2015

Development Impact Fees: A Vehicle or Restraint for Land Development?

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Abstract

Although development impact fees have been used by local governments for decades, it is still not well understood how this tool serves its fundamental policy goal of growth management. Previous studies have shown that impact fees can serve as either a vehicle or restraint for land development. By using panel data from Florida counties in the U.S., this study shows that the use of impact fees precipitates local development by increasing the value of developable parcels. Impact fees allow developers to pursue more development activities as they bear the imposed fees.

Key words: development impact fees, Florida counties, land development, growth management, uncertainty.
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Creating and implementing effective methods to manage growth has been an important policy issue for local governments. While the potential negative ramifications of moderate growth are more easily accommodated by local government, rapid growth can result in problems such as environmental pollution, traffic congestion, and the reduction of public open space not easily managed by local governments. The threat of these resultant problems to quality of life may lead the public to resist growth in their communities. Therefore, growth management policy aimed at balancing the economic benefits of growth while protecting quality of life has become a high priority in many communities that have experienced rapid growth.

The burden on growth management policies to achieve a balance between land development for economic growth and, at the same time, land preservation for future development and the protection of environmental quality, has resulted in a number of land-use control and infrastructure funding tools (Feiock, 2004; Feiock, Tavares and Lubell, 2008; NLC, 2003). Among the policy tools and institutional arrangements available for managing local growth, development impact fees have been perceived as a promising infrastructure funding method (Jeong, 2004; Kolo and Dicker, 1993; Nelson and Moody, 2003).

While development impact fees have become popular over the last few decades (Been, 2005; Lawhon, 2007), the study of development impact fees has a relatively short history.¹ Previous research has addressed the factors that influence the adoption of local impact fees (Campbell, 2006; Jeong, 2006; Kolo and Dicker, 1993); the efficiency of the impact fee systems (Altshuler and Gomez-Ibanez, 1993; Brueckner, 1997); the incidence of impact fees (Huffman et al., 1988; Yinger, 1998); and the impact of impact fees on local economic situations, including
job growth (Jeong and Feiock, 2006; Nelson and Moody, 2003), housing prices (Burge and Ihlanfeldt, 2006a; 2006b; Delaney and Smith, 1989; Ihlanfeldt and Shaughnessy, 2002; Singell and Lillydahl, 1990), land prices (Evans-Cowley, Forgey and Rutherford, 2005; Skaburskis and Qadeer, 1992), and capital spending (Clarke and Evans, 1999).

Still, previous research has given little attention to the functions of impact fees in a broader context of local economic development (Nelson and Moody, 2003). Because impact fees allow local development as long as collected funds can meet the demands of growth, different local growth patterns may result under this system. Empirical studies suggest that development impact fees may either encourage or discourage local growth (Been, 2005; Clarke and Evans, 1999; Nelson and Dawkins, 2004; Singell and Lillydahl, 1990). In other words, this tool may function as either a vehicle for more development by providing financial resources for infrastructure or a restraint on growth by reducing the willingness of developers to pay these fees.

Evans-Cowley and Lawhon (2003) specified three main limitations in the empirical research on impact fees: 1) a limited number of communities have been studied; 2) a lack of sufficient data, especially land development data; and 3) a narrow focus on existing housing prices without investigation of the long-term effect of impact fees. A decade after Evans-Cowley and Lawhon noted these limitations, they remain in place. This research advances the literature by directly addressing these limitations. First, it includes a longer cross-sectional panel data set from 1998 to 2007 to examine the effects of development impact fees on changes in the land value in all the counties in Florida, U.S. Florida is a state that has given growth management policy a higher priority. Florida has also been a pioneer in the creation and use of development impact fees. Second, local growth is measured using the value of all developable parcels since the extent of land development is interactive with existing land values which are attributed to
physical and neighborhood characteristics and growth boundaries in communities. Third, this study employs a distributed-lag model in testing the panel data. This methodological approach is valuable as impact fees are not likely to have only single-year effects.

In the final section, this article first explains development impact fees as a critical tool for growth management focusing on Florida Counties. A theoretical framework is advanced to identify the potential influence of impact fees, in general, along with local political institutions and forms of county government influence land development. Next, empirical models are formulated and estimated. After presenting the results of this analysis, conclusions are presented regarding the implications of the findings for theory and practice.

