DEVELOPMENT IMPACT FEE ADOPTION AND ITS EFFECTS IN TEXAS

A Thesis

by

JONATHAN GENTRY AMBS

Submitted to the Office of Graduate Studies of
Texas A&M University
in partial fulfillment of the requirements for the degree of

MASTER OF SCIENCE

May 2009

Major Subject: Economics

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MASTERS OF SCIENCE

Approved by:

Chair of Committee,	Timothy Gronberg
Committee Members,	Arnold Vedlitz
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ABSTRACT

Development Impact Fee Adoption and its Effects in Texas.

(May 2009)

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Chair of Advisory Committee: Dr. Timothy Gronberg

The purpose of my thesis is to study what factors affect the adoption of impact fees in Texas and what effects impact fees have on city budgets. This research was done using two models. The first model looked at the adoption of impact fees as the dependent variable and the second model looked at the total impact fee assed on new residential units as the dependent variable. Both models used the gross tax rate, debt per capita, change in city population as a percentage, city population, average price of a new home in 2007, number of building permits issued in 2007, and the average household income as independent variables.

The most significant independent variable found for the assessment of impact fees is change in population as a percentage. The total impact fee charged per city was driven by several factors. These included change in population as a percentage, population, and gross tax rate.

DEDICATION

This thesis is dedicated to my grandparents, Jerome and Margaret Ambs. Throughout my life they supported me and set a high standard in their work, family life, and service to their country and community. As a young man, my grandfather served the United States in the Korean War, and, after he retired, he devoted himself to helping people who suffered from respiratory disease. He spent his early life supporting his family and never had the opportunity to complete his college education. My grandmother, Margaret, devoted herself to her family and raised three children. Their enthusiasm for learning never diminished and the value that they placed on education helped inspire all five of their grandchildren to complete college degrees.

ACKNOWLEDGEMENTS

I would like to first thank all of my committee members, Dr. Gronberg, Dr. Jansen, and Dr.Vedlitz, for their assistance and invaluable time. Special thanks go to my committee chair, Dr. Gronberg, who met with me regularly and provided guidance and support during the entire process. Additionally Alice Webster, who works at the NCTCOG, provided significant assistance in obtaining copies of surveys that proved to be very useful.

I would also like to thank my family, who encouraged my pursuit of education from an early age. My father spent countless evenings helping me with math and science, my mother taught me to read and encouraged me to pursue my dreams, and my four grandparents convinced me that I could do anything.

Finally, thanks to all of my friends and fellow students who provided encouragement and support during my time at Texas A&M.

NOMENCLATURE

AOIF	Assessment of Impact Fees
CIPAP	Change in Population as Percentage
DPC	Debt per Capita
G.O.	General Obligation
GTR	Gross Tax Rate
LOS	Level of Service
NCTCOG	North Central Texas Council of Governments
POP	City Population
TIF	Total Impact Fee
TML	Texas Municipal League

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1. HISTORICAL INTRODUCTION AND POLICY CONTEXT OF DEVELOPMENT IMPACT FEES

Policy Context

Throughout most of America's history, growth was associated with progress, and communities welcomed new developments, but in 1970's this started to change. The environmental movement was gaining momentum and residents began to view new growth as a source of unwanted pollution and as a source of the deterioration of city services. Federal grants to municipal governments also fell by roughly one half between 1970 and 1987 (Evans, 2000). This reduction in federal grants coincided with tax revolts in the suburbs. Some states passed legislation limiting the local government's ability to raise revenue, such as California's Proposition 13, and residents around the country refused to support local politicians who tried to raise state taxes. This resulted in a decrease in funds available for capital improvements in suburbs around the country.

Simultaneously unprecedented growth was occurring in southern and western city suburbs. With higher than anticipated growth rates and the inability to raise additional funds from taxation, many city leaders faced budget short falls, resulting in a search for new sources of revenue. Some city leaders turned to impact fees. Impact fees are a onetime capital assessment charged by city governments to developers. The revenue is used to finance capital improvements made necessary by new development.

This thesis follows the style of *Urban Affairs Review*.

Legal History

Impact fees are unusual; most laws are passed by the legislative branch of government and then interpreted by courts. The basis for cities regulating growth and construction can be traced back to colonial times. Examples of city regulation include identification and control of unsafe building materials, creation of building height restriction, and requiring the fencing of agricultural parcels. In addition to regulating the construction materials and design, cities required land developers to provide physical improvements to the land as a pre-condition to building. (Rosenberg, 2005) Impact fees were assessed by cities based on the principle of policing power before states had passed laws regulating them. Resulting legal challenges led to courts interpreting the constitutionality of impact fees and states then adopting laws that adhered to the court's interpretation.

In 1926 the Department of Commerce passed the Standard State Zoning Enabling Act. This act gave local governments the authority to require developers to construct new streets, water mains, and sewer lines within the development. Cities could also require land dedications from the developer to assist in creating new capital infrastructure outside of the new developments. However, land dedications did not always assist the city in creating the new capital required by the development, so cities began charging fees in lieu of land dedications.

Developers challenged the land dedication requirements and fees in lieu of land dedication in the courts as taking without compensation. During the 20th century, several landmark court cases established the limits of impact fees. These cases were

based on the courts interpretation of the 5th, 10th, and the 14th Amendments of the US Constitution. The 5th Amendment stipulates that "No person shall be held to answer for a capital, or otherwise infamous crime, unless on a presentment or indictment of a Grand Jury, except in cases arising in the land or naval forces, or in the Militia, when in actual service in time of War or public danger; nor shall any person be subject for the same offense to be twice put in jeopardy of life or limb; nor shall be compelled in any criminal case to be a witness against himself, nor be deprived of life, liberty, or property, without due process of law; nor shall private property be taken for public use, without just compensation." The last phrase, "nor shall private property be taken for public use without just compensation" has been used by the developers to claim the impact fees are unconstitutional.

The 10th amendment states "powers not delegated to the United States by the Constitution, nor prohibited by it to the States, are reserved to the states respectively, or to the People." This amendment has been used by states and city governments to claim that impact fees fall outside of federal policy, and belong to state governments. The 14th Amendment stipulates that no State may "deprive any person of life, liberty, or property, without due process of law; nor deny to any person within its jurisdiction the equal protection of the laws."

In 1922 the Supreme Court ruled in the case *Pennsylvania Coal Co. v. Mahon.* In this case, Mahon had purchased the surface rights of a property from Pennsylvania Coal Co in 1878 with the agreement that Pennsylvania Coal could continue to operate a mine underneath the household. In 1921 Pennsylvania passed the Kohler Act that

prohibited mining coal that is less than one hundred fifty feet below human habitation. When Mahon sued Pennsylvania Coal Co, it went to the Supreme Court. The Supreme Court ruled that a state may pass legislation that lowers property values without compensating the property holders if the legislation did benefit the public and did not diminish the land's value beyond a reasonable amount.

The ruling is an important factor because economic theory suggests that impact fees may lower undeveloped land values. This allows city leaders to diminish the undeveloped land values as long as it is deemed by the courts to be in the public's interest and it does not diminish the value beyond a reasonable amount.

The U.S. Supreme Court created the requirement for rational nexus in 1987 when the case *Nollan v. California Coastal Commission* was heard. In this case, the California Coastal Commission approved Nollan's building permit for demolishing a smaller house and constructing a new larger house on beachfront property with the condition that Nollan grant a public easement to the beach allowing the public to access the beach via the property. This requirement would have lowered the property's value, so Nolan claimed that it constituted without compensation. The Supreme Court ruled that this requirement was related to the government's desire to improve access to the ocean, but that it placed a disproportionate burden on the owners of coastal property. Since other city residents were not required to assist in the city's goal to create better public access to the beach, this was considered to be taking without compensation and the court ruled in favor of Nollan. This ruling established the principle requires the local governments to prove that they are not placing an undue burden on new residents.

This means that a city cannot assess an impact fee to fund a project that fixes an existing problem without requiring other residents to pay for the improvements. Impact fees may only be used to fund projects that serve the new development.

In 1994 the Supreme Court established the condition of rough proportionality for land exactions. Dolan operated a plumbing store in Oregon, and petitioned for a permit to expand her store and pave the parking lot. The city agreed on the condition that Dolan constructed a pedestrian/bicycle path to help relieve congestion and that part of Dolan's land was to be dedicated as a public greenway to alleviate the increase in runoff. The court ruled that there was a nexus between the cities demands and the needs created by the expansion of Dolan's store, but the city had failed to demonstrate a reasonable relationship between the demands and the needs created by the construction.

This ruling implies that the fee assessed must be proportional to the impact of the new development. A city cannot simply assess an impact fee that funds a project that provides benefits to the community and the new development. The impact fee must be proportional to the new development's use of the capital improvements.

Legislative History

Cities assessed impact fees before States passed legislation authorizing them. In 1987 Texas became the first state to pass legislation regarding impact fees with the passage of Title 12, Chapter 395. This legislation authorized cities to assess impact fees for water, wastewater, and thoroughfare improvements. The fee may not be used to modernize or repair existing facilities that serve current residents, and the project must have a useful life of at least three years. Within two years of receiving the impact fee, the city must begin the construction of the capital improvements that the impact fee was assessed for, and it must spend the entire impact fee within ten years. If the fee is not used within the ten years, or if the new infrastructure costs less than the impact fee's value, the city must refund the impact fee to the current owner of the property with interest.

