied. At the same time, they find that impact fees increase the price of new and existing homes by considerably more than the size of the impact fee itself. They propose that even though their results suggest developers are fully compensated for the costs of impact fees in the form of higher selling prices to homebuyers, developers are not certain this will happen at the time they purchase the undeveloped land.

[5] Due to overlap in content, methodological approach, and authorship, these two papers are discussed jointly.

Evans-Cowley et al. (2005) use cross-sectional data from 43 Texas cities. They also find that impact fees are negatively capitalized into the price of undeveloped lots, but only at a relatively small percentage of the fee. Specifically, whereas the Ihlanfeldt and Shaughnessy results suggest a $1,000 impact fee should lower the price of an average residential lot by about $1,000, the Evans-Cowley results indicate the decrease in price would only be about $114. The disagreement in the direction of the estimated effect between the older and newer studies, as well as the discrepancy in the magnitude of the effect as estimated by the two most recent studies (that agree the causal effect is negative), motivates further empirical investigation.

Nuances of Impact Fee Programs: What Margins Matter?

Previous studies have only considered the effects traditional residential impact fees have on the price of residentially zoned parcels. School impact fees, one of the largest and most rapidly growing categories of fees, are levied on residential construction but are not paid by developers of non-residential property. However, school impact fees have been found to increase the demand for housing by lowering property taxes (Ihlanfeldt and Shaughnessy, 2004) and to stimulate job growth (Burge and Ihlanfeldt, 2009). As such, is it possible that school fees could influence the price of undeveloped land differentially based on the zoning classification of the parcel. For residential parcels, school impact fees bring both costs and benefits – making the predicted effect ambiguous. On the other hand, school fees benefit commercial developers but they pay no direct costs. Hence, their predicted price effect on commercial land is positive.[6]

Water/sewer impact fee programs, because they fund services otherwise paid for through user fees, may not affect the local regulatory environment in a manner identical to impact fees funding services otherwise covered by property taxes. Recent empirical work finds differential effects of water/sewer impact fees with respect to single family home construction (Burge and Ihlanfeldt, 2006b), multi-family home construction (Burge and Ihlanfeldt, 2006a), and job growth (Burge and Ihlanfeldt, 2009). The present study differentiates between water/sewer impact fees and impact fees that fund other services.

The pre-existing regulatory environment is expected to differ dramatically across urban and rural environments. Previous research has consistently found that growth controls and other exclusionary regulatory barriers to affordable housing are more prevalent in metropolitan areas than in rural communities (Ihlanfeldt, 2004). As such, the present study investigates the possibility that impact fee programs may not have symmetric effects across metropolitan (urban/suburban) and rural environments. In the empirical analysis that follows, metropolitan counties are designated as those with year 2000

[6] This assumes zoning decisions are exogenous to the school impact fee. If a community adopts a school impact fee and is subsequently willing to zone more parcels as residentially developable, this argument breaks down. However, any systematic differences in zoning/rezoning decisions should take time to play out and market participants may not fully account for this likelihood when considering the current supply of undeveloped parcels.

Census reported population densities above 100 persons per square mile. Other counties are designated as rural.[7]

Data

The 16 year panel used in the present study comes from 61 of Florida's 67 counties and covers the years 1994 through 2009.[8] Variables can be grouped conceptually into three categories: 1) county level impact fee levies, 2) selling prices and parcel characteristics for undeveloped land, and 3) additional covariates.

A complete history of impact fees was obtained for each county by contacting their respective planning and building departments.[9] Roughly two-thirds of counties in Florida have impact fees, with the majority changing the size and scope of their programs several times. As such, the panel provides considerable within-jurisdiction and cross-jurisdiction variation. The first impact fee variable comes from levies associated with services otherwise funded through recurrent user fees – namely, water/sewer impact fees (WSIF). WSIF are collected by utility departments rather than planning departments. Also, WSIF are distinct from any tap/connection fees the developers must pay to cover the on-site costs associated with connecting to the existing system. WSIF are based upon the number of equivalent residential units (ERUs) associated with a specific project. The baseline ERU for each community depends on the average daily consumption of a single family home; with newly constructed single family homes paying this exact amount. Apartment complexes and smaller multifamily structures pay WSIF based on the number of residential units contained within their building. While some counties require a full ERU per multifamily unit, many reduce the ratio. Commercial developers pay WSIF as a multiple of the baseline ERU, according to the physical characteristics of their project, following predetermined schedules. The baseline ERU rate is used as the WSIF variable in this study.

All other categories of impact fees fund services otherwise paid for, at least primarily, through local property tax revenues. Roads, schools, parks, libraries, police, fire, emergency medical services and public buildings represent the programs most frequently observed. The second impact fee variable measures commercial impact fees (CIF). Most

[7] A lone exception was Monroe County. A dominant feature of Monroe County is the Everglades National Park. Since the majority of land in the Everglades is not developable, it should not enter the denominator when conceptualizing true population density. As such, a rural designation would make little sense.

[8] Hillsborough, Holmes, Lafayette, Liberty, Sumter, and Union are the omitted counties. Hillsborough and Sumter suffer from serious data problems. The other four are sparsely populated and suffer from an extreme lack of sales for undeveloped land. The impact fee and covariates data predate 1994 by many years, making the parcel level sales data from the Florida Department of Revenue the limiting factor.

[9] Impact fees in Florida are primarily imposed by county governments and are most frequently countywide in their application. While cities can and do charge impact fees for services not provided by county governments, this practice is relatively rare and city impact fees are small relative to those at county levels. A frequently observed pattern is that city fees will largely mimic the level in place by the county for services like parks, libraries, or police if large cities have their own programs. The inclusion/exclusion of the small number of counties where city level impact fees play a non-trivial role was not found to impact the presented results.

counties have very nuanced systems concerning commercial property. For example, a newly developed fast food restaurant and clothing store may pay significantly different levies, even if they have identically sized buildings. As developers can use commercially zoned parcels for a variety of relatively substitutable outcomes, an aggregate/average measure of these complicated schedules is most appropriate. Fortunately, a unifying theme across counties is that each reports the fees due per 1,000 square feet of interior space for 'general retail', 'general office', and 'general industrial'. The CIF variable used presently is defined as the average across these three categories.

The third impact fee variable measures residential impact fees (RIF). Counties generally fall into one of two categories regarding residential impact fees. The first uses an entirely fixed/flat fee such that large and small homes pay the exact same rate. The second introduces some variability based on the size or number of bedrooms of the home. The difference in charges for moderate and large homes is generally a small fraction of the overall cost. In Dade County for example, a 1,800 square foot home would currently pay $6,675 in RIF, while a 3,000 square foot home would pay $7,777. For the present exercise RIF is constructed as the amount of non-utility related impact fees that would be levied on a 1,800 square foot, 3 bedroom home.[10]

The final impact fee variable is school impact fees (SIF). Most types of impact fees paid by commercial developers are also paid by residential developers (e.g., road, water/sewer, police, fire, public buildings, and solid waste). The exceptions are school, park, and library fees. Library fees are uncommon and, where observed, are extremely small in magnitude. Park fees are slightly more common, and can be non-trivial in size. Unfortunately, a common practice for counties is to change their park fees at the precise time they change other major categories paid by both residential and commercial developers. Hence, identification strategies relying on first-differencing are poorly equipped to estimate the effects of park fees on commercial land (i.e., even though commercial developers do not pay them, they pay other fees which change in size at the exact time). Fortunately, the changes in SIF levels are found to be uncorrelated with the timing of changes to other categories. Investigation of the data reveals that, while the levels of SIF and CIF are positively correlated within communities over the long run, their first-differences are not. That is to say, communities with high school fees do have higher levels of other fees, but the timing of rate increases to reach those higher levels is independent. As such, SIF for a 1,800 square foot, 3 bedroom home becomes the final impact fee variable.