Use of Development Impact Fees as a Means of Growth Management in Florida Counties

Land-use policy for growth management is categorized by two approaches (Altshuler and Gomez-Ibanez, 1993; Burge and Ihlanfeldt, 2007; Blaesser and Kentopp, 1990; Feiock, 2004; Feiock, Tavares and Lubell, 2008; Navarro and Carson, 1991). The first generation approach includes regulations such as zoning and building permit caps. The second generation approach intends to maintain quality of life by adding costs to development activities. Development impact fees are a typical example of this second generation approach.

Development impact fees are one time monetary payments, predetermined through a formula adopted by the government unit, that are assessed on property developers during the permit-approval process and levied to fund large-scale, off-site improvements, and public facilities and services necessary to serve new developments adequately (Burge and Ihlanfeldt, 2006a, 6; Lawhon, 2007, 12). Impact fees are collected for various purposes, including transportation, fire, water, sewers, parks, schools, law enforcement, libraries, public buildings, and emergency services (FCCMA, 2005).
Development impact fees were created for both financial and political reasons (Evans-Cowley, Forgey and Rutherford, 2005; FCCMA, 2005; Nicholars, Nelson and Juergensmeyer, 1991; Snyder and Stegman, 1986; Yinger, 1998). Impact fees have been institutionalized as a new financial method for the purpose of managing the increasing need for public infrastructure due to development by imposing the costs on developers rather than spreading the responsibility to exiting residents and voters. Over several decades, local governments have experienced fiscal stress resulting from economic fluctuation, increased responsibility of federal and state programs, and public resistance to tax increases. Such fiscal stress makes it difficult to expand new infrastructure and improve deteriorating infrastructure. The impact fee system can shift the burden of paying for infrastructure improvements to developers and new residents. According to Singell and Lillydahl (1990), impact fees tend to be more used in cities that are experiencing fiscal difficulties and taxpayer revolt.

The characteristics of Florida’s impact fee program makes it a valuable case to examine the influence of impact fees imposed and collected by county governments (Burge and Ihlanfeldt, 2007; FCCMA, 2005). Development impact fees in Florida are predominantly imposed by county governments and applied on a county-wide level. Although cities charge impact fees for public services not provided by counties, the scope of these programs is relatively small (Burge and Ihlanfeldt, 2007). Also, considering Florida counties autonomously adopt and implement impact fee systems (FCCMA, 2005), this provides us with an arena where the peculiar consequences of county-level policies can be investigated.

While many states have a state-level impact fee enabling act (Lawhon, 2007; Nelson and Moody, 2003), county governments in Florida have widely adopted and collected impact fees based on their own decisions without such an act (Burge and Ihlanfeldt, 2007; FCCMA, 2005).
The recommended adoption of impact fees in the Florida Growth Management Act of 1985 has been supported by a series of court decisions that ensured that properly imposed impact fees are protected under the home rule authority (Burge and Ihlanfeldt, 2007; FCCMA, 2005; Nelson and Duncan, 1995).

**Potential Effects of Development Impact Fees on Land Development**

One stream of impact fees research tests the effects of impact fees on land development (Evans-Cowley, Forgey and Rutherford, 2005; Ihlanfeldt and Shaughnessy, 2002; Skaburskis and Qadeer, 1992; Yinger, 1998). These theoretical and empirical studies tend to focus exclusively on land that is allotted for residential purposes in a small number of local jurisdictions. To the extent that local land is mostly used for residential usages, these studies have important implications. However, the influence of impact fees also needs to be studied with a consideration for the fundamental goal of this tool, growth management, in a broader context. Rather than focusing on any specific type of land-use, we use the aggregated land value of all parcels as a reasonable indicator of development in a local government.

Impact fees have been broadly used by local governments for two purposes: 1) to generate revenue by imposing on developers the cost and responsibility of the infrastructure improvements in conjunction with new development, and 2) to manage growth and the rate of development in their jurisdictions. These two primary goals may lead impact fees either to promote smart growth or to depress development: local governments may either encourage growth through lower impact fees or discourage growth through higher fees (Nelson and Dawkins, 2004). Accordingly, impact fees are assumed to cause changes in land development in two different ways. Based on the degree of impact fees imposition, impact fees function as either
a vehicle for more development by providing infrastructure or a restraint for growth by reducing the incentives for new development.

