An Empirical Study of Adopting Development Impact Fees in U.S. Metropolitan Cities*

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ABSTRACT: This research examines what characteristics of cities affect impact fee decisions by local governments within metropolitan regions using data from the U.S. Census Bureau. More and more cities are adopting different types of impact fees for financing public facilities and infrastructure with their cities’ growth upon which to base their decisions. To explore what overall characteristics of cities of U.S. metropolitan regions affect the adoption of impact fees, a research design is developed that randomly select 276 cities out of 827 cities having population exceeding 25,000 in the 97 Metropolitan Statistical Areas having populations exceeding 500,000 from the total 361 Metropolitan Statistical Areas. Empirical evidence should indicate that impact fee adoption relates to forms of local government, geo-demographic characteristics, local financial and unemployed conditions. Binary logistic regression is employed to provide information for local governments to seek or create their own fiscal policies to finance public facilities and infrastructure. The forms of local government are not statistically significant to the adoption of impact fees; however, the geo-demography of cities and local financial and unemployed conditions are important to explain impact fee adoptions. These findings have inspired additional research to examine the relationship between local economic growth and the adoption of impact fees.

Key Words: development impact fees, local financial policy, urban growth management

요약: 이 연구는 미국 메트로폴리탄 안에서 어떤 도시 특성들이 개발영향부담금정책 채택에 영향을 미치는지를 미국의 인구조사국 데이터를 이용하여 탐구한다. 많은 지방정부들이 도시성장에 기인하여 공공시설 및 인프라 구축에 관한 재원확보를 위하여 다양한 개발영향부담금 정책을 채택하고 있다. 개발영향부담금 정책을 가지고 있는 미국 메트로폴리탄 도시들의 전반적인 특성을 탐구하기 위하여 이 연구의 범위는 미국 전체 361개의 메트로폴리탄 중에서 인구 2만 5천명 이상을 가지고 있는 97개의 메트로폴리탄으로 한정한다. 그 97개의 메트로폴리탄 안에서 인구 2만 5천명 이상을 갖고 있는 827개의 도시 중 276개의 도시가 무작위 샘플로 선택되어지고, 지방정부의 형태, 지리 및 인구학적 특성, 지방재정 및 실업률 상태와 개발영향부담급정책 채택과의 관계를 실증적으로 분석한다. 지방정부가 공공시설 및 인프라구축을 위하여 그들 자신의 개발영향부담급정책 채택에 관련된 도시의 실증적 증거를 찾기 위하여 이진 로지스틱회귀분석(binary logistic regression) 방법을 사용한다. 지방정부의 형태는 통계적으로 개발영향부담금 정

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I. Introduction

Thousands of cities, including most counties in the U.S. Metropolitan Statistical Areas (MSAs), have serious financial problems in maintaining and improving their infrastructure (Hildreth, 1996; Levy, 2006). Due to the decline of Federal and State aid and the resistance to any kind of property taxes, many local governments have relied on other sources of revenue, such as development impact fees, to finance their public facilities and infrastructure during their population growth (Ladd, 1994; Evans, 2000; Jeong, 2004). Generally, the perceived decrease in adequate infrastructure is blamed and the deficiency of infrastructure has put fiscal pressure on local governments within a balanced-budget constraint (Evans, 2000; Pagano, 2002; Jeong, 2004; 이영성, 2004).

Urban growth of the past decade has caused most local governments to increase spending on both general revenues and capital facilities (Pagano, 2002). Pagano argues that the average annual growth of local governments’ general fund expenditure had been 1.99 percent between 1993 and 2000, whereas the average growth rate for capital spending was 7.8 percent per year during the same period. That is, local governments are facing with spending a significant portion of general revenues to finance public facilities and infrastructure for urban growth.

Carrion and Libby (2004) argue that they have had continual problems with financing infrastructure (i.e. roads, bridges, sewage treatment plants) to support new development because local governments had depended on federal and state funds as supplements. Now, most all of them face serious reductions of federal and state funds; that is, a significant portion of the financing of infrastructure has shifted from state and federal government to local governments such as cities, townships, villages, and counties forcing them to seek alternatives. Also, existing residents resisted higher property taxes to provide the current level of public good and services or to financing new infrastructure (Simmonds, 1993).

Nelson and Moody (2003) argue that property taxes increasingly fail to cover the full costs of the infrastructure needed to serve new development because there are statutory limits on annual increases (Jeong, 2004). As cities grow, local governments must develop new financial tools to meet the increased infrastructure costs and demands. As a popular financial tool, impact fees can provide for coordinated infrastructure for new development. Even so, debates over the adoption of local impact fee policies and their effectiveness continue. Therefore, the purpose of this study is to explore what characteristics of cities affect the adoption of impact fees to provide local policy makers the significant understanding of adoption of impact fee policy in U.S. metropolitan areas.
II. Impact Fees

Impact fees to finance infrastructure and public facilities are charges on new developments assessed by local governments to recover all or part of the cost of infrastructure such as water utilities, sewer, roads, drainage, parks, schools, treatment plants, fire and police stations, and major transportation improvement (Nicholas, 1988; Nicholas et al., 1991; Evans, 2000; Jeong, 2004). Even though there exist various types of impact fees across U.S. cities (이영성, 2007), Leithe and Montavon (1990) argue that three types of impact fees such as sewer/water, transportation, and parks were widely adopted by local governments. Impact fees have evolved from the exaction process (Listokin, 1990). Listokin says that many local governments required private developers to furnish land for public use such as parks, squares, commons, and even, more expensive private land donation for streets, sewer, and infrastructure in the nineteenth and early twenty centuries. By the 1940s and 1950s, local governments appeared to change a new type of development exaction because mandatory dedication was proved inadequate. If a community had already enough land for public use, the community imposes an in-lieu-fee equivalent to the fair market price on developers instead of land dedication. By 1960s, 1970s, and 1980s, local governments required more expensive demands such as physical infrastructure -streets, water and sewer lines, sidewalks, wider cart-ways and rights- of-ways for the subdivision streets (Listokin, 1990). That is, impact fees are known as exactions for financial responsibilities, which local governments can impose on a developer and builder to provide some or the entire physical infrastructure such as sewers and streets to parks and schools necessitated by development and its impacts (Kolo and Dicker, 1993; Brueckner, 1997).