Data for undeveloped land sales prices come from annual parcel level tax rolls submitted by each county to the Florida Department of Revenue. They contain the entire population sales occurring over the years 1994 through 2009. The critical fields for this exercise are the sales price, time of sale, and parcel land use classification codes. Three additional variables – lot size, distance to the central area of economic activity (CBD), and distance to the coast – were calculated for each parcel using information contained in

[10] This cutoff is selected for consistency with previous empirical studies in the literature. At a statewide level, approximately half the housing stock lies above/below this cutoff.

the GIS files submitted by each county to the state.[11] Distance to the coast is present only for counties bordering the Florida coastline, and distance to the CBD is measured only for counties defined by the US Census to be part of metropolitan statistical areas (one CBD is referenced for the entire MSA even if multiple counties are present). In total, nearly two million sales of undeveloped land parcels are observed. Parcels may contribute more than one observation if they sell more than once during the sample period. Not all two million are used as standard filtering techniques meant to remove extreme outliers are employed. As some observed sales likely represent within-family or within-business transfers, all sale prices of $100 or less are removed. After calculating the selling price per square foot (sales price/lot size), the extreme tails of the distribution are also eliminated. For each county, the beginning default was to drop any sale where the price per square foot fell below $0.03 or above $200. However, undeveloped land in Florida runs the full gamut of legitimate market values, as the state contains everything from extremely rural communities to the 8th largest CMSA in the United States (Miami-Fort Lauderdale-Pompano Beach). As such, if a filter dropped more than 2% of the total sales, it was incrementally adjusted until this was no longer true (e.g., the upper cutoff moved to $500 per square foot in Palm Beach County). After applying these filters, the remaining 1,547,711 residential zoned parcel sales and 134,610 commercially zoned parcel sales are used in the first stage land price regressions.

Other county level variables come from either the BEA (population, per capita income), the Florida Department of Revenue (millage rates), or the Florida Statistical Abstract (index crime rates). Finally, the CPI index for the Urban South was obtained from the BLS and is used to transform all monetary variables (per capita income, estimated constant quality land prices, impact fee variables) into real series using 2009 as the base year. The panel nature of the overlapping data sources facilitates first-differenced and random trends estimation strategies. The advantage of estimating first differenced models is that tests reveal it effectively mitigates bias from the strongly suspected potential endogeneity of impact fee programs with respect to land prices. Regressions using variables in levels do not pass exogeneity tests, but estimations in differences do. The downside of first differencing is that variables changing incrementally and predictably over time (i.e., all these covariates) are not well suited to reveal their causal effects. On the other hand, variables changing in large/discrete jumps (i.e., impact fees which are the focus of this study) are appropriately examined using this approach.

Table 1 lists all variables along with their descriptions and sources. For measures used in the second stage panel data regressions, Table 2 provides summary statistics for the full panel, as well as for the metropolitan, and rural counties. [Insert Tables 1 & 2 about here] The nature of impact fee data over time is interesting. While inflation adjusted averages rise over the panel for all four impact fee variables, they do so in very different ways. Regarding WSIF, there was moderate growth in the number of counties with

[11] Thanks are due to the Devoe L. Moore Center at Florida State University. Their support led to the generation and dissemination of these variables. All distances are calculated using straight-line approaches. As lot size is the primary determinants of land value, sales where this measure could not be determined were dropped.

programs, but little change in the average size of actual charges. For CIF and RIF, the moderate growth in counties with programs still holds, but additionally the size of average charges more than doubles over the panel in both cases. Finally, SIF increased most rapidly, both in terms of county program coverage and fee size. In 1994, only twelve counties collected school impact fees, at an average rate of $1,442. By 2009, the average rate was over $4,650 and 32 counties had school fee programs in place.

Empirical Methodology

The strategy for determining the effects of impact fees on the price of undeveloped land follows a simple two stage procedure. In the first stage, sales data for undeveloped land parcels is used to estimate the annual constant quality price of residentially zoned and commercially zoned land within each county from 1994 and 2009. The results are then used to construct the dependent variable for the second stage, where movements in median constant quality land prices are regressed on impact fee variables, the set of control variables, and fixed effects controlling for unobservable factors that vary by time and place.

The goal of the first stage is to obtain unbiased estimates of the constant quality price of undeveloped land within each county over time, for parcels with residential and commercial zoning designations. Hedonic and repeat-sales regressions are the two most commonly used techniques to obtain estimates of this nature. The repeat-sales approach is based on the work of Bailey, Muth, and Nourse (1963) and has since been advanced by scholars including Case and Shiller (1987, 1989), and Gatzlaff and Haurin (1997, 1998). Repeat-sales regressions only use sales from properties that sell two or more times during the observed period. The advantage of the approach is that it requires only sales dates and prices, since all property characteristics are assumed to remain constant. The criticisms of the repeat-sales methodology are: 1) that it severely reduces the sample size by discarding information from parcels selling only once, 2) that it introduces selection bias if the sample of properties selling two or more times differs systematically from the full population, and 3) that the characteristics of the property generally differ at the time of the initial and final sale. When considering undeveloped land, two dominant characteristics of the property – size and location – are fixed. As such, the identical properties assumption is reasonable. However, the first two criticisms represent serious issues. It is easy to argue undeveloped parcels selling twice in the same form do not represent a random sample. A common transition pathway for undeveloped land is for a developer (or other intermediary) to purchase a large plot of land, carry out the necessary steps for subdivision, and to then sell the subdivided parcels to builders. As such, land often sells twice – but not in the same form. To enter a repeat-sales regression, the land must sell twice in the initial aggregated stage or as a subdivided parcel. Hence, the data entering a repeat-sales regression for undeveloped land is tremendously restricted in size, and would not be expected to contain a representative sample.

The hedonic approach is well suited to measure the constant quality price of undeveloped land. Popularized by Rosen (1974), the technique assumes prices are determined by a bundle of measurable attributes associated with the parcel. OLS regressions are used to estimate the value of each attribute, including the time period of sale. The present estimations follow the form:[12]

$$\ln (P_{i,t} / Area_i) = ß_0 + ß_1 Area_i + ß_2 Area_i^2 + ß_3 Area_i^3 + ß_4 CBD_i + ß_5 CBD_i^2 + ß_6 Coast_i + ß_7 Coast_i^2 + ß_8 T_t + \mu_{i,t} \quad (1)$$

where $P_{i,t}$ = the selling price of parcel *i* at time *t*.
$Area_i$ = the size, in square feet, of parcel *i*
CBD_i = the distance, in feet, between parcel *i* and the central place of economic activity (only available for parcels in census defined metropolitan statistical areas)
$Coast_i$ = the distance, in feet, between parcel *i* and the nearest contact with the Atlantic Ocean or Gulf of Mexico (only available for coastal counties)
T_t = a vector of annual dummy variables
$\mu_{i,t}$ = a randomly distributed regression error term

Equation (1) is run separately for residentially and commercially zoned parcels in each county. For consistency, this functional form was used consistently across all estimations. For a few counties possessing neither CBD_i or $Coast_i$ (i.e., inland rural counties), an alternative procedure accounts for the role of location. The tax rolls contain a field (range) that places the parcel into contiguous geographic zones. The number of ranges varies across counties, but typically at least 5-10 are present. Unless a range contained less than 5% of the sales data, a dummy variable was created and included in the regression. Parcels in omitted ranges serve as the reference group.