One theoretical perspective in the literature posits the potential effect of impact fees on local development is their creation of a kind of contractual relationship that reduces uncertainties related to the future growth (Been, 2005; Burge and Ihlanfeldt, 2006a; Clarke and Evans, 1999; Jeong and Feiock, 2006; Nelson, Frank and Nicholas, 1992). Jeong and Feiock (2006) extends Williamson’s (1981, 1985) studies and argue that local developers who are assumed to be boundedly rational and behave opportunistically consider the degree of reduced uncertainty imposed by the impact fee system. According to this approach, the influence of impact fee systems on local land development can be thought of as an implicit contract between local governments and developers.

A conventional view is that the imposition of impact fees may impede local growth by creating increased development costs on builders and developers. Because development interests then bear the high burden of paying the costs associated with the new infrastructure demands, impact fees may result in reduced local growth. A study by Clarke and Evans (1999) shows that the use of development impact fees decreases government’s per capita capital spending when a portion of the costs for infrastructure are passed on to the private sector. In this situation, developers confront high uncertainties or transaction costs in pursuing their development efforts due to the fees imposed on them. This is supported by Burge and Ihlanfeldt’s (2009) finding that higher fees reduce employment over a 2 year period.

However, some studies suggest that impact fees do not always produce employment loss but instead generate growth by reducing uncertainties in the development process. Jeong and Feiock (2006) and Nelson and Moody (2003) provide evidence that impact fees have a positive
impact on local economic growth by increasing jobs. A possible explanation of the positive relationship between impact fees and local growth is that these payments reduce uncertainty and make development go forward by making governmental commitments more credible and providing necessary infrastructure (Burge and Ihlanfeldt, 2006a; Jeong and Feiock, 2006). If the demands of providing infrastructure can be quelled to some degree through the imposition of impact fees, local governments are less likely to deter development (Jeong and Feiock, 2006).

Thus, impact fees may have different impacts on land development based on the usage of this tool in each local government. If the construction of infrastructure that supports development is ensured based on the payment of impact fees, impact fees are likely to expedite land development. In this case, new infrastructure constructed through impact fees enables developers to be more secure in their investments. However, if the uncertainty of participating in development is still high in spite of the impact fees payment, impact fees may result in less land development.

**Form of Government**

The focus of this study is on the influence of the impact fees system on local land development, but the use of land and land value is also a product of a local government’s response to growth pressures. Particularly, we posit that an increase or decrease in the land value is linked to the form of government that each jurisdiction operates under.

Numerous studies have linked city forms of government to the motivations and decisions regarding growth and development (Lubell, Feiock and Ramirez, 2005; 2009; Ramirez de la Cruz, 2009). A similar link between form of government and growth policy has been established at the county level (Benton, 2002; 2003; Feiock, 2004; Feiock, Tavares and Lubell, 2008). Two
forms of county government are examined: the traditional “unreformed” county commission form of government and the “modernized” commission-administrator and commission-elected executive structures.

The commission system is a traditional unreformed system of county government where elected commissioners hold legislative and administrative oversight responsibilities. While commissions are, in general, assumed to be responsive to popular demands in making policies (Benton, 2002; Marando and Thomas, 1977), they are also more likely to be influenced by special interests, particularly in comparison to modernized counties that have been seen as more attuned to county-wide interests (Benton, 2002). In particular, the decision-making process on growth management policies in these more politicized and unreformed counties has been found to be more influenced by construction and development special interests (Feiock, Tavares and Lubell, 2008). Thus, traditional county commission forms of government are anticipated to promote growth more than modernized forms of government (Feiock 2004; Feiock, Tavares and Lubell, 2008).

Structural reform efforts at the county level focus on establishing professional management and centralized leadership by combining the professional manager or elected chief executive officer position (Benton, 2002). Under commission-administrator and commission-elected executive forms of county government, managers or elected mayors/executives are presumed to pursue a broader based set of administrative values because they are responsible for county-wide public services (Marado and Thomas, 1997). Therefore, the balance between growth and land preservation is likely to be more heavily emphasized, and elected officials serving in counties with modernized forms of government are less likely to succumb to land
development pressures than their counterparts serving in traditional county commission forms of
government (Feiock 2004; Feiock, Tavares and Lubell, 2008).