That is, impact fee is imposed on the developers or builders at the time of plotting or building permit because developers and builders are associated with a major portion of the cost land development for roads, utilities, and other infrastructure (Peiser and Schwanke, 1992; Yinger, 1998; 이영성, 2005). According to Carrion and Libby (2004), the use of impact fee is a practical tool to finance public facilities and infrastructure in the last decade in the U.S. An impact fee is a form of financial exaction to reduce the gap between the resources and the money to build new public facilities and infrastructure because residents resist higher property taxes in developing areas and federal and states aids decline in local public infrastructure.

Under the two aftermaths, many local governments turned to alternatives to fund public facilities and infrastructure. Generally, the perceived decrease in adequate infrastructure is blamed and the deficiency of infrastructure has put fiscal pressure on local governments within a balanced-budget constraint (Evans, 2000; Pagano, 2002; Jeong, 2004). Today, many local governments have relied on other sources of revenue, such as development impact fees, to finance their public facilities and infrastructure during their population growth (Evans, 2000; Jeong, 2004; 이영성, 2005).

III. Literature Review

1. Local Infrastructure Competition

Local infrastructure competition is that local
governments race each other through constructing infrastructures such as roads, water supply systems, and other physical public facilities to accommodate urban growth in U.S. MSAs (Taylor, 1991). Advocates of urban growth argue that local governments will be joining in infrastructure competition to attract people in the provision of public goods and services by a given territorial communities (Anas, 1999; Ciscel, 2001). Today, it is important for local governments in U.S. MSAs to provide infrastructure for delivery of public goods and services for residents in efficiency (Pinch and Patterson, 2000; Margulis, 2001). Local infrastructure competition for delivery of public goods and services also increases the consideration of adopting impact fees for financing infrastructure in U.S. MSAs (Taylor, 1991). Accordingly, local infrastructure competition in U.S. MSAs leads local governments to the efficient production and distribution of infrastructure to come up with market solutions (Tiebout, 1956; Ostrom, 1975). Local governments should be able to address infrastructure competition for carrying out delivery of public goods and services; that is, its competition promotes efficiency in the provision of public infrastructure and self-determination by territorial communities in U.S. MSAs (Boyne, 1998; Briffault, 2000).

According to the Tiebout, municipal competition can be explained to attract people who seek to better communities for quality of life. Tiebout (1956) argues if residents want to move from one city to another, they consider local infrastructure for the delivery of public services and goods such as school system, sewer system, water plants, clean environment, and etc. If based on promoting municipal competition to attract people, local infrastructure is an important factor for their movements because people consider the quality of life related to roads, water and sewer, schools and police and fire protection at the expense of the needs of the residents. That is, the needed infrastructure results from municipal competition to attract people by providing a better quality of life for residents.

Margulis (2001) investigates how infrastructure for the delivery of public goods and services such as selective housing traits, local government expenditure, and school district qualities influence household mobility in the suburban four-county Cleveland Metropolitan Statistical Area. Findings show that infrastructure competition is to some extent substantiated in Geauga, Lake, and Medina Counties. That is, government expenditures and amenity-aesthetic improvements in small-size municipalities offer strong enticements for the in-migration of high median-income households. Good infrastructure for the delivery of public services attracts people with increasing with the value of housing. The advantages of the competitive systems of local governments relate to infrastructure competition in U.S. MSAs (Parks and Oakerson, 1993). Local governments in U.S. MSAs through more infrastructure competition are formatted for efficiency and responsiveness to deliver public goods and services.

Accordingly, local infrastructure competition in U.S. MSAs brings the increase of impact fee adoption to improve the allocation of government expenditures for providing infrastructure (Taylor, 1991; Kolo and Dicker, 1993; Yinger, 1998; Brueckner, 1997; Pagano, 2002) because local governments intend to rely less on debt financing such as bond issues (Jeong, 2004). Impact fees promote the efficient provision of public infrastructure to match distinctive local financial conditions due to the decline of Federal and State aid and the
resistance to any kind of property taxes. Local governments with good fiscal conditions can efficiently provide their public infrastructure for the needs and desires of their taxpayers (Anas, 1999). That is, impact fee adoption can be alternative means for local governments to deliver public goods and services for their taxpayers within the territorial limits in the efficient advantages (Ihlanfeldt and Shaughnessy, 2004). Accordingly, impact fee adoption takes the advantages of the competitive systems of local government in U.S. MSAs. Adopting impact fees can be efficient to the competition of local infrastructure for delivery of public goods and services (Blewett and Nelson, 1988). Therefore, infrastructure competition in U.S. metropolitan areas brings local government more impact fee adoption based on the development areas to provide efficient infrastructure in U.S. MSAs.

U.S. metropolitan areas are composed of many competitive and overlapping local governments because those areas are highly politically fragmented i.e. Chicago, Houston, Dallas, L.A. areas and etc. These conditions will bring local infrastructure competition for delivering of public goods and services in the metropolitan areas (Warner and Hefetz, 2002). According to Taylor (1991), local governments in U.S. MSAs build roads, sewer system, water supply systems, and other public services not only to accommodate urban growth but also to compete with other local governments for new growth. Thus, local infrastructure competition stimulates local governments to adopt impact fees for financing infrastructure (Taylor, 1991). Accordingly, impact fee adoption in U.S. MSAs increases over time due to population growth and change in cities’ preference (Carrion and Libby, 2004). Local infrastructure competition has encouraged local governments to adopt impact fees in U.S. MSAs (Galardi, 2003).

The relationship between local infrastructure competition and the adoption of impact fees has become a topic of research and study during past decades (Taylor, 1991). That is, the urban infrastructure competition in U.S. metropolitan areas is a basic unit concept needed to understand the adoption of impact fees because urban infrastructure growth has led to population growth and migration outward from the inner city (Levy, 2006). People have been reported to migrate to the good infrastructure areas to seek for better lives and the educational opportunities for their children (Carrion and Libby, 2004).