The second stage explains the constant quality equilibrium price of undeveloped residentially zoned land (PLR_{it}) and commercially zoned land (PLC_{it}) in county *i* at time *t* depends on a wide range of potential factors. Conceptually, these determinants can be split into those that change very little (or not at all) over time within the county, and those that do change over time. Denote the area specific time invariant factors in the former category as vector X_i. Regardless of whether the factors in X_i are observable or unobservable, controlling for their influence on land prices can be accomplished through the inclusion of area specific fixed effects in panel regressions. In the latter category are impact fees and all other time variant factors. For ease, let the four impact fee variables described above be denoted IF_{it} and all other factors be contained in vector Y_{it}.

Observable variables contained in Y_{it} are population, income, millage rates, and crime. Reduced form models explaining equilibrium constant quality prices for residential and commercial land in county *i* at time *t* can then be expressed as:

$$PLR_{it} = a + bX_i + cIF_{it} + dY_{it} + e_{it} \quad (2)$$

and

$$PLC_{it} = a + bX_i + cIF_{it} + dY_{it} + e_{it} \quad (3)$$

After first differencing the data, the vector of area specific fixed effects (X_i) drops out leaving:

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[12] Logged price, as opposed to logged price per square foot, is also a commonly used dependent variable. The estimated constant quality prices coming from models using each were found to be highly similar.

$$\Delta PLR_{it} = a + c\Delta IF_{it} + d\Delta Y_{it} + e_{it} \quad (4)$$

and

$$\Delta PLC_{it} = a + c\Delta IF_{it} + d\Delta Y_{it} + e_{it} \quad (5)$$

It is reasonable to expect that some of the variables in Y_{it} are not directly observable. Time varying unobservables should fall into one of two groups: 1) those that change uniformly over time across all counties, and 2) those that change non-uniformly across counties over time. The first group of variables can be effectively controlled for by including time fixed effects (i.e., dummy variables for each year of the panel). The second includes factors that tend to follow a trend over time *within* a specific county. These variables are controlled for by allowing each county to have its own specific growth trend. This is accomplished by re-introducing the set of county dummy variables into the first-differenced models. After adding both time (γ) and county (α) fixed effect vectors to (4) and (5), the estimating equations become:

$$\Delta PLR_{it} = a + \alpha_i + \gamma_t + c\Delta IF_{it} + d\Delta Y_{it} + e_{it} \quad (6)$$

and

$$\Delta PLC_{it} = a + \alpha_i + \gamma_t + c\Delta IF_{it} + d\Delta Y_{it} + e_{it} \quad (7)$$

Often referred to as random-trends models, (6) and (7) utilize first differencing all variables and adding county fixed effects to control for unobserved heterogeneity in *levels and changes*, respectively. Omitted variable bias will now only result if annual changes in unobservable factors influencing undeveloped land prices are commonly correlated with the specific times counties implement and/or update their impact fee programs. Other than the stringency of the local regulatory environment and the probability of receiving development approval (which have both been identified in the discussion as likely relating to the presence and level of impact fees), it is hard to believe other unobserved factors meet this requirement. Still, standard strict exogeneity tests recommended for panel data estimations are discussed below in Section V.

Heteroskedasticity and serial correlation were consistently detected in the residuals of early estimations. Consequently, estimated standard errors that are robust to both arbitrary serial correlation and heteroskedasticity are used (Wooldridge 2002, p. 282).[13]

As previously noted, the nature of the relationship between various categories of development impact fees and the price of land may differ across metropolitan and rural environments. As such, equations (4)-(7) are estimated for the full sample of 61 counties, as well as for the metropolitan (34 counties) and rural (27 counties) subsamples.

Results

In total, 122 separate hedonic price regressions (61 counties with 2 land use categories) are estimated. Figure 1, as well as Tables 3 and 4, summarize the key aspects of the first

[13] The preferred test for serial correlation involves regressing Δe_{it} on $\Delta e_{i,t-1}$, for various time periods, as suggested by Wooldridge (2002, p. 283). The fully robust standard errors are obtained using the "cluster" option in Stata, specifying that the standard errors be clustered as the county level.

stage results. [Insert Figure 1, Table 3, and Table 4 about here] Using a non-weighted average across the 61 included counties, Figure 1 documents the nominal median constant quality price of residential and commercial land between 1994 and 2009. For both residential and commercial land, very little price appreciation occurs over the first ten years of the panel, mostly just tracking inflation rates. Around 2002 though, very interesting dynamics begin to surface. Residential prices begin to rise significantly, with a pronounced acceleration around 2003. Prices more than double between 2003 and 2007, when the value of residential land peaked. 2008 and 2009 remove these gains, retuning prices to the early 2000s value. In fact, shifting focus to inflation adjusted constant quality values; the results indicate average 1994 and 2009 constant quality prices across the state are nearly identical. Turning to commercially zoned parcels, the price run-up is even larger, with constant quality prices more than tripling between 2001 and their peak in 2006. Interestingly, the appreciation during 2004-2006 is even more pronounced than the first several years of the run-up. Also, the value of commercial property does not lose all of the run-up gains during 2008 and 2009, remaining considerably higher than early 2000s levels, even adjusting for inflation.

The overall constant quality price trends obtained are strikingly consistent with patterns reported by Nichols, Oliner, and Mulhall (2010). Using undeveloped land sales price data from 23 large MSAs in the United States, they report that nominal residential and commercial land prices rose slowly between the mid 1990s through the early 2000s, experienced a dramatic acceleration around 2002-2003 that led to a peak in very late 2006, and then lost the majority of these gains during the years 2007-2009. All told, the two sets of estimated price trends show very similar patterns. Additionally, where both studies consider the same market (Florida MSAs in their study); the price trends presently obtained are highly similar to their findings.

However, the aggregate trends mask considerable variation across counties. Nominal price appreciation was small, and even negative, for several cases. Note that at least a 44% nominal appreciation rate between 1994 and 2009 was needed just to keep pace with inflation. 43 counties met or exceeded this level for residential land while 18 did not. 49 counties met or exceeded this for commercial land while 12 did not. A better indicator of whether undeveloped land in Florida was a good or bad investment over this period compares overall appreciation rates to those of other common financial investments. Between January 1st 1994 and December 31st 2009, both the Dow Jones Industrial Average and the price of gold experienced roughly 175% nominal price appreciation. 21 counties beat this benchmark mark while 40 fell short. For commercial land, 39 counties exceeded the benchmark while 22 fell short. Interestingly then, although population growth and economic development in Florida over this period was intense, on average, owning undeveloped land in the state was no better or worse than other common forms of investing. [14]

[14] In fairness, this comparison ignores two important additional considerations. Property tax liabilities reduce the net rate of return on land, but not the other two investments. On the other hand, it can be argued that undeveloped land produces at least some direct benefits if the land has useful pre-development purposes (i.e., hunting/recreation).

Turning to Tables 3 and 4, we see the summarized results of the first stage. Columns 2 and 3 respectively report the number of observations and *R-squared* from each hedonic regression. While capturing high levels of explanatory power within these regressions is not necessary for producing accurate price movements over time, R^2 values are reassuring. In the residential regression they range from a high value of 0.68 to a low of 0.15. For commercial, the highest R^2 value is 0.65 (seen thrice) and the lowest value is 0.20.