Methods

Panel data was used to examine the influence of development impact fees and county political institution on local growth, growth as operationalized by the value of developable parcels over time. While impact fees are collected at a point in time, the effect of the fees on land development is likely to be distributed over several subsequent years. To address this characteristic of impact fees, a distributed-lag model is estimated in the analysis. This model enables us to estimate not only the effects of impact fees collected at different times, but also the cumulative influence of these distributed-lag values on the main explanatory variable (Wooldridge, 2003). Since the time lag effect of impact fees is likely to be focused on the near future, our analysis includes distributed-lag values that are collected during three successive years. In addition, we can estimate the cumulative effect of impact fees on land value change by aggregating three coefficients of each value.

Data

To examine the effects of development impact fees and other development pressure factors on land development in Florida counties, we included all available panel data from 1998 to 2007. Annual data for the panel analysis for 65 out of the 67 Florida counties were collected from multiple sources. The parcel-based land value data was drawn from the Florida Department of Revenue.
Land development is measured by land value of developable parcels. Cho, Kim and Roberts (2009) indicate that the probability of land development is based on a function of parcel attributes (i.e., individual parcel and neighborhood characteristics, and socioeconomic factors) in general, but especially a tax on land values. Furthermore, many scholars argue that the extent of land development is interactive with, or resulting from, the land values in the community (Cho et al., 2006; Cho and Newman, 2005; Irwin and Bockstael, 2004). One method of measuring land value is to use the assessed values of parcels (Evans-Cowley, Forgey and Rutherford 2005). In this paper, the assessed values of parcels with residential, commercial, or industrial purposes are aggregated. Then, the total aggregated value of each year per county is adjusted in 2007 real dollars following the Consumer Price Index for the south region obtained from the Bureau of Labor Statistics.

The amount of annually collected development impact fees are drawn from the database of the Florida Department of Financial Services. The total amount of impact fees (revenue code 363.2) is also adjusted for 2007 real dollars. The total amount of impact fees is obtained by aggregating the fees collected under multiple categories, including public safety, physical environment, transportation, economic development, human services, culture/recreation, and other impact fees. Data on the forms of county government are extracted from various volumes of the County Year Book published by the International City and County Management Association and individual county government websites.

Annual volumes of the Florida Statistical Abstract are the source for five of the control variables: 1) population change in the whole county; 2) population change in unincorporated areas; 3) annual change in per capita income; 4) number of permits for single-family housing units; and 5) number of permits for multi-family housing units. Panel data for the last control
variable, the annual change in the total amount of payroll, is drawn from County Business Patterns of the Bureau of Census (http://www.census.gov/econ/cbp/), and these values are calculated in 2007 real dollars. Descriptions and summary statistics for the variables are reported in Table 1.

(Table 1 about here)

Model

Our model is represented by the following equation:

\[
\Delta LVD_{it} = \beta_0 + \sum_{k,m=1}^{3} \beta_k TAIFi,t - m + \beta_4 FOG_{it} + \beta_5 \Delta TPOP_{it} + \beta_6 \Delta UPOP_{it} + \beta_7 \Delta TAP_{it} + \beta_8 \Delta PCI_{it} + \beta_9 SFP_{it} + \beta_{10} MFP_{it} + \nu_{it}
\]  

(1)

where \( i \) stands for \( i \)th county, \( t \) means the \( t \)th time period, \( \Delta LVD \) denotes the annual percentage change in the aggregated value of parcels to be developed for residential, commercial, and industrial purposes; \( TAIF \) is the log of the total amount of collected impact fees; \( FOG \) is the county form of government. Our focus is on the main effects of impact fees and county form of government, but the analysis also controls for demographic, economic, and locational factors that contribute to land development. The \( \Delta TPOP \) and \( \Delta UPOP \) variables are the annual percentage changes in the population of the total area of the county and the unincorporated area within a county, respectively. The annual percentage change in population in unincorporated areas variable is introduced to account for the intra-county discrepancies in the distribution of the population. \( \Delta TAP \) is the annual percentage change in the total amount of payroll; \( \Delta PCI \) represents the annual percentage change in per capita income. These variables reflect the
economic condition in each county. SFP and MFP are the numbers of building permits for single- and multiple-family homes, respectively. These variables allow us to account for the demand for land development. Because of the potential high correlation between single-family and multi-family housing permits, these variables were introduced into the model both separately and in aggregated form.