In these conditions, local infrastructure competition has created local governmental fiscal stress. That is, the needed infrastructure stems from additional population growth and influx in a community. Thus, local governments seem to prefer to adopt impact fees as an alternative revenue resource for competing infrastructure because residents resist higher local taxes such as property tax and federal or state funds for local infrastructure is limited (Carrion and Libby, 2004). Since the 1950s, it has become increasingly recognized that urban infrastructure competition results in certain significant costs (Tiebout, 1956). An extensive body of urban studies’ literature has been published that most of the cost of urban competition has focused on fiscal costs resulting from the need for expanded infrastructure and public services for new developments.

Nicholas and Nelson (1988) argue that impact fee policy has been a popular financing mechanism for local infrastructure competition in U.S.
Impact fees are exemplified as the most creative and innovative among new infrastructure financial tools against population growth and migration (Kolo and Dicker, 1993; Levy, 2006). Therefore, local governments consider the adoption of impact fees against financial burden of infrastructure under local infrastructure competition in U.S. metropolitan areas (Tiebout, 1956; Nelson, 1988; Taylor, 1991; Galardi, 2003; Levy, 2006).

2. Public Choice Perspectives

Public Choice theory is a highly developed rigorous social science theory with broad applicability to local public policies (Fahy, 1998). Public Choice scholars such as Buchanan, Tullock, Ostrom, Stretton, and Orchard are the acceptance of the microeconomic assumption that human beings are self-interested utility maximizers. That is, the most widely used assumption is that human beings seek to maximize ability in Public Choice theory. Thus, Public Choice theory can be applied to almost every aspect of individual life, social life, and economic life (Heine and Mause, 2004). The main applications of the idea is that people try to maximize the same things in their political and economic life, so that political activity can be sufficiently understood and predicted as driven by rational individual self-seeking.

Therefore, Public Choice theory provides insights about governmental institutions to help explain behaviors that lead to impact fee adoption decision (Jeong, 2004; Jeong and Feiock, 2006). Accordingly, many studies of policy concentrate on local governmental forms (Berry and Berry, 1999; Jeong, 2004) because the forms of local governments have spurred academic debates about local decision makers’ self-interests such as this incentives and motivations about fiscal policies such as revenue options and expenditures for delivering public goods and services (Morgan and England, 1999; Jeong, 2004; 이영성, 2005). Accordingly, this research articulates these forms of local government such as mayor-council and city manager systems that have local authorities to adopt impact fees. Even though a naive view of government is altruistic in contrast to the selfish motives such as private sectors, the Public Choice perspective focuses on local decision makers’ behaviors in self-interest in decision making process, regardless of whether they are local officials such as elected officials or city managers in the two forms of local government (Morgan and England, 1999).

Elected officials try to maximize their probability of reelection to avoid controversial policy decisions and to adopt popular policies (Jeong, 2004). That is, impact fee adoption is a local fiscal policy for imposing additional costs on developers, builders, and new residents for infrastructure; thus, it will allow competitive political forces into government like market institutions in local policy decision making process. According to Frant (1996), the elected officials such as mayors under the mayor-council form of local government grasped of power incentives promoting programs and policies for their reelections. In Public Choice theory, elected officials don’t want to make high risks in adopting unpopular programs and policies, because they depend on voters to be reelected. For example, if elected officials are unlikely to adopt increased general property taxes for infrastructure, they will lose the next election and take a lot of criticizing from residents. In a similar vein, if
elected officials adopt impact fees that impose a perceived fiscal burden on developers and builders for their infrastructure; thus, they get negative reviews from interest groups such as local home builder associations. Accordingly, it will be difficult to adopt impact fees for elected officials under the mayor-council system in favor of local home builder associations and developers or in favor of existing residents when their self-interests and public interest conflict.

At the turn of the 20th century, the manager-council system emerged to shrink the role of the political machines or mayoral power within local politics (Banovetz, 1994; Morgan and England, 1999). Today a majority of cities with population over 25,000 adopt the manager-council system on a nonpartisan ballot (Morgan and England, 1999). City manager position in the council-manager forms of government has been an important venue for serving the relationship between politics and administration to add professionalism to local decision making (Svara, 1999). The main impetus of manager-council system is city managers’ professional management in charge of daily municipal administration. That is, city managers’ characteristic is values of professionalism and efficiency enhancement for local government. City managers advise the council on the city’s direction, propose policies, and handle implementation for solving fiscal stress to provide infrastructure (Svara, 1999). City managers advise council’s members on local financial conditions for maximizing administrative professionalism to adopt impact fees in local policy decision making process (Jeong, 2004).

Home rule authority may provide more self-authority for local decision-makers to determine its own form of government, type of ballot (partisan or nonpartisan), and method of electing council members (ward or at large) (Morgan and England, 1999). That is, home rule authority encourages state legislators to stay out of local affairs for the rights of local self-government (Feiock and Tavares, 2002). Home rule charter pursuits to grant a degree of policymaking power to elected officials and city managers and to achieve general authority to carry out and manage local programs (Jones, 1983). In this sense, home rule charter allows elected officials and city managers greater discretion and opportunities to adopt impact fees. DeSantis (2003) states that cities having home rule charter could make flexible use of revenue sources compared to non-charter cities. Therefore, elected officials and city managers under the home-rule authority system may have greater discretion to initiate new revenue options.

Also, local elected officials attempt to maximize their self-interests through impact fee adoption decision for their reelections. City managers advise the council on the city’s financial management to adopt impact fees in local policy decision making process. Also, home rule charter allows elected officials and city managers motivations and constraints to adopt impact fees. Accordingly, Public Choice theory can be applied for the local political actors to maximize their self-interests through impact fee adoption. That is, impact fee adoptions and levels reflect a community’s decision making process with local political actors such as local and elected officials. In summary, Public Choice theory appears to have gained governmental institutions on impact fee adoption in the American literature,
However, the literature is still lacking and empirical studies are essential before concluding that adopting impact fees can be best for certain kinds of new development (Bruecker, 1997).