As expected, lot size contributes to higher selling prices at a diminishing rate. Columns 4 through 6 show the sign and significance of the area, $area^2$, and $area^3$ variables. The normal expectation would be for the area term to be positive, with alternating signs on higher order terms. However, the dependent variable is specified as price per square foot. As such, area should be negative. The alternating signs pattern is seen in every regression, with significance on all three terms in all but a handful of cases. The next four columns summarize the results concerning distance to the CBD and distance to the coast. Recall that distance to the CBD is not measured (or relevant) for rural counties, and that distance to the coast is not measured for inland counties. For the most part, these variables perform as expected, and control for the possibility that development patterns over time are not uniform in terms of location within each county.[15]

Tables 5, 6, and 7 report the results obtained using the full sample, the sample of 34 metropolitan counties, and the sample of 27 rural counties, respectively. Before discussing the performance of the impact fee variables, a few general comments are merited. First, note that the estimated coefficients on the control variables should be interpreted with caution. Theory suggests population growth and increased per capita income should cause constant quality undeveloped land prices to rise, whereas higher levels of crime should be negatively capitalized into land values.[16] The results show that significant effects in the expected direction for these variables is a rare occurrence, and that cases of expected and unexpected signs occur with somewhat similar frequency. This initially puzzling outcome should not be viewed as surprising. For the most part, the control variables change quite smoothly over time within counties and their co-movements across counties during any given year are significantly correlated. The presented first-differenced and random-trends models include annual fixed effects, leaving these estimations poorly suited to investigate the causal effects of factors that change in this manner. Quite the opposite in fact, as they are much better equipped to isolate the causal effects of factors that change abruptly/sharply at distinct points in time

[15] The exception is that in select counties with CBDs near the coast, the two variables are so strongly correlated that each affects the performance of the other. In these cases, the inclusion of one, but not the other, always leads to the expected result (i.e., a negative and significant linear term with a positive and significant squared term).

[16] The expected sign of millage rates in models that are not controlling for the quality of service provision over time is complicated as greater tax liabilities should be negatively capitalized while the current and expected future quality of local public services should be positively capitalized into land prices. A small/marginal change in the millage rate should only significantly affect the price of undeveloped land if the marginal costs and benefits of taxation/spending are significantly different from one another.

across counties, and in ways that are not correlated across counties during a given period. This is not the case in models that allow the data to enter directly in levels, and the expected directional effects for the control variables generally surfaces.[17]

Additionally, models that examine the data in levels are found to have greater explanatory power than the otherwise similar regressions using first-differenced data. This result is driven by the fact that area specific fixed effects demonstrate far more explanatory power in models explaining levels than in models explaining changes. A natural question then, is why are first-differenced and random-trends models preferred to models estimated in levels. The answer is that since the estimations include annual fixed effects, the consistency of obtained coefficients requires meeting the standard of strict exogeneity (Wooldridge, 2002). This requires the explanatory variables in each time period be uncorrelated with the idiosyncratic error term (e_{it}) in each time period. Standard tests investigating this property are not typically met when the models are run in levels, but estimations with first-differenced data are generally found to pass these tests.[18] As such, the first-differenced and random trends models presented are most appropriate for estimating the causal effects of impact fees on undeveloped land prices, and the lack of significant results on the control variables and/or greater explanatory power is willingly sacrificed.

The results suggest the effect of impact fees on both residentially and commercially zoned land prices is linked to whether the monetary fee covers water/sewer related infrastructure (WSIF) and is collected by the utility department, or is collected by the planning/permitting department and used to provide infrastructure otherwise funded through property taxes (RIF). Recall that impact fee revenues collected by the local planning authority are expected to significantly lower other unobservable regulatory barriers to development, as well as enhancing the probability of receiving project approval and/or requested re-zonings from development approval boards. The collective evidence from Tables 5, 6, and 7 suggests WSIF are negatively capitalized into land prices. Of the twelve estimated models, eleven show negative coefficients on WSIF and the twelfth is essentially zero. Additional differences surface between residential and commercial land. For residential parcels, although significance at standard levels of confidence is only achieved in the random trends model for rural areas, WSIF always has negative coefficients and the t-statistics generally exceed one. On the other hand, the evidence that WSIF lowers commercially zoned property values is much weaker: estimated coefficients are smaller, standard errors are larger, and the relationship does not seem as stable across models and geographic environments. This could indicate that expanded water/sewer infrastructure is more highly valued by commercial property owners or that, in the absence of impact fee programs, commercial developments are

[17] Results available upon request.

[18] The tests for strict exogeneity come from Wooldridge (2002). This involves regressing ΔPLR_{it} and ΔPLC_{it} on future as well as contemporaneous values of the impact fee change variables. If future changes are significant in these tests, then the null hypothesis of strict exogeneity is rejected. The presented first-differenced and random-trends models meet these tests when the first and second lead values of impact fee variables are included. In all cases the joint significance tests are based on *F-statistics* robust to heteroskedasticity and serial correlation.

forced to cover more than their proportionate share of the costs associated with expansions to existing water/sewer systems.

Models (4) and (6) consider the effect of residential impact fees (RIF) on the price of undeveloped residential land. The relationship seems sensitive to the shift from metropolitan to rural areas. In the full sample estimations, the RIF coefficients are both positive, although not achieving significance. When the sample splits, it becomes clear that metropolitan counties are driving the positive coefficient estimate. Although statistical significance is still not achieved in the metropolitan sample, the coefficients on RIF become even larger than they were in the full sample estimations. Conversely, in the rural sample the estimated effect becomes negative, even attaining significance in the random trends estimation. The result that RIF lowers the value of undeveloped land in rural areas, but not in urban areas is consistent with the idea that impact fee programs may interact with the prevalence/intensity of other regulatory barriers to residential development. Recall the earlier discussion that highlighted the evidence suggesting regulatory barriers are generally trivial in rural areas, but have been found to play a significant role in metropolitan environments. As such, impact fee programs in metropolitan areas not only lead to the provision of valuable infrastructure, they may carry the potential to reduce other non-pecuniary regulatory costs associated with development and to reduce the uncertainty that may otherwise characterize the permitting process.

Moving to commercial impact fees (CIF), it is not surprising that this positive effect on the price of land is reversed, and a negative effect on the price of land is again seen. Models (5) and (7) consistently show negative estimated coefficients on commercial land prices for CIF in the full sample and across the metropolitan and rural subsamples. While the precision of these estimates is weak, t-statistics are generally above one and nearly reach significance in the full sample. An important difference between residential and commercial development is that many communities actively seek to restrict affordable residential development, but there is much less evidence to support the idea that commercial development is limited. In fact, communities are generally found to aggressively compete over attracting new development (Anderson and Wassmer, 2000). As such, there is no reason to expect commercial impact fees would reduce other regulatory barriers or increase the probability of project approval. With little potential for positive effects on the regulatory/supply side of the market for new development, the only offsetting benefit of CIF is the enhanced level of service provision. The presented results suggest the benefits from this factor are not large enough to offset the monetary costs of the impact fees themselves.