While the influence of distributed-lags of impact fees is estimated through the previous model, the lags tend to have high correlations. That is to say, there may be multicollinearity among lagged impact fees which limit the ability to distinguish the yearly effects of impact fees on land values. To address this multicollinearity problem, we considered how each of the lagged impact fees variables influenced land value in Florida counties. This analysis provides us with a more systematic understanding of the relationship between impact fees and land value change because we can compare the total magnitude of all three lags with each of the lags. For this separate lag model, equation (1) is replaced by following equation (2):

\[
\Delta LVD_{it} = \beta_0 + \beta_1TAIF_{i,t-m} + \beta_2FOG_{it} + \beta_3TPOP_{it} + \beta_4UPOP_{it} \\
+ \beta_5TAP_{it} + \beta_6PCl_{it} + \beta_7SFP_{it} + \beta_8MFP_{it} + \nu_{it}
\]

(2)

where m (= 1, 2, and 3) is used to represent time lags. Single- and multi-family housing permits are analyzed separately as well as jointly in this equation as well.

**Results**

We performed a regression analysis with pooled model and conducted a Breusch-Pagan test to examine the heteroskedasticity. Breusch-Pagan test results in models 1-1, 1-2, 2-1, 2-2,
and 2-3 that are reported below show the existence of the heteroskedasticity; the chi-square(p-value) of each models are 7.20(p=0.007), 8.16(p=0.004), 7.38(p=0.006), 7.25(p=0.007), and 8.02(p=0.004), respectively. To correct for heteroskedasticity, we choose one-level fixed effect model for data analysis by a series of Hausman tests. In addition, since outliers usually cause biased regression results, we tried to examine outliers using both the Mahalanobis distance and Leverage tests.

Literature on panel data regression frequently reports panel autocorrelation so that we also need to examine it after running the fixed effect model. Most of statistical packages do not provide the panel autocorrelation test after running the regression with a fixed effect model, we conduct the Wooldridge autocorrelation test by following procedures; first, we run regression all models with least squares dummy variables (LSDV) model which is equivalent to the one-level fixed effect model (Kmenta, 1997); second, outliers are examined using both the Mahalanobis distance and Leverage tests; third, we conduct the Wooldridge test with LSDV regression results (Drukker, 2003).

From a series of tests, first, we screened out four observations identified as outliers. Second, we find that a Wooldridge test does not reveal any symptoms of panel autocorrelation. After outlier and Wooldridge tests, we estimated the panel analysis of land value change with a distributed lag model. The results of the empirical test with a fixed effect model are reported in Table 2.²
The results in Models 1-1 and 1-2 lead us to conclude that the test results between the two models did not significantly change whether the two housing permit variables were separate or aggregated. Thus, it is reasonable to focus our empirical tests on the model with separate housing permit variables, which explains the effect of housing permits more specifically than models with the aggregated housing permit variable.

In Model 1-1, a lag of the total amount of collected impact fees from t-1 to t-3 has a positive relationship with land value change. The impact fees system may increase local growth, but these variables are not significant. However, in spite of the insignificant impacts of each lag, the sum of lagged coefficients in each model shows that the aggregated influence of all these three distributed lags increases land value for the parcels of developmental purposes.\(^8\)

Based on the positive effect of impact fees on land development, the panel analysis of land value change with separate lags was also conducted to address the influence of impact fees. It is possible that the effect of lagged impact fees was not clearly revealed because of the high correlation among lagged impact fee variables. Like the distributed lag models, the fixed effect models for three models were chosen by a series of Hausman tests. The results are reported in Table 3.\(^9\)

\[(\text{Table 3 about here})\]

Empirical test results in model 2-1, 2-2, and 2-3 show that impact fees collected from t-1 to t-3 had a positive relationship with the percentage change of land values. Among the three results, the effect of impact fees at t-2 is larger than that of impact fees at t-1 or t-3. Using the regression coefficients, we can calculate that one standard deviation increase in the sample mean
on t-1, t-2, and t-3 impact fees will increase the aggregated land value on average by .255%, .282%, and .254% respectively.

Using the test results reported in Table 2 and Table 3, we employed the results of Model 2-3 in Table 3 to interpret the influence of other independent variables. The impacts of the variables can be interpreted in the same way, as the results were quite similar among models. While the political institution, form of government, variable was not statistically significant, demographic and economic variables influenced changes in land values. Whereas the total population growth at the county level increased developmental land value, the population increase in unincorporated areas resulted in less land development. Using the results in Model 2-3, we can calculate that one standard deviation increase in total population and population in unincorporated areas changes the percent change of land value by 1.876% and -1.376%, respectively.