Today, 27 states have legislation authorizing impact fees. Table 1. lists the states that have adopted impact fees and the year the impact fees were adopted.

Table 1. Impact Fee Enabling Acts in the United States

State	Year	Citation
Arizona	**1988**	Ariz. Rev. Stat. Ann., § 11-1102 et seq. (counties)
Arkansas	**2003**	Arkansas Code § 14-56—103 (cities only)
California	**1989**	Cal. Gov't Code, § 66000 et seq. (mitigation fee act); § 66477 (Quimby Act for park dedication/fee in lieu); § 17620 et. Seq. (school fees).
Colorado	**2001**	Colo. Rev. Stat., § 29-20-104.5; §29-1-801804 (earmarking requirements); §22-54-102 (school fee prohibition)
Florida	**2006**	Fla. Stat., § 163.31801
Georgia	**1990**	Ga. Code Ann § 36-71-1 et seq.
Hawaii	**1992**	Haw. Rev. Stat., § 46-141 et. Seq.; § 264-121 et. Seq.; § 320 (schools)
Idaho	**1992**	Idaho Code, § 67-8201 et seq.
Illinois	**1987**	605 Ill. Comp. Stat. Ann., § 5/5-901 et. Seq.
Indiana	**1991**	Ind. Code Ann., § 36-7-4-1300 et seq.
Maine	**1988**	Me. Rev. State. Ann., Title 30-A, § 4354
Montana	**2005**	Montana Code Annotated, Title 7, Chapter 6, Part 16
Nevada	**1989**	Nev. Rev. Stat. § 278B
New Hampshire	**1991**	N.H. Rev. Stat. Ann., § 674:21
New Jersey	**1989**	N.J. Perm. Stat., §27:1C-1 et seq.; § 40:55D-42
New Mexico	**1993**	New Mexico Stat. Ann., § 5-8-1 et seq.
Oregon	**1991**	Or. Rev. State, § 223.297 et seq.
Pennsylvania	**1990**	Pa. Stat. Ann., Title 53, § 10502-A et seq.
Rhode Island	**2000**	General Laws of Rhode Island, § 45-22.4
South Carolina	**1999**	Code of Laws of S.C., § 6-1-910 et seq.
Texas	**1987**	Tex. Local Gov't Code Ann., Title 12, § 395.001 et seq.
Utah	**1995**	Utah Code, § 11-36-101 et seq.
Vermont	**1989**	Vt. Stat. Ann., Title 24, § 5200 et seq.
Virginia	**1990**	Va. Code Ann., § 15.2-2317 et seq.
Washington	**1991**	Wash. Rev. Code Ann., § 82.02.050 et seq.
West Virginia	**1990**	W. Va. Code, § 7-20-1 et seq.
Wisconsin	**1993**	Wis. Stats., § 66.0617

Source: Mullen 2008

A survey conducted by the General Accounting Office in 2000 revealed that fifty-nine percent of cities with populations in excess of 25,000 collected impact fees. The legislation in the different states specifies what type of capital improvements may be funded with impact fees. Table 2 summarizes what fees may be charged by different states.

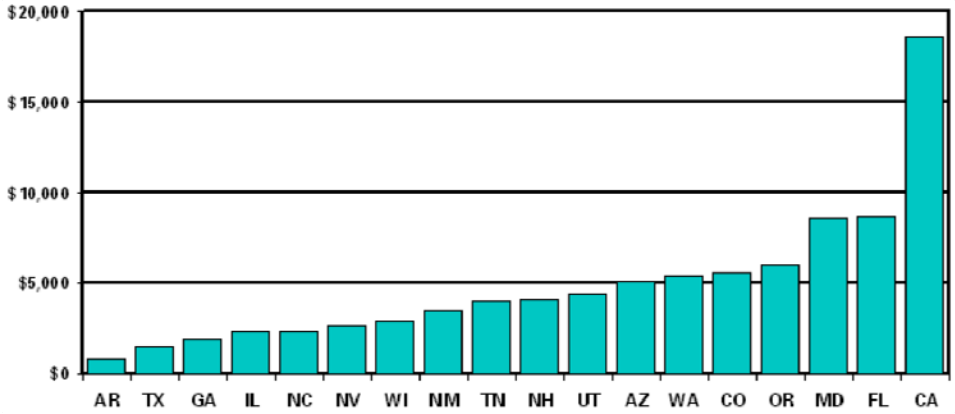
Table 2. Facilities Eligible for Impact Fees by State

State	Roads	Water	Sewer	Storm Water	Parks	Fire	Police	Library	Solid Waste	School
Arizona (cities)	•	•	•	•	•	•	•	•	•	
Arizona (counties)	•	•	•		•	•	•			
Arkansas (cities)	•	•	•	•	•	•	•	•		
California	•	•	•	•	•	•	•	•	•	•
Colorado	•	•	•	•	•	•	•	•	•	
Florida	•	•	•	•	•	•	•	•	•	•
Georgia	•	•	•	•	•	•	•	•		
Hawaii	•	•	•	•	•	•	•	•	•	•
Idaho	•	•	•	•	•	•	•			
Illinois	•									
Indiana	•	•	•	•	•					
Maine	•	•	•		•	•			•	
Montana	•	•	•	•	•	•	•	•	•	
Nevada	•	•	•	•	•	•	•			
New Hampshire	•	•	•	•	•	•	•	•	•	•
New Jersey	•	•	•	•						
New Mexico	•	•	•	•	•	•	•			
Oregon	•	•	•	•	•					
Pennsylvania	•									
Rhode Island	•	•	•	•	•	•	•	•	•	•
South Carolina	•	•	•	•	•	•	•			
Texas (cities)	•	•	•	•						
Utah	•	•	•	•	•	•	•			
Vermont	•	•	•	•	•	•	•	•	•	•
Virginia	•									
Washington	•				•	•				•
West Virginia	•	•	•	•	•	•	•			•
Wisconsin	•	•	•	•	•	•	•	•	•	

Source: Mullen 2007

The cost of the projects that impact fees are assessed for varies from city to city, but since cities in some states are limited in the types of impact fees that they may charge, the average impact fee per state may vary widely. Figure 1 demonstrates this point with Arkansas charging an average of 819 dollars for non-utility impact fees and California averaging 18,535 dollars for non-utility impact fees. Non-utility impact fees include all impact fees excluding those charged for water and wastewater.

Fig. 1. Average Non-Utility Impact Fee for Single-Family Residences



Source: Mullen 2007

Over the past forty years, the use of impact fees has rapidly increased. Prior to 1960, only 18.7 percent of U.S. cities had impact fees. By the 1970's this numbered had almost doubled to 36 percent. Between 1980 and 1985, a survey of 1000 communities found that another 35% of the cities had adopted impact fees (Evans, 2000). A 1989 survey from the Government Finance Officers Association found that 50 percent of cities were using impact fees and another 26 percent were considering using impact fess (Been,

2004). In 2000 the General Accounting Office estimated that 59 percent of cities with populations of 25000 or more used impact fees of some type.

Not only are more cities charging impact fees, the average impact fee is rising. In 2003 the average impact fee for a single-family home was 3,801 dollars. By 2007, the average impact fee for single-family homes was 6,743 dollars. This represents a 77 percent increase in the nominal value of the absolute impact fee assessed.

2. LITERATURE REVIEW

As impact fees became more prevalent, multiple studies examined impact fees from a legal perspective as well as the effect impact fees have on housing prices. Only one article was found examining impact fee adoption.

Articles Discussing Legal Settings of Impact Fees

The majority of articles discussing impact fees from a legal viewpoint occurred in the late 1980's and early 1990's as state governments began to write legislation authorizing city governments to assess impact fees. For example, *Legal Considerations of Development Impact Fees*, by Nancy Stroud, examined the major legal decisions that set precedents for impact fees and outlined the pattern used by state courts judging cases between developers and cities.

The courts' decision on the legality of impact fees may be divided into three phases: the cities authority to assess an impact fee, the relationship between the impact fee and the new development, and the use of the impact fee. During the first phase, the court determines if the city has the authority to assess an impact fee. In the twenty-six states where impact fees are authorized by law, this task is relatively simple. In the other twenty-four states, this decision can be more broadly interpreted. However, impact fees have become more common, and more precedents are currently available for use.

Having established the authority of the cities to assess an impact fee, the court then views the relationship between the new development and the size and purpose of the impact fee. During this phase the court must examine the impact fee based on rational

nexus and rough proportionality. The Supreme Court ruled on *Nollan v. California Coastal Commission* in 1987, and established the precedent of rational nexus. The city must prove that the impact fee does not place an undue burden on the new development by charging for capital improvements that are not made necessary by the construction. The precedent for rough proportionality was established seven years later in 1994 when the Supreme Court heard the case *Dolan v. City of Tigrad*. In this case, the court ruled that the city cannot charge a charge the developers for a disproportionate share of the cost of the new infrastructure.