School impact fees (SIF) are found to significant increase the value of commercially zoned undeveloped land – an important and novel contribution to the capitalization literature. While the coefficients are only statistically significant in the full model, the positive effect seems to be present across both metropolitan and rural areas. In the absence of school impact fee programs, communities in Florida essentially rely entirely upon property tax revenue to fund local education expenditures. This places the burden squarely on the shoulders of both residential and commercial property owners. On the other hand, school impact fee programs lead to a situation where at least a significant portion of educational finance is funded entirely by residential property owners. To my knowledge, this study marks the first to estimate the effects of impact fee programs on the value of commercially zoned land and the first to recognize school impact fees may influence the market for commercial property. The finding is intuitive, as significant benefits accrue to commercial landowners without the monetary costs of the fees being attached. Like other impact fee programs, school impact fees lessen the upward pressure on property taxes and create valuable infrastructure valued by all within the community. For developers of residential property, this creates a critical tradeoff. However, the monetary costs are not present for commercial development, making school impact fees a purely welfare enhancing policy.

Conclusions

Development impact fee programs represent a somewhat novel but increasingly utilized approach to managing economic development. While a considerable number of studies have investigated their effects on housing prices and rates of residential construction, relatively few empirical papers have examined their causal effects on the value of undeveloped land. The lack of agreement between previous findings, and the underlying importance of the relationship for evaluating the relative merits of impact fee programs motivates this study.

The presented results contain compelling evidence that development impact fee programs have significantly affected the market for undeveloped land. I first estimate, and then explore the determinants of the constant quality price of residentially zoned and commercially zoned undeveloped land in 61 of Florida's 67 counties between 1994 and 2009. In doing so, the paper documents the extreme run-up and rapid post-2006 decline in constant quality land prices in Florida. Additionally, it sheds light on the dramatic differences in price movements across different areas in Florida. The causal effects of impact fees on land prices are found to be complicated. Several margins that were not considered by previous studies are shown to be relevant. In fact, the present findings explain much of the disagreement plaguing previous empirical research on the subject. When estimation approaches primarily identify the effects of impact fees based on cross-sectional variation in their levels across jurisdictions, a significant upward bias (potentially related to policy endogeneity) is found to plague the estimated coefficients. The theoretically motivated negative effect of impact fees on land prices surfaces only when identification strategies rely more heavily on changes over time within areas. This explains the disagreement between early and more recent studies in this relatively thin literature. More importantly, previous studies did not consider the differential nature of markets for residential and commercially zoned land, as well as the possibility that various categories of impact fees have different effects.

Water/sewer impact fees are found to have significantly different effects than impact fees covering public services otherwise funded through property taxes. The strongest evidence that water/sewer impact fees lower the equilibrium price of undeveloped land comes from models considering residentially zoned land. In estimations considering commercially zoned land values, there is only weak evidence that prices are reduced by water/sewer impact fees. Similar negative effects on land prices for other categories of impact fees are found in rural areas, where preexisting regulatory barriers to development have been documented to be their lowest. However, the findings suggest that in metropolitan areas, where the literature on the subject has established that a more restrictive regulatory environment exists, residential impact fees do not lower the value of residentially zoned parcels. In fact, I find weak evidence to suggest they may slightly increase values in these areas. Conversely, impact fees paid by commercial developers do seem to lower the value of commercially zoned undeveloped land across both metropolitan and rural areas. Finally, the strongest and perhaps most novel result from this study is that school impact fees are found to significantly increase the value of commercially zoned land.

The study motivates further investigation. Impact fees in Florida fall largely under the control of counties, rather than municipalities. This allocation of responsibility is reversed in most other states. Because counties dominate municipalities in terms of geographic size, the issue of substitutability across locations and the nature of policy competition across jurisdictions may play a role in other states. Furthermore, Florida experienced a tremendous amount of economic development and population growth over the investigated time period. It would be interesting to see if the various types of impact fee programs considered by this study have similar effects in environments where the rate of economic development was more moderate.

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Table 1. Variable Descriptions and Sources

Variable Name	Variable Description	Source
1st Stage - Estimating Prices		
Sales price	Nominal sales price in dollars	Florida Department of Revenue
Sales date	Date of sale, used to generate the set of year specific dummies	Florida Department of Revenue
Land use code	Classification index for land use codes indicating zoning designations	Florida Department of Revenue
Lot size	Total size (in square feet) of the parcel	Florida Department of Revenue
Distance to CBD	Straight-line distance to the CBD of the respective MSA	Florida Department of Revenue
Distance to Coast	Straight-line distance to the nearest point of coastline	Florida Department of Revenue
2nd Stage - Explaining Prices		
Population	Annual county population	Bureau of Economic Analysis
Real per capita income	Annual county real per capita income (adjusted using price index)	Bureau of Economic Analysis
Millage rate	Annual county millage rate for unincorporated areas	Florida Department of Revenue
Crime	Annual county index crime rate per 100,000 persons	Florida Statistical Abstract
WSIF	Real water/sewer fee January 1st, per equivalent residential unit (ERU)	Florida county governments
CIF	Real commercial fee January 1st, per 1,000 square feet of space.	Florida county governments
RIF	Real residential fee January 1st, per single family home	Florida county governments
SIF	Real school fee January 1st, per single family home	Florida county governments
Residential_land	Real constant quality selling price for residential land	1st stage regression results
Commercial_land	Real constant quality selling price for commercial land	1st stage regression results

Table 2. Summary Statistics – 2^{nd} Stage Variables

	Full Panel (61 counties)		Metropolitan (34 counties)		Rural (27 counties)	
Variable Name	Mean (st.dev)	#obs	Mean (st.dev)	#obs	Mean (st.dev)	#obs
Population	252316 (404997)	976	427483 (474075)	544	31736 (20054)	432
Real per capita income	31062 (9499)	976	36418 (9139)	544	24317 (4134)	432
Millage rate	16.56 (3.15)	976	15.75 (3.18)	544	17.58 (2.79)	432
Crime	4298 (1785)	976	4865 (1808)	544	3581 (1471)	432
WSIF	2342 (2061)	956	3576 (1416)	544	845 (1696)	432
CIF	1494 (2134)	976	2377 (2348)	544	382 (1064)	432
RIF	2464 (3654)	976	3923 (3995)	544	626 (2009)	432
SIF	901 (1832)	976	1448 (2157)	544	213 (937)	432
Residential_Land	79783 (237897)	953	117050 (311492)	531	32891 (43286)	422
Commercial_Land	169141 (405156)	944	225968 (212193)	530	126212 (566464)	414

* The reduction in observations for Residential_Land and Commercial_Land is due to data related issues that prevent constant quality prices from being accurately estimated for a few county/year observations. The twenty missing observations for WSIF stems from two cases where water/sewer impact fee programs were in place, but early rates have proven to be impossible to obtain after intensive interactions with Flagler and Saint Lucie County.