Per capita income has a positive relationship with land development. The results reveal that one standard deviation increase in per-capita annual income change increases the percent change in land value by 1.344%. Change in total amount of payroll, another variable included to show counties’ economic situation, is not statistically significant, while the number of multi-family housing construction permits increases the value of developable land. One standard deviation increase in multi-family housing permits increases the percent change of land value by 0.988%. Unlike multi-family housing permits, single-family housing permit was not statistically significant.

**Discussions**
Development impact fees have been broadly adopted and implemented among local governments implementing growth management policies. Impact fees have been considered as a valuable and innovative tool to finance local infrastructure needs and are of increasing interest among scholars in various fields.

The results suggest that the use of impact fees in Florida counties results in more land development as long as the governments are being financially funded for capital improvement. In other words, when developers take some responsibility for financing infrastructure-concurrent development, they are allowed to develop local land, and the imposition of impact fees causes an increase in the value of developable land. By reducing uncertainties for developers and providing more infrastructure for developed communities, the impact fee systems in Florida counties are used to facilitate, rather than restrain, more development through capital improvement.

This study also reveals that local land development is influenced by local demographic and economic factors, including population changes and residents’ economic situations. In addition, more direct measures of land development demand, housing construction permits, also explain local land development. An increase in county-wide population increases land development suggesting the influx of more residents results in more growth. However, population growth in unincorporated areas is a force that decreases the value of developable land, implying that residents who migrate to unincorporated areas tend to not develop their land. The positive relationship between income increase and land development may suggest that wealthier residents who are experiencing good economic condition are more likely to develop their land. Also, counties that approved more construction of multi-family housing experience land value increases.
Conclusions

One of the most important finding of this research is that the development impact fees system does not simply facilitate or deter local land development. Instead, it is a flexible institutional tool as it is actually used in each local governments. If it applied in a strategic manner, it can function as contractual relationship between government and developers to reduce uncertainty. Thus is can operate to stimulate or impede new developments by reducing uncertainty in exchange. Local governments that are already utilizing or considering to use impact fees will need to understand this dynamic nature of the system, so they can use the system more effectively in order to effectively manage growth in their jurisdictions.

As Florida is not the only state that allows local governments to implement impact fees, this study needs to be extended to other states so we can compare influences of impact fees on local growth among states. This will lead us to a more comprehensive understanding of how impact fees, as a tool for growth management, has worked in the U.S. This work could also be extended to the European context. Impact fees have not been often applied in the European context and with the exception of Antonio Tavares (2003; 2010) European scholar have not addressees these types of local growth management instruments.

This study contributes to the literature on development impact fees and local growth by estimating a 10-year panel regression using a distributed-lag model. We do not employ a dynamic panel data model because our empirical test models do not contain lagged dependent variables. Our primary goal in this study was examining the influence of the development impact fees system and local political institution. However, it is possible that the change of land value can be explained further by including lagged dependent variables allowing for the modeling of a
structural adjustment. Future research can build from our work by expanding empirical model specifications to include lagged dependent variables.
Endnotes

1. Both terms of development impact fees and impact fees are interchangeably used in this paper.

2. The statistical data (Florida Statistical Abstract 2004; 2008) shows that Florida has experienced high growth for last decades. Florida experienced more than doubling population between 1970 (6,791,418) and 2000 (15,982,824). The state is still experiencing the extreme population growth since 2000: Percentage change in population between 2000 and 2007 (18,680,367) is 16.9. Rapid urbanization also explains the growth of Florida. The percentage of urban residents increased from 81.6 in 1970 to 89.3 in 2000, and 5 more counties came to have metropolitan statistical area status only within 7 years (from 34 in 1999 to 39 in 2006).

3. In Florida the development impact fees system was first adopted in Broward county in 1977 (Jeong, 2004; Burge and Ihlanfeldt, 2006a). Our data from the Florida Department of Financial Services shows that the number of counties that collected impact fees during the time period that this research includes (from 1998 to 2007) ranges from 33 (2000) to 42 (2007) when we exclude two consolidated counties as described later.

4. Duval and Miami-Dade counties are excluded in our analysis due to the difficulty of conducting reliable comparisons between these consolidated counties and other un-consolidated counties in Florida.