The final phase examines the projected use of the collected impact fees and the timing of proposed projects. Texas state law clearly dictates this. For a project to be funded with an impact fee in Texas it must have a useful life of at least three years and the fees may not be used to modernize or repair existing facilities. The construction of the improvement must begin within two years of the date that the impact fee was paid, and the city must use the entire impact fee within ten years. If the actual cost of the capital improvement is less than the impact fee, the difference will be refunded to the new property owners with interest from the date that the fee was received.

In Texas, and other states that have laws dictating the use of impact fees, the court only has to view the relationship between the new development and the impact fee that the city assed. This fact reduces the uncertainty associated with cities assessing impact fees.

Articles Discussing Effects of Impact Fees on Housing Prices

Most studies indicate that "there is considerable information to suggest that the cost of impact fees is born by the occupants of new constructed residents in terms of higher purchasing price or higher rents. The landowners, however, may bear a portion in terms of lower land values, depending on the supply of developable land available." (Lawhorn, 1996) All studies have concluded that at least a portion of the impact fees is passed onto the new homeowners. Some studies suggest that new homeowners pay an increase in price that is greater than the impact fee charged to the developers.

In 2004, Vicki Been wrote *Impact Fees and Housing Affordability*. This paper reviewed some past studies that attempted to determine the effect that impact fees have on the price of new and existing homes. She critiqued the models used, and reported the results.

A study done by Delaney and Smith in 1989 found that for every dollar of impact fees assessed, the developers raised the price by three dollars. (Delaney & Smith, 1989 a) A later study conducted by Delaney and Smith in the same year used the same data and compared the price of new homes and existing homes in the city of Dunedin, which assessed impact fees, and Clearwater, which did not assess impact fee. Both cities were located in Pinellas County. In this study, they determined that the price difference between new and existing houses in counties that assess impact fees and in counties that do not assess impact fees dissipate over time. (Delaney & Smith, 1989b) Been raised several possible limitations to this model. The demand for houses in Pinellas County during this period was very high. This created an inelastic market during this period, so

the results might not transfer to an elastic market, with low demand for houses. Litigation that preceded the adoption of the impact fee in Dunedin County could have resulted in different expectations of household value for existing residences. The model also had a rapid adjustment during the eighth year, so a third possible factor was that a variable was omitted that might have explained this rapid adjustment. Finally, no neighborhood variables were included in Delaney and Smith's regression. This made it impossible to determine if their were local factors within the counties that might have explained the price difference.

A study done by Larry Singell and Jane Lillydahl in 1990 looked at the affects of impact fees assessed in Loveland, Colorado. The city of Loveland charged an impact fee of $1182, and the study concluded that it raised the price of new homes by $3800 and the price of existing residences by $7000. (Singell & Lillydahl, 1990) Been points out several limitations in this model as well. She suggests the primary reason for inaccuracy in this model is that it only examines the affects of the impact fees on house prices for an 18-month period. This could be too short for the market to adjust to the impact fees. This model also contradicts the expectation that impact fees should not adjust the price of existing homes to a greater extent than the price of new homes. (Been, 2004)

A study conducted by Marla Dresch and Steven Sheffrin in 1997 evaluated the affect of impact fees in Contra Costa County, California. This county was divided into an affluent western section and a less affluent eastern section. In the affluent section, for every $1 increase in impact fee, new homes increased by $1.88. In the less affluent eastern section, for every one dollar increase in impact fees, the price of new homes

increased by $.25. They also found that in the affluent western section, there was no relation between the increase in the impact fee and the price of existing residences, but in the less affluent western section, every dollar in impact fees increased the value of existing homes by $.23. (Dresch & Sheffrin, 1997)

Baden and Coursey studied the affect of impact fees in eight Chicago suburbs. They found that and additional dollar of impact fees caused an increase in price ranging from $.70 to $2.10. (Baden & Coursey, 2002) Due to the fact that Baden and Coursey grouped pricing data for new homes with pricing data from existing homes, it is difficult to compare their results with other models that separate the change in price of new homes from the change in price of existing homes. (Been, 2004)

A study conducted by Ihlandfeltdt and Shaughnessy was done in 2004. This study concluded that for every $1 increase in impact fees, new residences will experience an increase of $1.64 and existing residences will experience an increase of $1.68. They drew three conclusions from their study. Their first conclusion is that impact fees will increase the price of new homes by the same amount as the price of existing homes. Their second conclusion is that the increase in the price of homes is equal to the present value of the property tax saving caused by raising revenue through impact fees rather than taxes. Their third conclusion is that the value of undeveloped property will decline if the increase in the price of houses is less that the rate of return expected by developers. (Ihlanfeldt & Shaughnessy, 2004)

Impact Fees and Equity

Impact fees are calculated on the expected capital improvements that will be made necessary by the new development, but they do not take into account the household income of the new residence. Because of this they are regressive in nature. As impact fees raise the prices of homes, they exclude lower income families from moving into the suburbs. A study done by Eisenber reported that a $1000 increase in the median price of homes excludes 2170,00 homebuyers. This represents a new form of racial segregation due to the income gap between Caucasian and African American households. (Connerly, 1988)

Without a significant increase in federal funding to cities, however, local governments will continue to search for new sources of revenue. Some authors, such as James C. Nicholas suggest that by modifying the method used to calculate an impact fee, the fee may be made less regressive. (Nicholas, 1992) He suggests that cities calculate impact fees based on the number of square footage of the new residence rather than an impact fee based upon the number of new residence built in an area. Since high-income households build larger houses, they would be charged a higher impact fee than smaller houses built for lower income residences. This would make the fee less regressive in nature.

While assessing impact fees based on the number of rooms within the new residence or the square footage has been upheld in courts, city leaders must be cautious in their attempts to reduce the regressive nature of impact fees. The City of Hollywood Florida attempted to impose an impact fee of 1 percent of the value of the improvements

that were approved in the building permit. The Florida Supreme Court considered this method of assessing impact fees an unconstitutional taxation in 1973. The court defined the impact fee as a tax because the city did not establish a relationship between the size of the fee and the services rendered. An impact fee based on the size of the house is defensible in that larger houses can accommodate more residents. The more residents within a structure, the greater the demand will be for new capital infrastructure.

Local Choices for Development Impact Fees

In 2006, Moon-Gi Jeong wrote *Local Choices for Development Impact Fees* examining the factors that influenced the adoption of impact fees in 66 counties in Florida between 1997 and 2001. Jeong identified 10 factors to predict the adoption of impact fees: types of county governments, the power of the development community, the power of the antigrowth interests, the political party that controls the county, the effect of commission governments vs. reformed governments, local administrative capacity, outstanding debt, geographic proximity to cities that assess impact fees, statewide adoption of impact fees legislations, and state legislation regarding growth management.

Ultimately Jeong predicted that reformed counties, with developers with low political power, strong antigrowth coalitions, democratic majorities, with commission local governments, large administrative capacity, high debt levels, adjacent to counties that had already adopted impact fees, with state legislation authorizing the assessment of impact fees and growth management were the most likely to adopt impact fees.

3. THEORETICAL MODEL

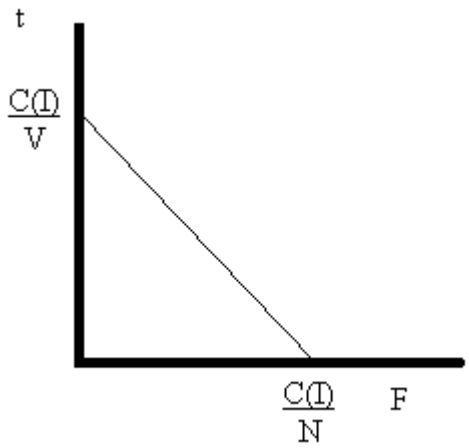
In my model, I assume that the amount of funding required by city leaders is fixed at providing new residences with the current level of service provided to existing residences. When new developments occur, the city must create new capital infrastructure, I, to provide services for the new residents. The cost of the required infrastructure, C(I), can be treated as an exogenous in this problem.

To fund new projects, city managers must chose between increasing taxes, assessing impact fees or issuing debt. In the long run, cities must operate under balanced budgets, so debt represents future tax burdens to the cities members. Therefore city managers must decide between an increase in the gross tax rate, t, or charging an impact fee, F. The amount of money that can be raised by an increase in taxes is proportional to the assessed value of the property within the city limits, V. The amount of money that can be raised with impact fees is proportional to the number of impact fees that the city may assess, N. Both N and V will be treated as fixed variables that the city leader treats as exogenous. The budget constraint can be represented with the equation

$$C(I) = t * V + F * N$$

The slope of the budget constraint is equal to –N / V. The budget constraint faced by city leaders if illustrated in Figure 2.

Fig 2. Budget Constraint



The above graph shows the budgeting decision faced by city leaders when they have to decide between funding new projects with an increase in tax rates or assessing impact fees.

If you hold N constant, the larger the cities' assessed value, V, is which varies directly with population, the greater the affect of an increase in taxes due to the large tax base. This will cause the slope of the line to become flatter as shown in Fig 3. A city with a smaller population has a smaller assessed property value. Therefore it will have a steeper budget constraint than a large city.