Figure 1. Nominal Median Constant-Quality Land Prices: 1994-2009

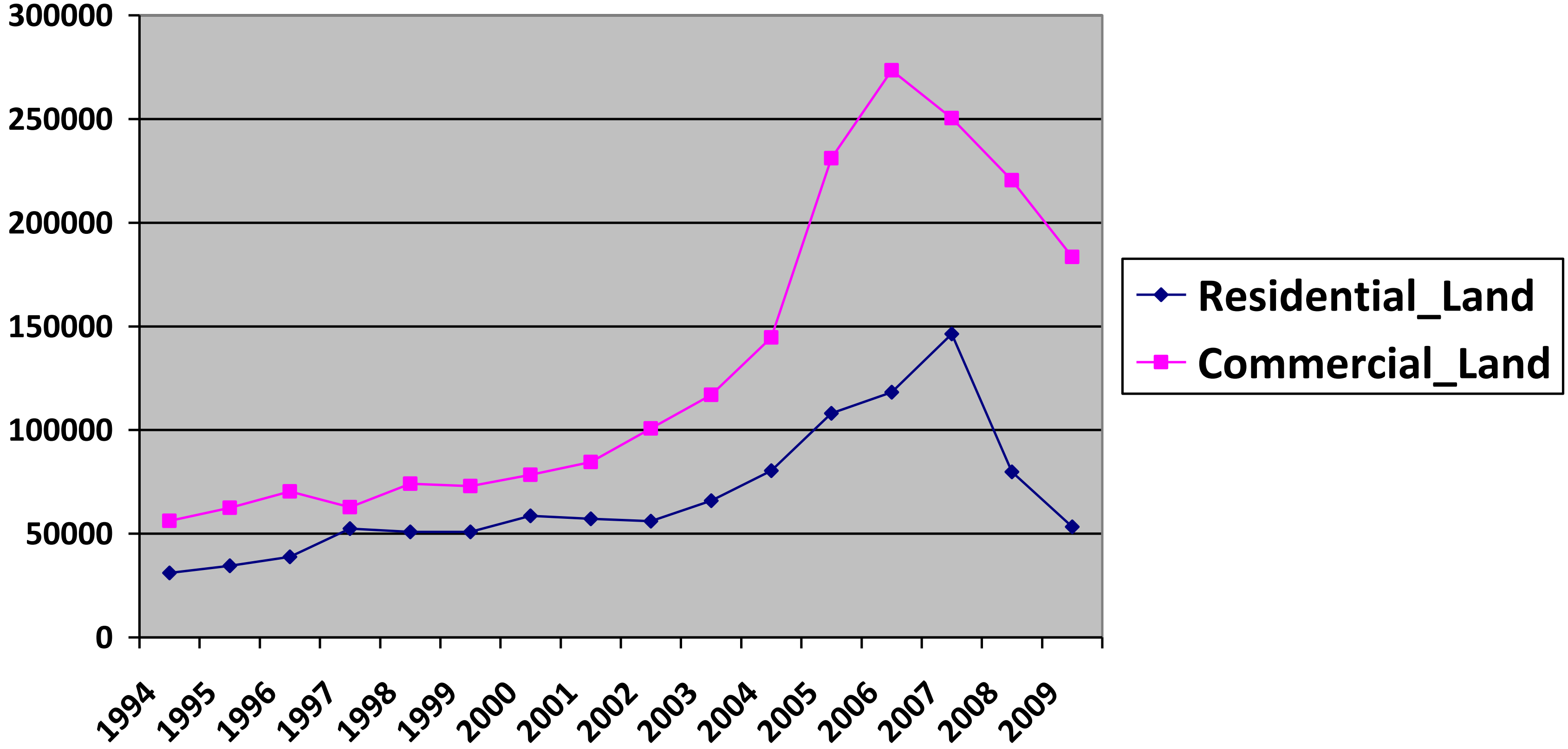

Table 3. First Stage Hedonic Land Price Regressions – Residentially Zoned Parcels

County	#OBS	R^2	Area	$Area^2$	$Area^3$	CBD	CBD^2	Coast	$Coast^2$	Median 1994	Δ price 94-09
Alachua	10443	0.38	negative*	positive*	negative*	negative	negative*	N/A	N/A	32000	22.13%
Baker	1215	0.34	negative*	positive*	negative*	N/A	N/A	N/A	N/A	12500	665.46%
Bay	17139	0.45	negative*	positive*	negative*	negative*	positive*	negative*	positive*	23000	161.01%
Bradford	2049	0.32	negative*	positive*	negative*	N/A	N/A	N/A	N/A	10000	312.60%
Brevard	85807	0.16	negative*	positive*	negative*	negative*	positive*	negative*	positive*	15000	273.15%
Broward	16574	0.36	negative*	positive*	negative*	negative*	positive*	positive*	negative*	79950	349.20%
Calhoun	978	0.33	negative*	positive*	negative*	N/A	N/A	N/A	N/A	5000	319.88%
Charlotte	124833	0.22	negative*	positive*	negative*	negative*	positive*	negative*	positive*	8500	74.58%
Citrus	33601	0.3	negative*	positive*	negative*	N/A	N/A	positive*	negative*	14000	37.41%
Clay	12658	0.55	negative*	positive*	negative*	negative*	positive*	N/A	N/A	18500	163.21%
Collier	41071	0.68	negative*	positive*	negative*	negative*	positive*	negative*	positive*	36500	354.31%
Columbia	4289	0.56	negative*	positive*	negative*	N/A	N/A	N/A	N/A	12500	91.31%
Dade	15712	0.21	negative*	positive*	negative*	positive*	negative*	negative*	positive*	950000	-75.79%
DeSoto	3783	0.27	negative*	positive*	negative*	N/A	N/A	N/A	N/A	13150	95.38%
Dixie	3727	0.57	negative*	positive*	negative*	N/A	N/A	negative*	positive*	7500	340.70%
Duval	23482	0.16	negative*	positive*	negative*	positive*	negative*	negative*	positive*	47000	-2.34%
Escambia	14137	0.25	negative*	positive*	negative*	positive*	negative*	negative*	positive*	23800	21.46%
Flagler	46132	0.42	negative*	positive*	negative*	N/A	N/A	negative*	positive*	10800	181.45%
Franklin	5687	0.5	negative*	positive*	negative*	N/A	N/A	negative*	positive*	40000	411.92%
Gadsden	3269	0.32	negative*	positive*	negative*	positive*	negative*	N/A	N/A	10000	207.19%
Gilchrist	3847	0.42	negative*	positive*	negative*	positive	negative	N/A	N/A	10500	219.25%
Glades	2491	0.32	negative*	positive*	negative*	N/A	N/A	N/A	N/A	12000	57.08%
Gulf	4563	0.63	negative*	positive*	negative*	N/A	N/A	negative*	positive*	16000	275.94%
Hamilton	4091	0.28	negative*	positive*	negative*	N/A	N/A	N/A	N/A	6950	71.82%
Hardee	1747	0.65	negative*	positive*	negative*	N/A	N/A	N/A	N/A	11000	376.79%
Hendry	17406	0.43	negative*	positive*	negative*	N/A	N/A	N/A	N/A	8600	64.33%
Hernando	37517	0.29	negative*	positive*	negative*	positive	negative*	positive	negative*	20000	11.46%
Highlands	34723	0.2	negative*	positive*	negative*	N/A	N/A	N/A	N/A	7500	-31.65%
Indian River	22970	0.27	negative*	positive*	negative*	positive*	negative*	negative*	positive*	13150	104.54%
Jackson	8139	0.31	negative*	positive*	negative*	N/A	N/A	N/A	N/A	4000	51.77%
Jefferson	470	0.44	negative*	positive*	negative*	positive*	negative*	negative	positive*	5995	21.73%
Lake	10570	0.28	negative*	positive*	negative*	positive*	negative*	N/A	N/A	23900	108.59%