IV. Data, Hypotheses, and Method

1. Data and Hypotheses

1) Dependant Variable
The dependent variable for the analysis is the adoption of impact fee in local governments for 2005. The dependent variable is a dichotomous variable that is measured a value of one (1) if local government adopted at least one impact fee, and a value of zero (0) if it has not. This dichotomous variable will be able to determine the effects of having impact fees. To support the importance of this yes/no variable of having impact fees, this empirical study will examine local governments’ adoption of impact fee policy related to the following impact fee types such as capacity fees, facility fees, system development charges, capital recovery fees, Fees-in-Lieu of dedication, development taxes, and availability fees (Jeong, 2004; Mullen, 2005). The relationship between local governments’ impact fee adoption and independent variables in this study should not be misconstrued to mean that the increasing trend of impact fee adoption will be related to the overall characteristics of cities in 97 MSAs.

2. Independent Variables and Hypotheses

1) Forms of Local Government
The major unit of local government is a municipality such as city, town, or village. The forms of local government are referenced by specifying two forms: mayor-council and city manager systems in this research. The two forms of municipalities, mayor-council and city manager systems, are legal entities that have local authorities to operate under a chapter or an ordinance enabled by the state (Jones, 1983). The two forms of municipal government can have an impact on adopting impact fees. Also, home rule charter adoption brings significant impacts on local decision making for local financial policies because home rule charter allows local governments to give more leeway in local policies (Morgan and England, 1999). Accordingly, the forms of local governments are divided into four category variables using two-by-two matrix such as 1) manager-home rule charter, 2) manager-non home rule charter, 3) mayor-home rule charter, and 4) mayor-non home rule charter. Each category variable is encoded using dummy values.

Hypothesis 1
Local governments with Manager-Home Rule Charter are more likely to have impact fees than local governments with the others.

Hypothesis 2
Local governments with Manager-Non Home Rule Charter are more likely to have impact fees than local governments with the others.

Hypothesis 3
Local governments with Mayor-Home Rule Charter are more likely to have impact fees than local governments with the others.
2) Geo-demographic Characteristics of Cities

Hypothesis 4

The cities with the larger populations for 2000 are more likely to have impact fees.

Frank and Downing (1987) found demographic characteristics of community that are useful to consider for adopting impact fees in U.S. MSAs; that is, large population communities need to adopt impact fees to support comprehensive plan implementation and to manage growth in developing communities as well as in older revitalizing communities. According to Gilliland et al. (1992), larger cities are more likely to adopt impact fees than smaller ones in a survey of Texas cities. Only 5% of the smaller cities in the survey had adopted impact fees whereas 37% of larger cities had adopted impact fees because larger cities had to provide more infrastructures such as water and sewer connections. Also, Evans (2000), reports that 40 percent of the 25 largest cities in Texas have adopted impact fees. Local governments will spend more millions of dollars to build infrastructures such as new roads, sewer, and schools due to the size of population.

Hypothesis 5

The cities with the higher rates of growth in population between 1990 and 2000 are more likely to have impact fees than the cities with the lower rates of growth in population between 1990 and 2000.

Burchell et al. (2005) state that urban sprawl as a reason expanding and building new infrastructure due to the rapid growth of suburban population at 12.5 percent, whereas most central cities are not able to keep pace with small increase of only 3.9 percent. They argue that 1980s to 2000s data indicates that the suburban areas of U.S. metropolitan areas rapidly urbanized undergo infrastructure problems such as the heavy traffic congestion, need for schools and improved water systems due to rapid population growth. That is, a higher rate of growth in population requires expanding infrastructure such as new roads, water and sewer systems, and schools.

Frank and Downing (1987) mention that city population growth relates to the adoption of impact fees. According to Blevett and Nelson (1988), one of the most significant demographic characteristics of a city is population growth. Conceptually, change in population in a city should intensify or alleviate many of the urban growth oriented problems. As a result, the search for a relationship between population growth and the adoption of impact fees is of particular interest, for it may lead to the possibility of predicting future densities and their impacts with the adoption of impact fees. That is, cities with higher rate of growth in population between 1990 and 2000 are more likely to adopt impact fees than cities with lower rate of growth in population between 1990 and 2000.

Hypothesis 6

Young cities are more likely to have impact fees than old cities.

The birth year of cities will be associated with the adoption of impact fees. Barnett (1995) provides a clear proposal for improving young cities and restoring old cities in U.S. MSAs. She mentions that young cities are usually rapid growth cities
related to suburban centers and sprawl in U.S. MSAs. The young cities require expensive infrastructure such as roads, sewers, water plants, etc. to meet the need of new residents for new development. However, old cities need revitalized or improved infrastructure, for both new residents and existing residents. That is, the old cities have different conditions because new cities have more new development. Accordingly, new development will need capital costs for infrastructure in young cities. Young cities will be more likely to adopt impact fees then old cities for new development.

Hypothesis 7

The cities in West or South region are more likely to have impact fees than the cities in Midwest and Northeast regions.

U.S. Census Bureau provides the four broad statistical regions such as Northeast, Midwest, South, and West in the United States under the trend of population for the 1990s. U.S. Census Bureau (2000) reports percentage change in metropolitan populations by the four regions. The West and South regions with an overall 20 percent growth rate grew more rapidly than the Midwest and the Northeast regions with the low percent for the 1990s; therefore, the regional setting is important to analyze the overall growth pattern of U.S. population.

The West swelled 19.6 percent and the South gained 19.3 percent, while the Midwest grew 8.7 percent and the Northeast gained 5.6 percent in metropolitan percentage change (U.S. Census Bureau, 2000). Due to regional trends in population, metropolitan local governments of West and South regions are inevitably facing with more urban growth problems than the metropolitan area local governments of the Midwest and the Northeast in financing public facilities and infrastructure (Pack, 2005). The adoption of impact fees will strongly be related to the geo-demographic characteristics of cities such as regional place of city. That is, cities in West and South regions are likely to have impact fees than cities in Midwest and Northeast regions.

3) Local Financial and Unemployed Conditions

Hypothesis 8

Cities with higher per capita debt expenditure between 2001 and 2002 are more likely to have impact fees than cities with lower per capita debt expenditure between 2001 and 2002.