Fig. 3. Budget Constraint with Fixed N

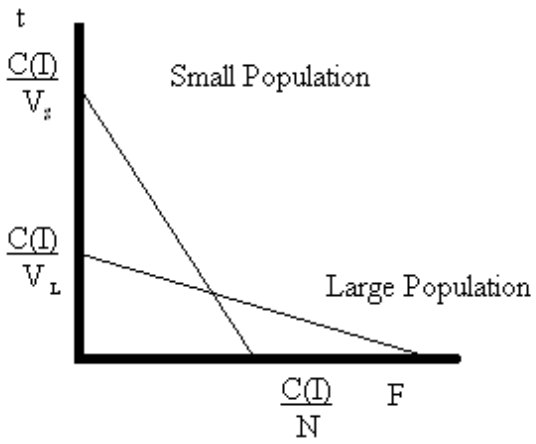


Figure 3 depicts the differences between cities with small populations and cities with large populations. Cities with large populations have larger tax bases, V_L, so a smaller increase in Gross Tax Rate will result in a larger increase in funds, which leads to the steeper slope. Cities with smaller populations have smaller tax bases, V_s, so it takes a larger increase in gross tax rate to raise the same funds.

Cities that have a larger N, holding C(I) constant, will have a steeper budget constraint curve. This is the expected outcome with more new houses being built and more impact fees being collected. Therefore a slight increase in impact fees will result in a significant increase in revenue. If very few new construction projects are occurring, then very few impact fees may be collected. Consequently, it will take a large increase in impact fees to significantly change the revenue produced by impact fees as shown in Figure 4.

Fig. 4. Budget Constraint with Fixed V

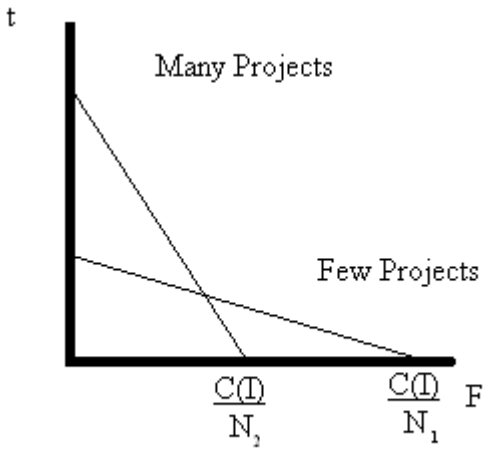
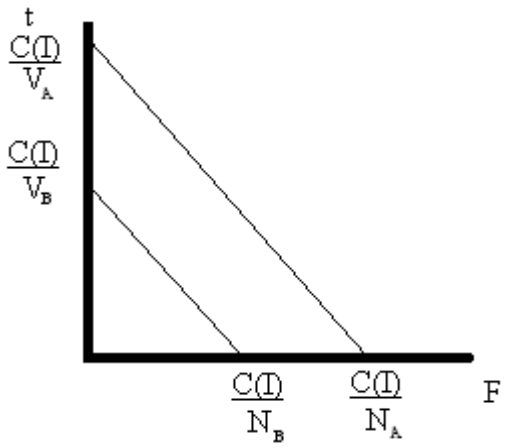


Figure 4 demonstrates a city leader's ability to raise capital through impact fees. If many new projects are being conducted, impact fees may be used to raise large amounts. If only a few new projects are beginning, impact fees require much larger increases in amount to significantly raise revenue.

Fig. 3. and Fig. 4. can be combined into a single figure by considering the percentage rate of change in a city's population. For example, City A and City B have identical home values and Gross tax rates. City A has 100,000 current residences and 10,000 new residences being constructed. City B has 10,000 current residences and 1,000 new residences being constructed. The managers of City A and City B are faced with the same slope between GTR and Total Impact Fees per new residences. The slope of Fig. 2. Is 10 times steeper for City B than City A, but the slope in Fig. 3. Is 10 Times steeper for City A than for City B. Because of this, both city leaders face the same slope

between GTR increase and Total Impact Fee assessed per new residence as shown in Figure 5.

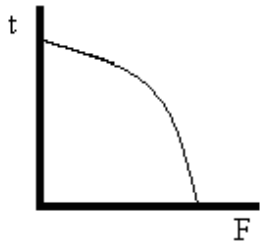
Fig. 5. Budget Constraint Comparison



While impact fees do represent another possible source of revenue, they also have an initial creation price and risk possible lawsuits. The alternative is raising the funds through taxation, which is unpopular with the representative's constituents. Therefore a city leader is facing a decision set composed of two undesirable choices. The leader's goal should be to minimize them. It is reasonable to assume that city managers are risk averse and interested in avoiding lawsuits. If a city leader charges more for the impact fee than the project is worth, he/she will eventually face legal challenges and costs. The larger the impact fee is, the greater the manager's risk, so the city leader should be expected to raise GTR to mitigate this risk. Because of this the indifference curve will be the steepest when impact fees are high. If impact fees are low,

the city manager faces relatively low risks of legal challenges, so he can afford to raise the impact fee without significantly increasing his risk, so the indifference curve is shallow at this point. Therefore the indifference curve should be concave as shown in Fig. 6.

Fig. 6. City Leader's Indifference Curve



If a city is facing a low growth rate proportional to its population, the city leader will face the decision curve shown in Fig. 6. This city leader should be expected to charge no impact fee because the start up cost and the cost of implementing the impact fee would be greater than the revenues generated by the impact fee.

Fig. 7. Decision with a Low Growth Rate: Corner Solution

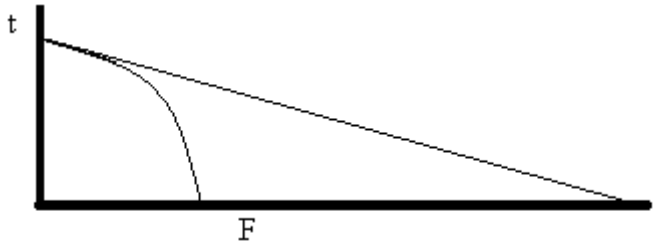


Figure 7 models the decision making process for cities experiencing low growth. The indifference curve is tangent with the pricing line when the improvements are completely funded with gross tax rate increases.

If the city is facing rapid population growth, however, the city leader would be responding to a different indifference curve. In this scenario, the city leader is expected to assess an impact fee that covers at least a portion of the cost of the new infrastructure. Even though this impact fee may be high, it will not cover the complete cost of the project due to the risk faced by the city leader of possible lawsuits brought on by developers.

Fig. 8. Decisions with a High Growth Rate

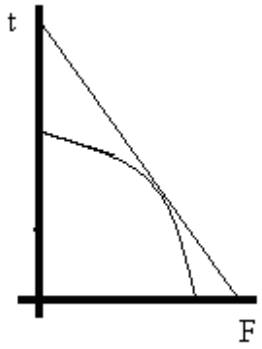
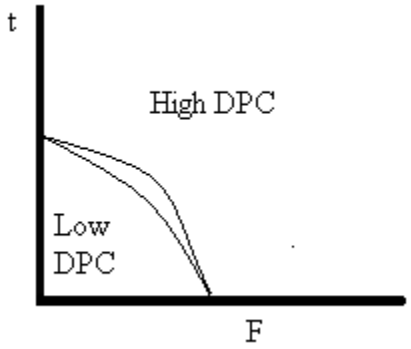


Figure 8 models the decision making process of a city leader that is facing a rapid growth rate. In this scenario a city leader may be expected to finance a significant portion of the needed capital improvements with an impact fee.

The level of debt per capita will shift the indifference curve of a city leader. A city with a high level of debt per capita, DPC, will have to charge a higher tax than a city with a low DPC due to the cost of servicing the existing city debt. This will make further increases in the tax rate less likely due to the unpopularity of the existing tax level as shown in Figure 9.

Fig. 9. Indifference Curve with Debt Per Capita



In my model, a city experiencing rapid growth with high levels of debt per capita is more likely to adopt an impact fee than a city with lower growth rates and lower debt per capita. My model also predicts that a city experiencing rapid growth with high levels of debt per capita will charge a higher impact fee than a city experiencing average growth and average debt per capita.

4. ECONOMETRIC MODEL

The first question that confronts a city manager is whether or not they should assess an impact fee. This decision should relate to the city's population size, change in population as a percentage, gross tax rate, debt per capital, year, the average price of a new home, the number of building permits issued during the previous year, and the average household income. If the city's leadership decides to assess an impact fee, their next step is determining the appropriate level of the impact fee. The second model will look at the relationship between the size of the impact fee assessed per residential unit and the city's population size, change in population as a percentage, gross tax rate, debt per capital, year, the average price of new homes, the number of building permits issued during the previous year, and the average household income.