County	#OBS	R^2	Area	$Area^2$	$Area^3$	CBD	CBD^2	Coast	$Coast^2$	Median 1994	Δ price 94-09
Lee	244647	0.17	negative*	positive*	negative*	negative*	positive*	negative*	positive*	10500	60.11%
Leon	17538	0.17	negative*	positive*	negative*	negative*	negative	N/A	N/A	31000	1.59%
Levy	17112	0.29	negative*	positive*	negative*	N/A	N/A	negative*	positive*	7500	149.08%
Madison	2403	0.4	negative*	positive*	negative*	N/A	N/A	N/A	N/A	5995	23.50%
Manatee	18152	0.36	negative*	positive*	negative*	negative*	positive	positive*	negative*	51900	46.05%
Marion	98012	0.31	negative*	positive*	negative*	negative*	positive*	N/A	N/A	7000	138.57%
Martin	1137	0.39	negative*	positive*	negative*	positive	positive	negative*	positive*	135000	102.01%
Monroe	7460	0.42	negative*	positive*	negative*	N/A	N/A	negative*	positive*	40000	362.83%
Nassau	8985	0.3	negative*	positive*	negative*	positive*	negative*	negative*	positive*	28000	158.91%
Okaloosa	18208	0.4	negative*	positive*	negative*	positive	positive	negative*	negative*	50000	266.45%
Okeechobee	12779	0.6	negative*	positive*	negative*	N/A	N/A	N/A	N/A	10583.5	150.70%
Orange	39136	0.37	negative*	positive*	negative*	positive*	negative*	N/A	N/A	25400	34.55%
Osceola	19697	0.35	negative*	positive*	negative*	negative*	positive*	N/A	N/A	25000	-45.25%
Palm Beach	34887	0.34	negative*	positive*	negative*	negative*	positive*	negative*	positive*	30000	57.27%
Pasco	18258	0.46	negative*	positive*	negative*	negative*	positive*	negative*	positive*	21300	155.74%
Pinellas	17123	0.15	negative*	positive*	negative*	negative*	positive*	negative*	positive*	59500	41.52%
Polk	32732	0.25	negative*	positive*	negative*	positive*	negative*	N/A	N/A	5000	208.79%
Putnam	43915	0.22	negative*	positive*	negative*	N/A	N/A	N/A	N/A	6000	-21.60%
St. Johns	20910	0.54	negative*	positive*	negative*	positive*	negative*	negative*	positive*	44900	30.30%
St. Lucie	58847	0.23	negative*	positive*	negative*	negative*	positive	negative*	positive*	11500	99.49%
Santa Rosa	28793	0.21	negative*	positive*	negative*	negative*	positive*	negative*	negative*	20700	47.58%
Sarasota	79849	0.2	negative*	positive*	negative*	negative*	positive*	negative*	positive*	16700	30.58%
Seminole	13366	0.25	negative*	positive*	negative*	positive*	negative*	N/A	N/A	84000	-59.30%
Suwannee	7828	0.42	negative*	positive*	negative*	N/A	N/A	N/A	N/A	10000	199.76%
Taylor	4075	0.42	negative*	positive*	negative*	N/A	N/A	negative*	positive*	7995	174.75%
Volusia	29084	0.3	negative*	positive*	negative*	negative*	negative	negative*	positive*	26000	-86.56%
Wakulla	6152	0.3	negative*	positive*	negative*	positive*	negative*	negative*	positive*	16500	227.30%
Walton	13662	0.46	negative*	positive*	negative*	N/A	N/A	negative*	positive*	39000	208.98%
Washington	17844	0.45	negative*	positive*	negative*	N/A	N/A	N/A	N/A	6500	418.62%

* Statistically significant at the 95% confidence level

Table 4. First Stage Hedonic Land Price Regressions – Commercially Zoned Parcels

County	#OBS	R^2	Area	$Area^2$	$Area^3$	CBD	CBD^2	Coast	$Coast^2$	Median 1994	Δ price 94-09
Alachua	1047	0.48	negative*	positive*	negative*	negative	negative	N/A	N/A	60000	47.59%
Baker	172	0.57	negative*	positive	negative	N/A	N/A	N/A	N/A	22500	1275.94%
Bay	2341	0.65	negative*	positive*	negative*	negative*	positive*	negative*	positive*	50000	200.57%
Bradford	287	0.23	negative*	positive*	negative*	N/A	N/A	N/A	N/A	33000	71.29%
Brevard	4614	0.30	negative*	positive*	negative*	negative*	negative	negative*	positive*	65000	211.37%
Broward	4128	0.26	negative*	positive*	negative*	positive	negative	positive	positive	140000	601.46%
Calhoun	280	0.40	negative*	positive*	negative*	N/A	N/A	N/A	N/A	14000	151.73%
Charlotte	4440	0.41	negative*	positive*	negative*	negative*	positive*	negative*	positive*	36600	-39.67%
Citrus	829	0.42	negative*	positive*	negative*	N/A	N/A	negative	negative	30000	511.47%
Clay	533	0.55	negative*	positive*	negative*	negative*	positive*	N/A	N/A	55900	-51.54%
Collier	4610	0.51	negative*	positive*	negative*	negative*	negative*	negative*	positive*	33800	483.28%
Columbia	3097	0.28	negative*	positive*	negative*	N/A	N/A	N/A	N/A	22950	740.65%
Dade	10939	0.56	negative*	positive*	negative*	negative*	positive*	positive*	negative*	105000	196.06%
DeSoto	679	0.38	negative*	positive*	negative*	N/A	N/A	N/A	N/A	35900	1332.20%
Dixie	995	0.40	negative*	positive*	negative*	N/A	N/A	negative*	positive*	8050	347.05%
Duval	5243	0.20	negative*	positive*	negative*	negative*	positive*	negative*	positive*	60000	17.34%
Escambia	2070	0.47	negative*	positive*	negative*	negative*	positive	negative*	positive	51450	53.90%
Flagler	1049	0.49	negative*	positive*	negative*	N/A	N/A	negative*	positive*	129000	243.36%
Franklin	576	0.42	negative*	positive*	negative*	N/A	N/A	negative*	positive	13500	728.21%
Gadsden	384	0.41	negative*	positive*	negative*	negative*	positive*	N/A	N/A	77000	-53.33%
Gilchrist	94	0.59	negative*	positive*	negative*	negative	positive	N/A	N/A	29000	180.89%
Glades	242	0.61	negative*	positive*	negative*	N/A	N/A	N/A	N/A	60000	-47.86%
Gulf	203	0.65	negative*	positive*	negative	N/A	N/A	negative*	positive*	10200	13.28%
Hamilton	141	0.61	negative*	positive*	negative*	N/A	N/A	N/A	N/A	34000	412.64%
Hardee	657	0.38	negative*	positive*	negative*	N/A	N/A	N/A	N/A	18013	1185.97%
Hendry	847	0.37	negative*	positive*	negative*	N/A	N/A	N/A	N/A	20000	27.19%
Hernando	5125	0.35	negative*	positive*	negative*	positive	negative*	negative*	positive*	28150	522.14%
Highlands	1246	0.44	negative*	positive*	negative*	N/A	N/A	N/A	N/A	35000	66.03%
Indian River	1613	0.35	negative*	positive*	negative*	positive	negative*	negative*	positive*	40000	3.62%
Jackson	232	0.58	negative*	positive*	negative*	N/A	N/A	N/A	N/A	19000	9.74%
Jefferson	1214	0.35	negative*	positive*	negative*	positive*	negative*	negative	positive*	15800	655.34%
Lake	1659	0.22	negative*	positive*	negative*	negative*	positive	N/A	N/A	35000	1366.99%