Evans (2000) tested that total revenue was compared between impact fee and non-impact fee cities in local financial conditions. As the result, all cities with impact fees increase revenues. Thus, impact fees can be an alternative revenue source; also, the adoption of impact fees can be offset by
some cities’ reduced property taxes in local financial conditions. That is, impact fee adoption will see an increase in total cities’ revenues. Jeong(2004) argues that local financial conditions can be measured by per capita debt expenditures to explain the debt burden by the citizens. Accordingly, it will be anticipated that cities with the higher mean per capita debt expenditure on debt service funds between 2001 and 2002 will be more likely to adopt impact fees than cities with lower mean per capita debt expenditure on debt service funds between 2001 and 2002.

Hypothesis 9

Cities with the higher ratio of Road Park Water and Sewer expenditure divided by total revenue between 2001 and 2002 are more likely to have impact fees than cities with the lower ratio of Road Park Water and Sewer expenditure divided by total revenue between 2001 and 2002.

As cities grow, local governments must develop alternative financial tools to meet the increased infrastructure costs due to the decline of Federal and State aid and the resistance to any kind of property taxes. However, urban growth has stressed local governments to meet spending on infrastructure costs. According to Pagano(2002), even though the both general and capital facilities expenditures have increased for the recent decade, the average growth rate for capital improvement expenditure is higher than the average annual growth rate of local governments’ general fund expenditure. That is, local governments have to deliberate the potential reduction of general revenues for infrastructure costs. Accordingly, the ratio of Road Park Water and Sewer expenditure divided by total revenue as a financial characteristic on each city is an independent variable to explain the local financial conditions. Thus, it will be anticipated that cities with the higher ratio of Road Park Water and Sewer expenditure divided by total revenue between 2001 and 2002 are more likely to have impact fees than cities with the lower ratio of Road Park Water and Sewer expenditure divided by total revenue between 2001 and 2002.

Hypothesis 10

Cities with lower mean unemployment rates between 1990 and 2000 are more likely to have impact fees than cities with higher unemployment rates between 1990 and 2000.

Dresch and Sheffrin(1997) mention that impact fees help sustain jobs growth in local economic conditions. One of the primary goals of economic development is to create jobs(Nelson and Moody, 2003). Blair(1995) argues that job creation addresses the rate of growth in the number of employment to explain local economic condition. Cities with job growth attract the unemployed who move into the labor markets where these are new jobs. Cities with higher rates of growth in employment between 1990 and 2000 should be more likely to adopt impact fees than cities with lower rates of growth in employment between 1990 and 2000.

Also, the unemployment rate will explain local economic conditions. Unemployment rate is defined herein as change in enhancing local economic conditions(Blair, 1995). That is, the relationship between unemployment rate and the adoption of impact fees will be a factor to
understand local economic conditions. Accordingly, local economic conditions will be reflected by relationships between the mean unemployment rate between 1990 and 2000 and the adoption of impact fee. It will be anticipated that cities with lower mean unemployment rates between 1990 and 2000 will be more likely to adopt impact fees than cities with higher mean unemployment rates between 1990 and 2000.

For the binary logistic regression model analysis, variables and data sources are shown in Table 1.

### 3. Method

This study investigates a random sample of 276 cities out of 827 cities populations over 25,000 located within 97 MSAs to understand what variables within their settings relate to impact fee adoptions using three categories such as forms of local government, geo-demography of city, local financial and economic conditions.

The investigation on the relationship between impact fee adoption and the overall characters of cities is examined using cross-section data(CSD). Binary logistic regression directly estimates the probability of an event occurring because there are only two responses for dependant variable such as impact fee adoption or not. In the binary logistic regression, the formula below is as follow:

\[
\text{Logit}(\text{Impact Fees Adoption}) = b_0 + b_1 \text{ Forms of Local Government}(\text{Manager*Home Rule Charter}) + b_2 \text{ Forms of Local Government}(\text{Manager*Non Home Rule Charter}) + b_3 \text{ Forms of Local Government}(\text{Mayor*Home Rule Charter}) + b_4 \text{ Size of Population/1000} + b_5 \text{ Rate of Growth in Population} + b_6 \text{ Age of City} + b_7 \text{ Regions(West and South or Midwest and Northeast)} + b_8 \text{ Per Capita Debt Expenditure/1000} + b_9 \text{ Ratio of Road-Park-Water and Sewer-Expenditure divided by Total Revenue} + b_{10} \text{ Mean Unemployment Rate}, \text{ Where } b_0 \text{ is constant}
\]

### Table 1. Variables and Data Sources

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<tr>
<th>Variables</th>
<th>Data Sources</th>
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<tr>
<td><strong>Dependent Variable</strong></td>
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<tr>
<td>Impact Fee Adoption(2005)</td>
<td>City Code Information</td>
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<tr>
<td>- Adoption of impact fees(adoptions: 1; non-adoptions: 0)</td>
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<tr>
<td><strong>Independent Variables</strong></td>
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<tr>
<td>Forms of local government</td>
<td>City Code Information</td>
</tr>
<tr>
<td>- Forms of municipal government * Home rule charter</td>
<td></td>
</tr>
<tr>
<td>Geo-demographic characteristics of Cities</td>
<td>U.S. Census Bureau</td>
</tr>
<tr>
<td>- The size of population divided by 1000(2000)</td>
<td></td>
</tr>
<tr>
<td>- The rate of growth in population(1990-2000)</td>
<td></td>
</tr>
<tr>
<td>- The age of city</td>
<td></td>
</tr>
<tr>
<td>- Regions(West and South, or Midwest and Northeast)</td>
<td></td>
</tr>
<tr>
<td>Local financial and unemployed conditions</td>
<td>Local governments’ budget books and U.S. Census Bureau</td>
</tr>
<tr>
<td>- Debt Per Capita Expenditure divided by 1000(2001-2001)</td>
<td></td>
</tr>
<tr>
<td>- Ratio of Road Park Water and Sewer Expenditure divided by total revenue(2001-2002)</td>
<td></td>
</tr>
<tr>
<td>- Mean Unemployment Rate(1990-2000)</td>
<td></td>
</tr>
</tbody>
</table>
This study of the relationships between impact fee adoption and overall city characteristics is examined using cross-sectional data (CSD). This CSD can be analyzed by extending a binary logistic model with dichotomous dependent variable in this research. This empirical study for determining local government’s impact fee adoption is a binary logistic regression. The formula below is as follow:

\[
\ln\left(\frac{P}{1-P}\right) = b_0 + b_1X_1 + b_2X_2 + \cdots + b_nX_n
\]