Differences between Florida and Texas

There are several important differences between Texas and Florida that need to be noted. Texas passed legislation authorizing cities to assess impact fees in 1987. Florida did not pass similar legislation until 2006. The average impact fee for a single-family home in Texas in 2007 was 2,987 dollars (Mullen, 2007), while, in Florida, the average impact fee in 2007 was 9,939 dollars (Mullen, 2007). The primary reason for the disparity is that Texas cities are only authorized to assess impact fees for roads, water, sewage, and storm water whereas Florida cities are authorized to assess impact fees for roads, water, sewer, storm water, parks, fire and police departments, libraries, solid waste, and schools.

Another distinction between Texas and Florida political is composition. In the 2004 presidential general election, 61.08 percent of the Texas votes were for the Republican candidate while 38.22 percent of the votes were for the Democratic candidate. In the Texas State Senate, Republicans hold 20 out of 31 seats. In Florida during the 2004 presidential election 52.1 percent of voters supported the Republicans and 47.09 percent of the voters supported the Democratic candidates. In the Florida State Senate, Republicans held 26 our of 40 senate seats

Models

Two models will be created using two data sets described in the next section. The first model will look at the factors that affect a city leader's decision to assess an impact fee, and the second model will look at how these factors affect the size of the impact fee.

Model 1

Model 1 examines the relationship between the adoption of impact fees and city population, POP, the change in population as a percentage, CIPAP, the debt per capital, DPC, average price for a new home in 2007, AVGP07, number of building permits issued in 2007, BP07, and average household income, AVGINC.

$$\text{Adoption of Impact Fees} = B_0 + B_1 \text{Pop} + B_2 \text{CIPAP} + B_3 \text{GTR} + B_4 \text{DPC} + B_5 \text{AVGP07} + B_6 \text{BP07} + B_7 \text{AVGINC} \quad (1)$$

The regressors in this model include:

Population-- Cities with larger population have larger city governments. Larger cities governments lead to more specialization within the city government as well as more resources that can be devoted to developing projects such as impact fees. Because of this a positive correlation between population and the assessment of impact fees is expected.

CIPAP-- Change in population as a percentage represents the growth rate of a city. Growth rate as a percentage was chosen because this method takes into account the scale of the increase. The effect of 5,000 new residents would be greater in a city with a population of 25,000 than it would be in a city with a population of 100,000. The more rapid the growth rate, the greater the strain will be on the city to finance capital infrastructure improvements. In view of this, a positive correlation between CIPAP and the assessment of impact fees is anticipated.

DPC-- Debt per capita measure the amount of city debt divided by the population. If debt per capita is high, cities may be viewed as having large existing obligations and may be more likely to assess impact fees. Additionally, impact fees do not recover the full cost of building new capital infrastructure for new developments, so cities that experience higher growth rates will have larger debt per capita than cities with lower growth rates. Additionally, debt per capita represents future obligations in the form of higher taxes. Therefore, convincing the population to accept more future obligations will be difficult when the city's population is already paying a substantial

portion of the budget to service existing debt. Therefore I expect a positive correlation between the adoption of impact fees and debt per capita.

AVGP07-- Impact fees can be measured as a percentage of the cost of a new home. The higher the average price of new homes is, the smaller the percentage of the cost of a new home comes from an impact fee. For this reason, a positive correlation between the average price of a new home and the assessment of impact fees is anticipated.

BP07-- Since impact fees may only be assessed when building permits are issued, the more building permits issued, the more revenue can be collected by assessing an impact fee. Accordingly, cities that are issuing numerous building permits, should be expected to assess impact fees given that they produce a viable source of revenue.

AVGINC-- The higher the average household income is within a city, the more affluent the current residents are. Since new residences can be expected in a similar income bracket, income fees may be used for these cities. Another possible interpretation is that the cities with high-income residences may be using impact fees to maintain a certain price level for new household to exclude lower income residents. Under either assumption, a positive correlation between average household income and the assessment of impact fees is likely.

This model was estimated with both a probit and a linear regression with robust standard errors. The probit regression method was chosen because the assessment of impact fees is represented binomially with a 1 representing the choice to access an

impact fee and a zero representing the choice to not access an impact fee. The logit model is viable alternative to the probit model, but the main advantage of the logit model is its simplicity. Since we are dealing with a small sample size, the probit model was selected.

Model 2

Model 2 examines the relationship between the total impact fee charged per new residential unit, tif, and the cities population, pop, change in population as a percentage, cipap, gross tax rate, GTR, debt per Capital, DPC, and the year. The base year was taken to be 1987 when Texas passed legislation authorizing the assessment of impact fees.

$$\text{Total Impact Fees}=B_0 + B_1\,\text{Pop} + B_2\,\text{CIPAP} + B_4\,\text{DPC} + B_5\text{DV05} + B_6\text{DV02} + B_7\,\text{DV97} + B_8\,\text{AVGP07} + B_9\,\text{BP07} + B_{10}\text{AVGINC} \qquad (2)$$

The regressors for this model include:

Pop-- Prior papers report that while larger cities are more likely to assess impact fees, smaller cities are likely to charge larger impact fees. This may stem from larger cities dealing with larger developers, who have more advanced legal teams. These legal teams are likely to challenge impact fee laws that are more aggressive based on the rough proportionality test. Developers in smaller cities are generally smaller, and they lack the resources to mount such legal challenges. I expect the correlation between POP and TIF to be negative.

CIPAP-- Change in Population as a percentage measures the increase or decrease in population levels within a city. Cities that are experiencing rapid growth are more likely to face difficulty raising the required capital to fund infrastructure improvement programs, so these cities are likely to charge higher impact fees. Because of this, I expect a positive correlation to exist between CIPAP and TIF.

DPC-- Debt per capita measures the amount of city debt bourn by each resident within the city. Higher debt levels indicate that the city is struggling to finance existing projects, which will lead to higher impact fee rates. I expect a positive correlation to exist between DPC and TIF.

AVGP07-- Impact fees can be measured as a percentage of the cost of a new home. The higher the average price of new homes is, the smaller the percentage of the cost of a new home comes from an impact fee. Because of this, City A with an average price of new homes of 2X will have to charge twice the impact fee of city B with an average price of new homes of X, to create the same percentage increase in the price of homes. Therefore I expect a positive correlation to exist between the average price of a new home and the assessment of impact fees.

BP07-- Since impact fees may only be assessed when building permits are issued, the more building permits are issued, the more revenue will be generated by impact fess. Because of this, cities that are issuing numerous building permits may be expected to be more aggressive in their assessment of impact fees because the impact fees represent a larger portion of the cities budget. Hence I expected to a positive

correlation to exist between the number of building permits and the total impact fees assessed per new residential unit.

AVGINC-- The higher the average household income within a city, the more affluent the current residents are. These residences can afford to pay a higher impact fee in the form of a higher price of new homes. Since the new residences can afford to pay a higher impact fee, I expect to see a positive correlation between average household income and the total impact fee.

A normal linear regression was used to solve for this relationship.

5. DATA

Three sources of data were used to gather information about cities that assess impact fees and cities that do not assess impact fees. The Texas Municipal League, TML, conducts an annual Tax and Debt Survey. This survey was available online between 2002 and 2008. Prior to 2002, the Tax and Debt Survey may be found in Texas Town and City, a Texas Municipal League publication. Another source of data was the website city-data.com. This website only contains information for the 2007 fiscal year. The final source used was the North Central Texas Council of Governments, NCTCOG. The NCTCOG conducts a Municipal fee survey. This survey was not done annually in the past, and the NCTCOG charges $150 dollars per survey. Surveys were obtained from 2008, 2005, 2002, 1997, and 1995.

These three sources of Data were combined to form two subsets of data. The first subset of data evaluates the assessment of impact fees over time. This set includes all the cities that responded to all five NCTCOG surveys. This data set cannot include the variables from city-data because city data because it did not provide historical data. The second subset of data includes all of the respondents to the 2008 NCTCOG survey. This survey was able to incorporate the information from city data.

Texas Municipal League

One source of data originated from the Texas Municipal League, TML. The TML is a voluntary organization of Texas cities that provides services to its members. As of 2003, 1067 cities had joined the organization. Every year TML conducts several

surveys, one of which is entitled the Tax and Debt Survey. The cities that respond to this survey list their total population, net taxables, gross tax rate, General obligation Bond Indebtedness, Revenue Bond Indebtedness, and Certificates of Obligation. From 2008 to 2002 these surveys were available online. From 2001 through 1995, these surveys were published in a journal published by the TML called the Texas Town and City.

The TML provided several important pieces of data that were used during this study: the total assessed valuation, gross tax rate, general obligation bonds, G.O. Bonds, revenue bond, and certificates of obligation. The total assessed valuation is the government's estimate of the property values within the city limits. The gross tax rate is the rate at which assets are valued per 100 dollars of assessed valuation. The G.O. bonds are bonds that are insured from the taxing power of the issuers. Revenue bonds are payable from revenues that come from income producing facilities. They sometimes have physical plants or property that serve as collateral. Certificates of obligation are used to pay contractual obligations from construction projects. Certificates of obligation are most directly linked to impact fees since impact fees are designed to allow cities to fund capital improvement projects that will benefit the new developments. The TML did not include Certificates of Obligation in the 1997 or 1995 survey, so observations on this available are not available for the entire time involved.