5. We use the assessed value, rather than taxable or just value, to capture land value because Florida state and local governments’ taxing or related activities are mainly based on the assessed value. For example, the Save Our Homes Amendment limits the increase in the assessed value of property within 3% annually for the real property that receives homestead exemption.
6. 


7. R² values in tables are estimated from the fixed effect model with county dummies. Hausman test results are also reported in table 2 and table 3, showing that a fixed effect model is superior to a random effect model.

8. While the coefficient and standard error of the summated variable are calculated from the three lags, this variable is not a separate independent variable by itself.

9. This table reports the results for two separate housing permit variables.
References


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<table>
<thead>
<tr>
<th>Variable</th>
<th>Measure</th>
<th>Mean</th>
<th>Std. Dev.</th>
<th>Min</th>
<th>Max</th>
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<td>Land Value Change</td>
<td>Annual percentage change in the aggregated amount of assessed values of parcels of residential, commercial, and industrial purposes</td>
<td>9.580</td>
<td>9.005</td>
<td>-18.488</td>
<td>66.302</td>
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<td>Total Amount of Impact Fees at t-1</td>
<td>Log (Total amount of collected impact fees at t-1)</td>
<td>8.243</td>
<td>7.620</td>
<td>0</td>
<td>18.970</td>
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<td>Total Amount of Impact Fees at t-2</td>
<td>Log (Total amount of collected impact fees at t-2)</td>
<td>8.075</td>
<td>7.578</td>
<td>0</td>
<td>18.601</td>
</tr>
<tr>
<td>Total Amount of Impact Fees at t-3</td>
<td>Log (Total amount of collected impact fees at t-3)</td>
<td>7.845</td>
<td>7.535</td>
<td>0</td>
<td>18.505</td>
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<td>Form of Government</td>
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<td>.468</td>
<td>0</td>
<td>1</td>
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<td>Change in Total Population</td>
<td>Annual percentage change in the total county population</td>
<td>2.410</td>
<td>2.813</td>
<td>-12.760</td>
<td>19.226</td>
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<td>Change in Unincorporated Area Population</td>
<td>Annual percentage change in the unincorporated areas in a county</td>
<td>2.144</td>
<td>4.821</td>
<td>-49.303</td>
<td>21.601</td>
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<td>Change in Total Amount of Payroll</td>
<td>Annual percentage change in the total amount of payroll</td>
<td>6.208</td>
<td>8.771</td>
<td>-52.375</td>
<td>83.408</td>
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<td>Annual percentage change in the per capita personal income</td>
<td>4.159</td>
<td>3.488</td>
<td>-11.038</td>
<td>24.726</td>
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<td>Number of Single Family Housing Permit</td>
<td>Log (the number of single-family housing permits)</td>
<td>6.179</td>
<td>2.068</td>
<td>0</td>
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<tr>
<td>Number of Multi Family Housing Permit</td>
<td>Log (the number of multi-family housing permits)</td>
<td>3.721</td>
<td>3.138</td>
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<td>9.052</td>
</tr>
<tr>
<td>Number of Total Family Housing Permit</td>
<td>Log (the number of single-family housing permits + the number of multi-family housing permits)</td>
<td>6.366</td>
<td>2.182</td>
<td>0</td>
<td>10.286</td>
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Notes: N=646; Values of land value change, total amount of impact fees, total amount of payroll and per capita income are obtained based on the each amount that is adjusted in 2007 real dollars.
Table 2. Panel Analysis of Land Value Change with Distributed Lags