County	#OBS	R^2	Area	$Area^2$	$Area^3$	CBD	CBD^2	Coast	$Coast^2$	Median 1994	Δ price 94-09
Lee	7969	0.32	negative*	positive*	negative*	negative*	positive*	positive	negative*	93450	12.93%
Leon	1736	0.46	negative*	positive*	negative*	negative*	positive*	N/A	N/A	111250	104.01%
Levy	1825	0.54	negative*	positive*	negative*	N/A	N/A	positive*	negative*	30000	430.36%
Madison	1066	0.35	negative*	positive*	negative*	N/A	N/A	N/A	N/A	39017	551.30%
Manatee	3089	0.62	negative*	positive*	negative*	negative*	positive	negative*	positive*	67500	16.87%
Marion	7158	0.37	negative*	positive*	negative*	negative*	positive	N/A	N/A	41450	300.32%
Martin	128	0.38	negative*	positive	negative	positive	negative	negative*	positive	180000	340.44%
Monroe	463	0.37	negative*	positive*	negative*	N/A	N/A	negative*	positive*	43750	44.72%
Nassau	458	0.50	negative*	positive*	negative*	positive	negative*	negative*	positive*	39100	831.57%
Okaloosa	2068	0.65	negative*	positive*	negative*	positive	positive	negative*	positive*	28250	467.80%
Okeechobee	884	0.32	negative*	positive*	negative*	N/A	N/A	N/A	N/A	30482	257.87%
Orange	5840	0.38	negative*	positive*	negative*	negative*	negative	N/A	N/A	79000	365.48%
Osceola	1030	0.37	negative*	positive*	negative*	negative*	positive	N/A	N/A	525000	21.23%
Palm Beach	3242	0.38	negative*	positive*	negative*	positive*	negative*	negative*	positive*	137500	397.04%
Pasco	1688	0.58	negative*	positive*	negative*	negative*	positive	negative*	positive*	65000	409.88%
Pinellas	4116	0.24	negative*	positive*	negative*	negative*	positive*	negative*	positive*	125000	133.36%
Polk	8195	0.25	negative*	positive*	negative*	negative*	positive*	N/A	N/A	11670	918.08%
Putnam	4855	0.29	negative*	positive*	negative*	N/A	N/A	N/A	N/A	7000	197.96%
St. Johns	636	0.50	negative*	positive*	negative*	negative*	positive*	negative*	positive*	170000	172.13%
St. Lucie	4083	0.29	negative*	positive*	negative*	negative*	negative	positive	negative*	100000	713.52%
Santa Rosa	1849	0.41	negative*	positive*	negative*	negative	positive	negative*	positive*	50000	407.39%
Sarasota	1575	0.39	negative*	positive*	negative*	negative*	positive	negative*	negative	103900	69.62%
Seminole	3451	0.35	negative*	positive*	negative*	positive*	negative*	N/A	N/A	143050	388.17%
Suwannee	783	0.37	negative*	positive*	negative*	N/A	N/A	N/A	N/A	26147.5	990.26%
Taylor	264	0.23	negative*	positive*	negative	N/A	N/A	negative*	positive	26017	240.59%
Volusia	2922	0.43	negative*	positive*	negative*	negative	negative*	negative*	positive*	65000	277.19%
Wakulla	125	0.35	negative	positive	negative	positive*	negative*	negative*	positive*	22700	185.11%
Walton	385	0.60	negative*	positive*	negative*	N/A	N/A	negative*	positive*	21300	682.64%
Washington	1141	0.25	negative*	positive*	negative*	N/A	N/A	N/A	N/A	9140	309.51%

* Statistically significant at the 95% confidence level

Table 5. Second Stage Panel Data Regression Results *(Full Sample, Residential & Commercial Land)*

Model	**4 – First Differenced**		**5 – First Differenced**		**6 – Random Trends**		**7- Random Trends**	
Dep. Var.	**Δ PLR**		**Δ PLC**		**Δ PLR**		**Δ PLC**	
Ind. Variables	**Coef.**	**t-stat**	**Coef.**	**t-stat**	**Coef.**	**t-stat**	**Coef.**	**t-stat**
RIF	6.155	0.71	------	------	7.516	0.73	------	------
CIF	------	------	-50.84	1.43	------	------	-34.44	1.32
WSIF	-23.91	1.05	-4.001	0.09	-29.93	1.36	-19.96	0.58
SIF	------	------	102.9	1.90*	------	------	94.77	1.77*
Population	-2.401	1.19	6.313	1.88*	-16.35	1.13	8.359	1.52
PC Income	1.032	0.16	-34.81	0.91	-14.06	1.20	-14.97	0.64
Millage Rate	-89.16	0.03	1758.2	0.24	-1267.5	0.50	3513.7	0.51
Crime	-4.972	0.77	23.82	1.93*	-3.955	0.54	30.10	2.20**
Year Dummies	Yes		Yes		Yes		Yes	
Area Dummies	No		No		Yes		Yes	
R-square	0.03		0.08		0.17		0.46	
Observations	808		777		808		777	

* and ** denote statistical significance at the 10% and 5% level, respectively, using a two-tailed test.

Table 6. Second Stage Panel Data Regression Results *(Metropolitan Sample, Residential & Commercial Land)*

Model	**4 – First Differenced**		**5 – First Differenced**		**6 – Random Trends**		**7- Random Trends**	
Dep. Var.	**Δ PLR**		**Δ PLC**		**Δ PLR**		**Δ PLC**	
Ind. Variables	**Coef.**	**t-stat**	**Coef.**	**t-stat**	**Coef.**	**t-stat**	**Coef.**	**t-stat**
RIF	9.321	0.68	------	------	15.81	0.85	------	------
CIF	------	------	-51.23	1.10	------	------	-16.45	0.51
WSIF	-35.96	0.83	3.756	0.04	-42.49	1.03	-35.77	0.51
SIF	------	------	76.54	1.36	------	------	87.33	1.44
Population	-5.280	1.76*	1.652	0.56	-19.06	1.29	2.982	0.48
PC Income	-13.49	1.03	-95.57	1.22	-28.44	1.43	-54.49	1.33
Millage Rate	189.04	0.04	2113.3	0.20	-845.13	0.19	2617.8	0.27
Crime	-13.73	0.52	3.587	0.08	-9.738	0.32	26.22	0.76
Year Dummies	Yes		Yes		Yes		Yes	
Area Dummies	No		No		Yes		Yes	
R-square	0.05		0.10		0.19		0.48	
Observations	450		449		450		449	

* and ** denote statistical significance at the 10% and 5% level, respectively, using a two-tailed test.

Table 7. Second Stage Panel Data Regression Results *(Rural Sample, Residential & Commercial Land)*

Model	**4 – First Differenced**		**5 – First Differenced**		**6 – Random Trends**		**7- Random Trends**	
Dep. Var.	**Δ PLR**		**Δ PLC**		**Δ PLR**		**Δ PLC**	
Ind. Variables	**Coef.**	**t-stat**	**Coef.**	**t-stat**	**Coef.**	**t-stat**	**Coef.**	**t-stat**
RIF	-0.402	0.49	------	------	-1.337	1.97*	------	------
CIF	------	------	-31.39	1.08	------	------	-31.95	1.00
WSIF	-5.313	1.32	-25.39	1.22	-10.43	1.99*	-26.23	1.07
SIF	------	------	63.21	1.58	------	------	63.08	1.46
Population	-0.046	0.01	-0.079	0.01	-4.038	0.85	-22.20	0.82
PC Income	1.032	0.16	-11.18	0.84	-3.544	1.65	-14.69	0.87
Millage Rate	1581.2	0.96	318.19	0.08	1655.9	1.20	-1389.8	0.34
Crime	-3.170	2.07**	8.129	0.91	-3.303	1.93*	10.81	1.07
Year Dummies	Yes		Yes		Yes		Yes	
Area Dummies	No		No		Yes		Yes	
R-square	0.12		0.16		0.20		0.29	
Observations	358		328		358		328	

* and ** denote statistical significance at the 10% and 5% level, respectively, using a two-tailed test.