These three types of obligation, general obligation bonds, revenue bonds, and certificates of obligation, were summed together, and divided by the cities population to solve for the debt per capita within the city. Table 3 summarizes the average total

assessed valuation, gross tax rates, and debt per capita. Between 2008 and 1995, the average gross tax rate remained relatively stable, while the average assessed value fluctuated widely. This is most likely caused by responses from large cities in 2008 and 2002 that chose not to respond in the other three surveys. The most significant change is in the Average Debt per Capita, which almost doubles between 1995 and 2008.

Table 3. Tax and Debt: 1995-2008

	Total	2008	2005	2002	1997	1995
Average Assessed Value (in millions)	$3,558.80	$4,285.07	$3,277.01	$4,730.49	$2,924.08	$3,137.36
Average Gross Tax Rate	0.57	0.56	0.59	0.56	0.58	0.59
Average Debt per Capita	$1,369.89	$1,893.37	$1,761.03	$1,161.07	$980.15	$1,053.85

Source: Texas Municipal League

City Data

Information about the median selling price of homes, median income of households, number of building permits issued, and the average price of the new homes being constructed was gathered from a web site called city-data.com. This website had the median price of homes and median household income for 2007, and the number of building permits and average price of new homes from 1997 – 2007.

Table 4 looks at the differences between the respondents of the NCTCOG survey in 2007 and statewide average. The average household/condo value across Texas is $120,900, while the cities that responded to the NCTCOG survey in 2008, had an average household/cond value of $154,850 in 2007. The respondents of the NCTCOG survey also had a higher average household income than the average Texas home owner. NCTCOG respondents had an average household income of $ 60,112 while the average Texas household income is $47,548. The average household size was very similar between the respondents to the NCTCOG survey and the state of Texas.

Table 4. NCTCOG Respondent Representation

	Average Median Household/Condo Value	Average Household Income	Average Household size
NCTCOG respondents	$ 154,850	$ 60,112	2.8
All Texas Cities	$ 120,900	$ 47,548	2.7

Source: city-data.com

North Central Texas Council of Governments

Data was collected from the North Central Texas Council of Governments, NCTCOG. The NCTCOG is a volunteer association of local governments in the Dallas Fort Worth area. One hundred sixty eight cities, sixteen counties, twenty-three independent school districts, and twenty-nine special districts are members of this organization. One of the services provided by the NCTCOG is that it conducts a

voluntary Municipal Fee survey. This survey is not collected every year however, so it is difficult to create a complete picture using these surveys. The surveys from 2008, 2005, 2002, 1997, and 1995 were purchased for this research. One hundred twenty out of one hundred sixty eight cities responded to at least one of the surveys.

From this survey, water, wastewater, and thoroughfare impact fees charged by the cities during that particular year were available. The three fees were summed to calculate the total impact fee charged by the city per new residential unit. Population data was then used to calculate change in population as a percentage of former population.

Table 5. NCTCOG Responses

	Total	2008	2005	2002	1997	1995
Total Number of Respondents	120	56	53	80	69	44
Number of Cities that Assessed Impact Fees	56	26	23	20	29	23
Percentage of Cities that assessed Impat Fees	46.67	46.43	43.4	25	42.03	52.27

Source: NCTCOG

When a range of possible fees was given the lowest fee was selected unless the minimum value given was 0. In this case, the average of the range was taken. If impact fees for water and wastewater were based on the size of the meter that was to be

installed, the 5/8" and 3/4" meter were selected. Some cities chose not to provide values for the impact fees assessed. They made a note next to the column that stated fee varies or estimated by formula. When this occurs, an X was placed in the column. The X represents an unknown value. Since no numbers are known for this value, we calculate it as a zero for calculating the total dollar value of impact fees. If the option was given to select between residential and commercial impact fees, residential fees were selected. To determine the total impact fee, the actual water, wastewater, and thoroughfare fees were summed together, and divided by the number of cities that assessed the fees.

Table 6 contains the average impact fee assessed by the cities that charge impact fees, the standard deviation of the impact fees, and percentage change in the average impact fee charged.

Table 6. Average Impact Fee

	Total	2008	2005	2002	1997	1995
Average Total Impact Fee	$1,567	$2,341.42	$2,260.65	$1,296.84	$1,109.00	$817.08
Standard Deviation	1045.95	1527.43	1707.87	849.12	546.16	598.19
Average Percentage Change in Total Impact Fee per Year	8.44	0.88	21.21	3.03	16.5	

Source: NCTCOG

The types and number of impact fees also varies by year. The number of cities that assess thoroughfare impact fees increases as a percentage from a low of 21.74% in 1995 to 46.15% in 2008. In 1997, 44.83% of cities assessed impact fees. The variation in the number of cities that assess impact fees remains fairly stable, ranging from 23 cities to 29 cities.

Table 7. Types of Impact Fee by Year

	Thoroughfare (actual)	wastewater (actual)	water (actual)	Assessed Impact Fees
2008	12	24	25	26
2005	9	21	23	23
2002	5	22	24	24
1997	13	29	25	29
1995	5	20	22	23

Source: NCTCOG

Data Subsets

Two subsets of data were generated. The first set of data looked at the assessment of impact fees over time. This set only uses data from the TML Tax and Debt Survey and the NCTCOG Municipal Fee survey. The second subset of data utilized the variable information from city-data.com. Since this information was only available for 2007, I could only use the NCTCOG survey from 2008 and the TML data from 2008.

Data Set 1

The first set of data looks at the use of impact fees over time. This data set was created by eliminating all the cities that did not respond to all five NCTCOG surveys. Only 13 cities meet these criteria. This method leads to a potential selection bias because the cities within the data set may not be representative of the average city in Texas. The average city population in the NCTCOG is 34,950. The average population of cities that responded to all five surveys is 53,319 the average population of a city that responded to the 2008 survey, excluding Dallas, is 32887. Cities that responded to the survey five times also had the lowest standard deviation of population for the three groups. The entire NCTCOG area has a standard deviation of 121,244 and the cities that did not respond five times has a standard deviation of 125,460. Cities that did respond five times had a standard deviation of 46,045. This is only slightly more than one third of the total standard deviation. This implies that the cities that participated in the survey are on average fifty percent larger than the cities that did not participate in the survey and have a lower variance in population as shown in Table 8.

Table 8. Average Populations from NCTCOG Surveys

	Total	Responded 5 Times	Responded to NCTCOG 2008	Responded to NCTCOG 2008 excluding Dallas
Average Population	34950	53319	55991	32887
Standard Deviation of Population	121244	46045	175004	42851

Source: NCTCOG

Table 9. demonstrates that cities with larger populations are also more likely to respond to the survey sent out by NCTCOG. This is likely because larger cities have more staff members who can do additional tasks such as responding to surveys. There is also a positive correlation between population and the adoption of impact fees. (Jeong, 2006) This leads to a higher percentage of cities that have adopted impact fees in the study group than is representative of NCTCOG as shown in Table 9.

Table 9. Assessment of Impact Fees as a Percentage of Responses

	5 responses	2008	2005	2002	1997	1995
Total Responses per Year that Recurred 3 or more times	13	36	36	43	42	32
Cities that Reported Impact Fees	9	21	18	14	21	17
Cities that Reported Impact Fees as a Percentage	69.23	58.33	50	32.56	50	53.13

Source: NCTCOG

Every city that responded to all five NCTCOG surveys is a member of the TML, but due to the fact that the TML survey is voluntary some cities elected not to respond every year. Every city selected from the NCTCOG's municipal fee survey responded to three years or more. Table 10 lists the 13 cities used in the sample, and the response rates. Eight cities responded to all five surveys, three cities responded to four surveys, and two cities responded to three survey.

Table 10. TML Response Rate

TML RESPONSES	2008	2005	2002	1997	1995
Allen	1	1	1	1	1
Cleburne	1	1	1	1	1
Coppell	1	1	1	1	1
Duncanville	1	1	1	1	1
Farmers Branch	1	1	1	1	1
Flowermond	1	1	1	1	1
Granbury	1	1	1	1	1
Grand Prarie	1	1	1	1	1
Kaufman	1	1	1	1	1
McKinney	1	1	1	1	1
North Richland Hills	1	1	1	1	1
University Park	1	1	1	1	1
Weatherford	1	1	1	1	1

Source: TML

This means that for the first set of data, there are 58 observations for 13 cities over 13 years. Of the thirteen cities that responded to all five NCTCOG surveys, nine indicated that they assessed an impact fee at least once during the period.

Eight cities listed their impact fees in 2008, eight cities listed their impact fees in 2005, four cities listed their impact fees in 2002, seven cities listed their impact fees in 1997, and five cities listed their impact fees in 1995. I assume that once a city begins assessing an impact fee, it doesn't revoke it. Thus I assume that the nine cities that indicated that they assessed an impact fee at least once during that time period, assessed that impact fee over the whole time period. This means that I could not evaluate the initial adoption of an impact fee as a function of time.