<table>
<thead>
<tr>
<th></th>
<th>Model 1-1</th>
<th>Model 1-2</th>
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<tr>
<td>[Sum of Lagged Coefficients]</td>
<td>.3700***</td>
<td>0.3770***</td>
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<td></td>
<td>(.1329)</td>
<td>(0.1330)</td>
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<tr>
<td>Ln(Total Amount of Impact Fees&lt;sub&gt;i,t-1&lt;/sub&gt;)</td>
<td>.1362</td>
<td>.1391</td>
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<tr>
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<td>(.1120)</td>
<td>(.1122)</td>
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<tr>
<td>Ln(Total Amount of Impact Fees&lt;sub&gt;i,t-2&lt;/sub&gt;)</td>
<td>.1029</td>
<td>.0965</td>
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<tr>
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<td>(.1277)</td>
<td>(.1278)</td>
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<td>Ln(Total Amount of Impact Fees&lt;sub&gt;i,t-3&lt;/sub&gt;)</td>
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<td>.1413</td>
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<tr>
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<td>(.1165)</td>
<td>(.1165)</td>
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<tr>
<td>Form of Government</td>
<td>5.4600</td>
<td>5.1405</td>
</tr>
<tr>
<td></td>
<td>(9.0502)</td>
<td>(9.0596)</td>
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<tr>
<td>Change in Total Population</td>
<td>.6623***</td>
<td>.6828***</td>
</tr>
<tr>
<td></td>
<td>(.1986)</td>
<td>(.1985)</td>
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<tr>
<td>Change in Unincorporated Area Population</td>
<td>-.2384*</td>
<td>-.2444**</td>
</tr>
<tr>
<td></td>
<td>(.1221)</td>
<td>(.1222)</td>
</tr>
<tr>
<td>Change in Total Amount of Payroll</td>
<td>.0467</td>
<td>.0456</td>
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<tr>
<td></td>
<td>(.0411)</td>
<td>(.0412)</td>
</tr>
<tr>
<td>Change in Per Capita Income</td>
<td>.3880***</td>
<td>.3896***</td>
</tr>
<tr>
<td></td>
<td>(.1029)</td>
<td>(.1030)</td>
</tr>
<tr>
<td>Ln(Single-family Housing Permits)</td>
<td>.2063</td>
<td>(.4623)</td>
</tr>
<tr>
<td>Ln(Multi-family Housing Permits)</td>
<td>.6554*</td>
<td>(.3673)</td>
</tr>
<tr>
<td>Ln(Total Family Housing Permits)</td>
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<tr>
<td>Constant</td>
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<td>-2.8687</td>
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<tr>
<td></td>
<td>(6.8920)</td>
<td>(6.8820)</td>
</tr>
<tr>
<td>Hausman test(Chi&lt;sup&gt;2&lt;/sup&gt; test)</td>
<td>26.98***</td>
<td>23.18***</td>
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<tr>
<td>Wooldridge test for</td>
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<td>.218</td>
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<td>Autocorrelation in panel data(F-test)</td>
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<tr>
<td>R&lt;sup&gt;2&lt;/sup&gt;</td>
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<td>.2004</td>
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<td>Observations</td>
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Note: *p<.10; **p<.05; ***p<.01. Standard errors are in parentheses.
Table 3. Panel Analysis of Land Value Change with Separate Lags

<table>
<thead>
<tr>
<th>Model</th>
<th>Ln(Total Amount of Impact Fees_{i,t-1})</th>
<th>Ln(Total Amount of Impact Fees_{i,t-2})</th>
<th>Ln(Total Amount of Impact Fees_{i,t-3})</th>
<th>Form of Government</th>
<th>Change in Total Population</th>
<th>Change in Unincorporated Area Population</th>
<th>Change in Total Amount of Payroll</th>
<th>Change in Per Capita Income</th>
<th>Ln(Single-family Housing Permits)</th>
<th>Ln(Multi-family Housing Permits)</th>
<th>Constant</th>
<th>Hausman test (Chi^2 test)</th>
<th>Wooldridge test for Autocorrelation in panel data (F-test)</th>
<th>R^2</th>
<th>Observations</th>
</tr>
</thead>
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<td>2-1</td>
<td>..2081**</td>
<td>..2301**</td>
<td>..2075**</td>
<td>5.6128</td>
<td>..6784***</td>
<td>-.2334*</td>
<td>.0418</td>
<td>..4023***</td>
<td>.1627</td>
<td>..6678*</td>
<td>-2.4913</td>
<td>23.69***</td>
<td>.227</td>
<td>.2043</td>
<td>646</td>
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<td>(.0986)</td>
<td>(.1007)</td>
<td>(.1026)</td>
<td>(9.0607)</td>
<td>(.1986)</td>
<td>(.1221)</td>
<td>(.0411)</td>
<td>(.1027)</td>
<td>(.4619)</td>
<td>(.3637)</td>
<td>(6.8631)</td>
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<td>2-2</td>
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<td>..2301**</td>
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<td>5.2790</td>
<td>..6618***</td>
<td>-.2306*</td>
<td>.0443</td>
<td>..3915***</td>
<td>.2256</td>
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<td>24.97***</td>
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<td>.0473</td>
<td>..3827***</td>
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Note: *p<.10; **p<.05; ***p<.01. Standard errors are in parentheses.