\(b_0\) and \(b_p\) are the estimated regression coefficient. For several predictors \((X_1, \cdots, X_n)\), the probability of an event can be written as

\[
P = \frac{1}{1+e^{(-Z)}}
\]

\(e\) is the base of the natural logarithms and \(Z\) is the linear combination as follow:

\[
Z = b_0 + b_1X_1 + b_2X_2 + \cdots + b_nX_n
\]

The probability of the event occurring is as follow:

Probability(no event) = 1 - Probability(event)

**V. Findings and Analysis**

This research examined the statistical relationships between adopting impact fees and overall characteristics of metropolitan cities. Table 2. shows population and sampling cities’ percentage from the census regions. In population city percentage from the four regions, each region include: 33.3 percent in West; 23.7 percent in South; 28.1 percent in Midwest; and 14.9 percent in Northeast. In sampling city percentage from four regions, each region consists of: 28.6 percent in West; 26.4 percent in South; 29.7 percent in Midwest; and 15.3 percent in Northeast. There is the 2 percent difference between population and sampling cities in the both West and South regions. Also, the 2 percent difference between population and sampling cities is in the both Midwest and Northeast regions. Therefore, the 276 sampling cities can represent the 827 population cities in the four regions. In the binary logistic regression model analysis, the results are shown in Table 3. Binary Logistic Regression Estimates in Impact Fees Adoption:

<table>
<thead>
<tr>
<th>Four Regions</th>
<th>Population City Percent</th>
<th>Sampling City Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>West</td>
<td>33.3% (276)</td>
<td>28.6% (79)</td>
</tr>
<tr>
<td>South</td>
<td>23.7% (196)</td>
<td>26.4% (73)</td>
</tr>
<tr>
<td>Midwest</td>
<td>28.1% (222)</td>
<td>29.7% (82)</td>
</tr>
<tr>
<td>Northeast</td>
<td>14.9% (123)</td>
<td>15.3% (42)</td>
</tr>
<tr>
<td>Total</td>
<td>100% (827)</td>
<td>100% (276)</td>
</tr>
</tbody>
</table>

**1. Forms of Local Government**

In order to explain the relationship between forms of local government and impact fee adoption, the forms of local governments fail to reject the null hypotheses to explain impact fee adoption. Manager*charter, manager*non charter, and mayor*charter are not statistically significant
### Table 3. Binary Logistic Regression Estimates in Impact Fees Adoption

<table>
<thead>
<tr>
<th></th>
<th>B</th>
<th>S.E.</th>
<th>Wald</th>
<th>df</th>
<th>Sig.</th>
<th>Exp(B)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Constant</td>
<td>-.687</td>
<td>1.469</td>
<td>.219</td>
<td>1</td>
<td>.640</td>
<td>.503</td>
</tr>
<tr>
<td>Manager*Home Rule Charter</td>
<td>.468</td>
<td>.592</td>
<td>.624</td>
<td>1</td>
<td>.429</td>
<td>1.597</td>
</tr>
<tr>
<td>Manager*Non-Home Rule Charter</td>
<td>-.041</td>
<td>.614</td>
<td>.005</td>
<td>1</td>
<td>.946</td>
<td>.959</td>
</tr>
<tr>
<td>Mayor*Home Rule Charter</td>
<td>.738</td>
<td>.650</td>
<td>1.287</td>
<td>1</td>
<td>.257</td>
<td>2.091</td>
</tr>
<tr>
<td>Population 2000(Unit 1000)</td>
<td>.003</td>
<td>.001*</td>
<td>3.282</td>
<td>1</td>
<td>.070</td>
<td>1.003</td>
</tr>
<tr>
<td>Rate of growth in population 1990-2000</td>
<td>.044</td>
<td>.011***</td>
<td>16.710</td>
<td>1</td>
<td>.000</td>
<td>1.045</td>
</tr>
<tr>
<td>Age of city</td>
<td>-.004</td>
<td>.003</td>
<td>2.044</td>
<td>1</td>
<td>.153</td>
<td>.996</td>
</tr>
<tr>
<td>Cities in West or South Regions</td>
<td>1.524</td>
<td>.368***</td>
<td>17.140</td>
<td>1</td>
<td>.000</td>
<td>4.592</td>
</tr>
<tr>
<td>Per Capita Debt Expenditure divided by 1000, 2001-2001</td>
<td>.299</td>
<td>.150**</td>
<td>3.961</td>
<td>1</td>
<td>.047</td>
<td>1.349</td>
</tr>
<tr>
<td>Ratio of Road Park Water and Sewer expenditure divided by total revenue 2001-2002</td>
<td>-.002</td>
<td>.015</td>
<td>.017</td>
<td>1</td>
<td>.897</td>
<td>.998</td>
</tr>
<tr>
<td>Mean unemployed rate 1990-2000</td>
<td>-.461</td>
<td>.151***</td>
<td>9.335</td>
<td>1</td>
<td>.002</td>
<td>.503</td>
</tr>
</tbody>
</table>

|                                    |       |       |      |     |       |        |
|                                    | N     |       | Log Likelihood | 265(11 missing) | .243  | .417    |
|                                    |       | Pseudo R square |       | .486 |    |        |
|                                    |       | Chi square     |       | 119.315 |    |        |

Note: *p < 0.1, **p < 0.05, ***p < 0.01, Two-tailed significance tests

at the 0.05 significance level. Government forms are not a related variable to adopting impact fees.