I set the change in population in 1995 to equal the average change in population from 2008 to 1997. To fill in the gaps caused by cities that did not respond to impact fees during a particular year, I had to impute the gross tax rate and the debt per capita. Since the gross tax rate remained relatively stable between 2008 and 1995, I assumed that the gross tax rate for cities that did not respond to the TML survey during a particular year was the same as the gross tax rate that was reported in the prior year. The nominal average debt per capita increased by 80 percent between 1995 and 2008. This is equal to a 4.61 percent increase compounded annually. To estimate the debt per capita, I divided the debt per capita from a previous TML Tax and Debt survey by 1.0461 raised to the nth power, where n was the number of years that had elapsed since the last debt per capita was reported. After data imputations, there were 65 observations in data set 1.

Data Set 2

If a city had elected to respond to the NCTCOG survey in 2008 and not the TML survey, than I went to a previous year in the TML to get the information for that city.

Since the gross tax rate did not vary significantly over time, I held the gross tax rate constant. The debt per capita grew at an average rate of 4.61 percent compounded annually between 1995 and 2008. To determine the debt per capita when data was missing in 2008 Tax and Debt survey, the debt per capita value from a previous TML survey was multiplied by 1.0461 raised to the nth power where n is the difference in years between 2008 and the most recent Tax and Debt Survey response available for that city. Two cities that responded to the NCTCOG surveys did not respond to any TML Tax and Debt Surveys between 2002 and 2008. This left 54 observations. Dallas was also removed from the data set due to its population size. Dallas has a population of over 1.2 million people. This is significantly larger than the average city located within the NCTCOG.

6. MODEL ESTIMATES

For each model, two data sets are used. The data set that looks at the cities that responded to all five NCTCOG survey does not include the variables for the average price of new homes in 2007, AVGP07, the number of building permits issued in 2007, BP07, or the average household income, AVGINC because data for these variables were not available after 2008.

To scale the variables debt per capita was measured in units of $1,000, the cities population was measured in units of 10,000 people, the average price for a new home was measured in units of $ 100,000, the number of building permits issued in 2007 was measured in units of 100 building permits, and the average household income was measured in units of $10,000.

Model 1

Model 1 looks at the factors that influence the adoption of impact fees using a probit and linear regression and the following equation.

$$\text{Adoption of Impact Fees}=B_0 + B_1\,\text{Pop} + B_2\,\text{CIPAP} + B_3\,\text{GTR} + + B_4\,\text{AVGP07} + B_5\,\text{BP07} + B_6\text{AVGINC}$$

Table 11 reports the findings from a linear regression with a robust standard error for cities that responded to 5 NCTCOG surveys. This model looked at 13 cities over 13 years with five observations between 2008 and 1995. This means that there are 65 observations.

Table 11. Adoption of Impact Fees: Linear Regression-Estimates

Variable	Coefficient	Robust Standard Error	t-statistic
Intercept	**0.26**	**0.12**	**2.12**
DPC	**0.11**	**0.04**	**3.13**
CIPAP	**0.04**	**0.007**	**4.98**
POP	**0.03**	**0.01**	**2.25**
Observations	65		
R-squared	0.3247		

This model yields coefficients consistent with several predictions from my theoretical model. The adoption of impact fees is positively correlated with debt per capita, change in population as a percentage, and population. The independent variable with the largest t-statistic is change in population as a percentage. Another important conclusion that can be derived from the above table is that impact fees are used more frequently by cities that have high debt levels. The debt per capita has the largest coefficient for the independent variables that were viewed. The population is also positively correlated with the adoption of impact fees.

Debt per capita is measured in units of $1,000. The average debt per capita for data set 1 is $1,359, but the largest debt per capita is $6,021, and the standard deviation is 1.14 units. The coefficient for debt per capita is .11, which makes debt per capita a fairly important determinant for the decision to adopt an impact fees. Change in population as a percentage averages 4.84. The most rapid change is 25.83 percent, and

the standard deviation is 5.73. The coefficient for the change in population as a percentage is .04, which makes change in population a very important factor in the decision process for a city manager to adopt an impact fee. The population is measured in units of 10,000, and the average city population for data set 1 is 40,144. The largest population is 161,550, and the standard deviation is 3.31 units. This means that population is fairly important in the city's decision to adopt impact fees.

Table 12 reports the findings for a probit regression for the cities that responded to five NCTCOG surveys between 2008 and 1995. There are 13 cities that meet these criteria, and that means that there are 65 observation points that are examined.

Table 12. Adoption of Impact Fees: Probit Regression Estimate

Variable	Coefficient	Standard Error	t-statistic
Intercept	-1.39	0.28	2.91
DPC	0.14	0.21	0.68
CIPAP	**0.52**	**0.17**	**2.99**
POP	0.16	0.1	1.66
Observations	65		
Pseudo R-2	0.4513		

The probit model also confirms the prediction made in my theoretical model that there would be a positive correlation between the adoption of impact fees and the debt per capita, change in population as a percentage, and the cities population. In this model, the only statistically significant independent variable is change in population as a percentage. This is consistent with the results from the linear regression with robust

standard errors that change in population as a percentage is the most important indicator of the assessment of an impact fee. In this regression, change in population as a percentage is the most important independent variable facing a decision maker who is deciding whether or not to adopt impact fees. It has the highest standard deviation of the three independent variable included in the model, 5.73, and the highest coefficient, .52.

Tables 13 and 14 displays the results for a linear regression of the assessment of impact fees from cities that responded to the 2008 NCTCOG Survey and responded to the Texas Municipal League Tax and Debt survey between 2008 and 2002. Dallas was eliminated due to the population size.

Table 13. Adoption of Impact Fees: 2008 Sample

Variable	Coefficient	Robust Standard Error	t-statistic
Intercept	0.2	0.12	1.66
DPC	0.03	0.05	0.58
CIPAP	0.03	0.17	1.86
POP	**0.03**	**0.15**	**2.07**
Observations	53		
R-squared	0.47707		

In this regression, population remains statistically significant, and its coefficient is .03 for the linear regression using data set 1 and the linear regression using data set 2. While fewer only one of the three independent variables in this model is statistically significant, the R-squared value is much higher. Using data set 1, the R-squared value

was .3247, but using data set 2 the R-squared value was .47707. This means that data set has more overall significance. The change in population as a percentage is almost statistically significant, but debt per capita losses most of it's significance in this model with a t-statistic of .58.

In data set 2, the average debt per capita is 1.78 units with a maximum of 6.02 units, and a standard deviation of 1.25. This makes the coefficient of .03 relatively insignificant. The average change in population as a percentage is 4.67 with a maximum value of 21.71, and a standard deviation of 5.47. This implies that change in population as a percentage is very important to the adoption of impact fees. The average population is 3.30 units with a maximum of 22.48 units, and a standard deviation of 4.28. This implies that population is also an important factor.

Table 14. Adoption of Impact Fees: 2008 Sample with Expanded Regressor

Variable	Coefficient	Robust Standard Error	t-statistic
Intercept	0.15	0.24	0.62
DPC	0.03	0.05	0.57
CIPAP	0.03	0.02	1.66
POP	**0.03**	**0.01**	**2.47**
BP07	-0.009	0.02	-0.35
AVGP07	-0.004	0.05	-0.08
ANGINC	-0.01	0.02	-0.35
Observations	53		
R-squared	0.1608		

The linear regression with data set 2 has fewer statistically significant independent variables than the linear regression for data set 1, and the same number of statistically significant independent variables as the linear regression with data set 2 that does not include the number of building permits, the average price of a new home, and the average household income. The regression with data set 2 also has a lower R-squared value, .1608, than the regression for data set 1 which had an R-squared value of .3247. The low R-squared value indicates that multicollinearity exists within this model. This most likely results from the relationship between change in population as a percentage and the number of building permits issued in 2007. Another possible relation exists between the average household income and the average price of new homes.

The only significant independent variable was population with a coefficient of .03. This is the same coefficient found when doing a linear regression with robust standard errors for data set 1. In all three linear regressions using data set 1 and data set 2, population remained statistically significant and positive as predicted in my theoretical model.

The coefficients for the number of building permits issued in 2007, the average price of a new home in 2007, and the average household income were negative. While these coefficients are statistically insignificant, their values are surprising, and further research should be conducted in this area.

A possible cause for the insignificance in average household income is that the cities that responded to the 2008 NCTCOG survey had an average household income of 60,012 dollars while the statewide average is 47,548 dollars. This indicates that the

respondents to the NCTCOG survey do not contain an even distribution of income. The same discrepancy can be observed in the average price of the average median household value. The respondents to the 2008 NCTCOG survey had an average household/condo value of 154,800 dollars while the average value of a household/condo in Texas is only 120,900 dollars.

The number of building permits is measured in units of 100. The average is 1.69, with a maximum of 16.62, and a standard deviation of 2.87. The coefficient for building permits is -.009, which implies that this variable has little influence. The average price for new homes in 2007 is measured in units of 100,000. The average value is 2.05 units with a maximum value of 9.02, and a standard deviation of 1.47. The coefficient for this variable is -.004, which means that this variable has very little influence of the decision makers. The average household income was measured in units of $10,000, and the average value is 6.08 units, with a maximum of 12.06 units, and a standard deviation of 2.19. The coefficient for this variable is -.01, which means that this variable has little influence on the decision maker.

Table 15 and Table 16 look at the results of a probit regression for cities that responded to the 2008 NCTCOG survey.

Table 15. Probit Regression for the Adoption of Impact Fees in 2008

Variable	Coefficient	Standard Error	z-statistic
Intercept	-0.82	0.39	2.12
DPC	0.08	0.15	0.55
CIPAP	**0.09**	**0.04**	**2.17**
POP	0.09	0.05	1.89
Observations	53		
Pseudo R-2	0.1223		

In this regression, as well as the probit regression using data set 1, the change in population as a percentage is the only statistically significant independent variable. This regression is also similar the linear regression using data set 2 and the same variables in that population is almost statistically significant, while debt per capita is not statistically significant. In this model, change in population as a percentage and population are the variables most likely to influence a city leader. The standard deviation for change in population as a percentage is 5.47, and the standard deviation for population is 4.28. The coefficient for both variables is .09.

Table 16. Probit Regression for the Adoption of Impact Fees in 2008: Expanded Regressors

Variable	Coefficient	Standard Error	z-statistic
Intercept	-0.91	0.61	-1.49
DPC	0.08	0.15	0.56
CIPAP	0.09	0.05	1.74
POP	0.1	0.07	1.47
BP07	-0.02	0.1	-0.22
AVGP07	-0.002	0.17	-0.01
ANGINC	0.02	0.12	0.12
Observations	53		
Pseudo R-2	0.1234		

A probit regression for the adoption of impact fees with data set two yields no statistically significant independent variables. This regression also has a lower Pseudo R-2 value than the probit regression using data set 1. In this model, change in population as a percentage is the most likely variable to influence a city manager's decision. It has the highest coefficient, .09, and the largest standard deviation, 5.47. It would also appear that running a linear regression leads to more statistically significant independent variables than running a probit regression.

Model 2

Model 2 examines the relationship between the total impact fee charged per new residential unit and ten variables as shown below. A linear regression was used to model this relationship.

$$\text{Total Impact Fees} = B_0 + B_1\,\text{Pop} + B_2\,\text{CIPAP} + B_3\,\text{GTR} + B_4\,\text{DPC} + B_5\,\text{AVGP07} + B_6\text{BP07} + B_{17}\text{AVGINC}$$

Table 17 looks at the results for cities that responded to all five NCTCOG surveys between 2008 and 1995.

Table 17. Total Impact Fee: Linear Regresion

Variable	Coefficient	Standard Error	t-statistic
Intercept	-103.2	350.76	-0.29
DPC	**295.32**	**144.97**	**2.04**
CIPAP	16.2	29.63	0.55
POP	**122.302**	**50.78**	**2.41**
Observations	65		
R-squared	0.1420		

The linear regression for total impact fee charged using data set one produced two statistically significant independent variables. They were debt per capita and the city's population size. Debt per capita agreed with the predictions that I derived in my theoretical model. The size of the cities population, however, was also reported as positively correlated with the total impact fee assessed. This is the opposite of what I expected to see. One possible reason for this is that the cities are listed in data set one have larger populations than the average Texas city. The average population for a city in data set one is 53,319.2 while the average city in the NCTCOG is 34,950.3. Since cities with smaller populations are excluded from data set 1, it may bias the outcome.

Another possibility is that there is a positive correlation between the size of the city's population and the total impact fee assessed once a city reaches a certain size. This could occur because larger cities have larger staffs that are able to create a more accurate model for the assessment of impact fees and update the model more frequently to reflect increases in the price to construct new infrastructure.

A third possibility is that since the average impact fee is significantly lower than the national average, a cities population is positively correlated with the assessment of impact fees in Texas. Since the average impact fee is lower in Texas than the national average, developers are less likely to cities assessing impact fees in court. This leads to a situation where Texas city leaders face a shallower indifference curve for the indifference curve for a city charging the national average impact fee.

In this model population will most likely be the variable that influences the level of impact fees. It has a coefficient of 122.30 and a standard deviation of 3.31. Debt per capita has a higher coefficient, 295.32, but its standard deviation is 1.14. Change in population as a percentage has a low coefficient, 16.2, and a standard deviation of 5.73.

Table 18 and Table 19 report the results for data set 2.

Table 18. Total Impact Fee: 2008 Sample

Variable	Coefficient	Standard Error	t-statistic
Intercept	417.58	402.72	1.04
DPC	-1.15	158.58	0.01
CIPAP	**128.09**	**41.59**	**3.08**
POP	47.95	45.98	1.04
Observations	53		
R-squared	0.1242		

In the linear regression based upon data set 2, while using the same independent variables to model the determinants of total dollar value of impact fees, the only statistically significant independent variable was change in population as a percentage. This coefficient was positive as predicted in my theoretical model. The coefficient for population was also positive, although it was statistically insignificant. This strengthens my conclusion that pass a certain point, a larger city will charge a higher impact fee than a medium size city due to the larger city's ability to readjust their impact fee plan more frequently. This could also be due to the fact that the average impact fee is significantly smaller in Texas than across the nation. In this model, change in population as a percentage will most likely be the factor that influences city leaders. Its coefficient is the largest, 128.09, and the standard deviation for change in population as a percentage is also the largest, 5.47.

Table 19. Total Impact Fee: 2008 Sample Expanded Regressors

Variable	Coefficient	Standard Error	t-statistic
Intercept	-312.43	650.76	-0.48
DPC	6.62	157.89	0.04
CIPAP	94.86	50.39	1.88
POP	11.59	58.02	0.2
BP07	73.64	89.88	0.82
AVGP07	99.51	179.3	0.55
ANGINC	106.82	130.87	0.82
Observations	53		
R-squared	0.2345		

The linear regression model estimated over data set 2 includes building permits issued, the average price of new homes, and the average household income has an R-squared value that is almost double the R-squared value of the estimated model without these additional independent variables. This means that including this information provides a significant increase in the overall accuracy of the model. None of the independent variables, however, are statistically significant in this regression. This is probably because of the multicollinearity relationship between building permits and change in population as a percentage. The coefficient for population is again positive in this model, which is not what my theoretical model predicted.

7. SUMMARY AND CONCLUSIONS

Summary of Results

The purpose of my thesis is to study what factors affect the adoption of impact fees in Texas, and what effects impact fees have on city budgets. This research was done using two models. The first model looked at the adoption of impact fees as the dependent variable and the second model looked at the total impact fee assed on new residential units as the dependent variable. Both models used the gross tax rate, debt per capita, change in city population as a percentage, city population, average price of a new home in 2007, number of building permits issued in 2007, and the average household income as independent variables.

The statistically significant results for modeling a city leader's decision as to whether or not to adopt an impact fee agree with my theoretical model. Cities with large populations, experiencing rapid growth, and with high levels of debt per capita are more likely to adopt impact fees. The model that was used to find the relationship between the total impact fees and debt per capita, change in population as a percentage, and the current city population also found a statistically significant correlation.

The independent variables that measured the number of building permits issued, average household income, and the average price of new homes were not statistically significant in any model. This is possible because change in population as a percentage and the number of building permits issued may be highly correlated and average household income and the average household price are highly correlated. This could

weaken my model due to the effect of multicollinearity. Further research needs to be done in this area.

Practical Implications

The three significant independent variables in my model are debt per capita, population, and change in population as a percentage. Debt per capita measures existing city obligations to creditors, and represent future expenditures of tax revenue. A high level of debt per capita will shift the city leaders indifference curve, and make it shallower, because the current residents will already be paying a higher level of taxes, and resist any increases. Because of this, I expect city leaders with high levels of debt per capita to adopt impact fees to help fund new construction projects. I also expect the total impact fee to be higher due to the fact that a shallower indifference curve leads to a tangency point where the increase in gross tax rate is smaller and the impact fee is larger. This is seen in my model estimates.

If the change in population as a percentage and debt per capita is constant, large cities generally have more resources at their disposal due to their larger budgets, and issue more building permits than smaller cities. Since impact fees are assessed for each building permit, a large city will experience a greater return on its investment when it adopts impact fees than a small city. This is seen in my model estimates, where the cities population has a positive correlation with the adoption of impact fees. Cities that have larger populations are also more likely to assess larger impact fees.

Cities that are experiencing rapid change in population as a percentage, are faced with more demands for new infrastructure than cities experiencing low growth rate.

These cities are expected, based on my model estimates, to adopt impact fees. Change in population as a percentage should also lead to larger impact fees. When population growth is rapid a slight increase in the total impact fee assessed will result in a large increase in city revenue.

Future Directions

Further research should be focus on a national sample, so as to capture a larger variation in the institutional and economic environmental variable factors that affect the total impact fee assessed by a city. Another important piece of information would be determining the year that cities began assessing impact fees. This would allow a researcher to study the affect that impact fees have on city budgets. Some proponents of impact fees argue that they help alleviate budget shortfalls caused by new developments. If this is correct, the use of impact fees and total impact fees should be correlated with a decrease in debt per capita and gross tax rate. Additional data on the historic number of building permits issued per year, the average household income, and the average price of new homes sold within the city would be beneficial because they improve the accuracy in modeling the decision maker's process in setting the level for total impact fees.

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