### 2. Geo-demographic Characteristics of Cities

The size of population divided by 1000 for 2000 rejects the null hypothesis to explain impact fee adoption. The size of population divided by 1000 is statistically significant at the 0.1 significance level. Very small 0.3 percent change in odds for every 1-unit increase in the size of population divided by 1000 for 2000, holding all other independents fixed. The rate of growth in population between 1990 and 2000 reject the null hypotheses to explain impact fee adoption. That is, the rate of growth in population between 1990 and 2000 is strongly statistically significant at the 0.01 significance level. 4.5 percent change in odds for every 1-unit increase in the rate of growth in population between 1990 and 2000, holding all other independents fixed. However, age of cities fail to reject the null hypotheses to explain impact fee adoption. Age of cities is not statistically significant at the 0.05 significance level. Cities in West or South regions reject the null hypotheses to explain impact fee adoption. Cities in West or South regions are more likely to have impact fees than Cities in Midwest or Northeast regions. Cities in West and South regions are highly statistically significant at the 0.01 significance level. 359.2 percent change in odds for every 1-unit increase in cities of West and South regions, holding all other independents fixed.
3. Local Economic and Unemployed Conditions

The per capita debt expenditure divided by 1000 between 2001 and 2002 rejects the null hypotheses to explain impact fee adoptions. The per capita debt expenditure divided by 1000 between 2001 and 2002 is statistically significant at the 0.05 significance level. Particularly, 34.9 percent change in odds for every 1-unit increase in the per capita debt expenditure divided by 1000 between 2001 and 2002, holding all other independents fixed. However, the ratio of Road Park Water and Sewer expenditure divided by total revenue between 2001 and 2002 fail to reject the null hypotheses to explain impact fee adoption. Accordingly, the ratio of Road Park Water and Sewer expenditure divided by total revenue between 2001 and 2002 are not significant to explain the local financial condition. The mean unemployment rate between 1990 and 2000 rejects the null hypotheses to explain impact fee adoptions. The mean unemployment rate between 1990 and 2000 is very statistically significant at the 0.01 significance level. Low unemployment rate relates to the adoption of impact fees. Accordingly, cities with the higher mean rate of unemployment between 1990 and 2000 are less likely to have impact fees than other cities because the direction of the coefficient estimate is negative as predicted. -63.0 percent change in odds for every 1-unit increase in mean unemployment rate between 1990 and 2000, holding all other independents fixed.

In summary, the findings disclose that cities having impact fees do not relate to the overall forms of local government such as manager*home rule charter, manager*non-home rule charter, and mayor*home rule charter. However, cities with impact fees highly relate to the geo-demographic variables such as size of population, population growth rate, and the location of city in West or South, except for age of cities. For local financial and unemployed conditions, the ratio of Road Park Water and Sewer expenditure divided by total revenue does not relate to the adoption of impact fees; however, those cities having higher per capita debt expenditure are more likely to adopt impact fees. Also, those cities having lower unemployment rates are more likely to adopt impact fees. The binary logistic regression directlyestimates the probability of an event occurring because there are only two responses for impact fee adoption or not. In this binary logistic regression, the formula below is as follow:

Prediction Equation, \( Z = -0.687 + 0.003 \frac{\text{Size Of Population 2000}}{1000} + 0.044 \frac{\text{Rate of Growth In Population}}{} + 1.524 \text{Regions(West or South)} + 0.299 \text{Per Capita Debt Expenditure} - 0.461 \text{Mean Unemployment Rate} \)

For several predictors, the probability of impact fee adoption can be written as

\[ P = \frac{1}{1 + e^{-Z}} \]

The probability of impact fee adoption is as follow:

\[ \text{Probability(Non Impact Fee Adoption)} = 1 - \text{Probability(Impact Fee Adoption)} \]

For example, let us calculate the probability of impact fee adoption for Plano city in Texas.
Prediction equation for Plano city, \( Z = -0.687 + 0.003(222.03) + 0.044(72.8) + 1.524(0) + 0.299(1.427) - 0.461(2.3) = 2.548663 \)

\[
\text{Probability(Impact Fee Adoption)} = \frac{1}{1+e^{-2.548663}} = \frac{1}{1+0.0781861310} = 0.92748
\]

Therefore, the probability of impact fee adoption is about 92.74 percent. When the probability of impact fee adoption is above .50, we would predict the City of Plano will be adopting impact fees.

**VI. Conclusion**

Over recent decades, local governments have increasingly adopted development impact fees as an alternative for gaining portions of public infrastructure costs within their geographic and political boundaries. With this trend, the sharing of public infrastructure costs with the private sector has become quite common. Cities with rapid population growth have mitigated fiscal stress to provide public infrastructure. Accordingly, local governments in higher population growth areas all across the U.S. have adopted various types of impact fees in their jurisdictions. In this vein, impact fee adoption is considered as a very important action enabling better long-term financial planning as an aid to comprehensive plan. Even though impact fee adoption has caught the attention of scholars and policy makers of local governments for about three decades, impact fee adoptions are relatively new public financial tools to supplement property tax revenues and other fees. Also, impact fee adoption arguments have led to issues about the theoretical and actual effects of impact fees. Accordingly, the conclusions of this research add to hopefully, help clarify the importance of different city characteristics tending toward adoption.

In forms of local government, the discussion of municipal forms focuses on council-manager with professional management compared to mayor-council government with the separation of power. Also, these two forms of local government are mixed with home rule charter or without. According to these findings, the four categories of local government forms generally fail to explain impact fee adoptions. That is, the forms of local government are not significant to the adoption of impact fees. In studying the geo-demography, this research also provides the evidence that the size of population and the rate of growth in population between 1990 and 2000 are highly significant to adopt impact fees. That is, population growth stimulates local governments to adopt impact fees. Also, age of city is not significant to adopt impact fees. Region variations, where cities are in West and South, or Midwest and Northeast, are very significant to adopt impact fees. That is, the region variable is very close to the variable of population growth. According to U.S. Census Bureau, the West and South regions have an overall 20 percent population growth rate during 1990s, while the Midwest and the Northeast regions have below 9 percent population growth during that time; therefore, the regional variables keep up with population growth rate to adopt impact fees. In general, geo-demography of cities such as size of population, population growth rate, and city location in its region of the United States are important to explain impact fee adoptions in 97 MSAs.
For local financial conditions, even though the ratio of road park water and sewer expenditure divided by total revenue between 2001 and 2002 does not relate to impact fee adoptions, cities with the higher debt per capita expenditure between 2001 and 2002 are more likely to adopt impact fees. That is, urban growth increases spending on city revenue and infrastructure; therefore, local governments have continual financial problems to support new development (Pagano, 2002; Carrion and Libby, 2004). In local unemployment condition, the mean unemployment rate between 1990 and 2000 is very statistically significant to explain impact fee adoptions. Cities with the lower mean unemployment rate between 1990 and 2000 are more likely to adopt impact fees than other cities due to the negative direction of the coefficient estimate. That is, it will be expected that cities with impact fees have upper-middle class with stable jobs because the cities with impact fees will be not industrial cities but satellite bed town cities.

VII. Policy Implications and Limitations

The findings from studying the variables of cities as developed in this research clarify and contribute to the body of knowledge needed before decisions are made about collecting impact fee revenues. That is, inter-related sets of identified variables of cities can add useful information prior to adopting impact fees. Accordingly, this research finds that the knowledge of overall characteristics of cities is important for policy decision makers of local government prior to adopting impact fees in support of this particular regulatory policy financial tool that levies on new development to make it to pay the sharing costs of infrastructure. That is, a comprehensive understanding of the overall characteristics of cities is a useful factor for adopting impact fee policy to manage desirable urban growth or control urban sprawling development.

Even though local governments have used fiscal policies such as property tax abatement and TIF (Tax Increment Finance) for economic development and zoning ordinances to develop a larger tax base, they have turned to impact fees to recover the costs of infrastructure due to urban growth beyond the carrying capacity of existing infrastructure, and requiring the provision of services (Rosenberg, 2002). Also, local governments have applied the property taxes and zoning regulations to control limiting new development to existing infrastructure service areas; however, it is difficult to meet the costs of new development due to rapid population growth. As one of the solutions to the additional infrastructure costs with urban growth, the adoption of impact fee can be found in infrastructure financial resources of local governments to accommodate urban growth.

Finally, the limitations of research and further research are suggested. This research examines the 276 local decisions of 97 MSAs about impact fee adoption related to the overall characteristics of cities. However, this research design does not include the capacity of city infrastructure to explore the overall characteristics of cities related to impact fee adoptions. That is, further research needs the capacity of city infrastructure to make a good empirical model for the information of impact fee policy adoption.

Nelson and Moody (2003) argued that the relationship between impact fees and local economic development was positive; that is, they
argued that infrastructure improvements bring job growth and high income people. However, this research excludes high income groups such as Whites from this data set to avoid a very high Pearson Correlation score between the variables. Therefore, future research will need to examine the specific relationship between income levels and the adoption of impact fees.

Finally, future research need to examine about how impact fees affect urban growth boundary and population growth. That is, there is a need to currently assess the effects of impact fees with regard to the growth of cities. Also, further research will be connected to Korean development impact fee system. The Korean impact fee system may not be typical because the Korean impact fee system has started since 2006; therefore, the specific better findings of the Korean impact fee system about impact fee policy related to the overall Korean characteristics of cities such as local financial, economic, housing, environmental or control factors have been needed for further research.

References

An Empirical Study of Adopting Development Impact Fees in U.S. Metropolitan Cities


Galardi, D., 2003, Development Fee Trends and Tucson Case Study, Portland, OR: Galardi Consulting, LLC.


Nicholas, J. and Nelson, A., 1988, “Determining the


APPENDIX 1. Means and Standard Deviations of Independent Variables

<table>
<thead>
<tr>
<th></th>
<th>156 cities with adopting impact fees</th>
<th>120 cities without adopting impact fees</th>
<th>Total 276 cities</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Mean</td>
<td>Std. Deviation</td>
<td>Mean</td>
</tr>
<tr>
<td>Manager*Home Rule Charter</td>
<td>.49</td>
<td>.501</td>
<td>.39</td>
</tr>
<tr>
<td>Manager*Non-Home Rule Charter</td>
<td>.30</td>
<td>.400</td>
<td>.16</td>
</tr>
<tr>
<td>Mayor*Home Rule Charter</td>
<td>.13</td>
<td>.342</td>
<td>.35</td>
</tr>
<tr>
<td>Population 2000/1000</td>
<td>136,867</td>
<td>307,964</td>
<td>86,391</td>
</tr>
<tr>
<td>Rate of growth in population 1990-2000</td>
<td>29,777</td>
<td>32,016</td>
<td>8,137</td>
</tr>
<tr>
<td>Age of city</td>
<td>97.62</td>
<td>56.937</td>
<td>129.94</td>
</tr>
<tr>
<td>Cities in West or South Regions</td>
<td>.25</td>
<td>.434</td>
<td>.72</td>
</tr>
<tr>
<td>Per Capita Debt Expenditure divided by 1000, 2001-2001</td>
<td>1.856</td>
<td>1.630</td>
<td>1.404</td>
</tr>
<tr>
<td>Ratio of Road Park Water and Sewer expenditure divided by total revenue 2001-2002</td>
<td>42.047</td>
<td>13,1347</td>
<td>35,387</td>
</tr>
<tr>
<td>Mean unemployed rate 1990-2000</td>
<td>3.28</td>
<td>1,0965</td>
<td>3,899</td>
</tr>
</tbody>
</table>

APPENDIX 2. Probability of Impact Fee Adoption

<table>
<thead>
<tr>
<th></th>
<th>Estimated Coefficient</th>
<th>Hypothesis Value</th>
<th>Product</th>
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<tr>
<td>Manager*Home Rule Charter</td>
<td>.468</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Manager*Non-Home Rule Charter</td>
<td>-.041</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mayor*Home Rule Charter</td>
<td>.736</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Population 2000 divided by 1000</td>
<td>.003</td>
<td>114.92</td>
<td>.34476</td>
</tr>
<tr>
<td>Rate of growth in population 1990-2000</td>
<td>.044</td>
<td>20.36</td>
<td>.89584</td>
</tr>
<tr>
<td>Age of city</td>
<td>-.004</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Cities in West or South Regions</td>
<td>1.524</td>
<td>.45</td>
<td>.6858</td>
</tr>
<tr>
<td>Per Capita Debt Expenditure divided by 1000, 2001-2001</td>
<td>.299</td>
<td>1,659</td>
<td>.49041</td>
</tr>
<tr>
<td>Ratio of Road Park Water and Sewer expenditure divided by total revenue 2001-2002</td>
<td>-.002</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Mean unemployed rate 1990-2000</td>
<td>-.461</td>
<td>3,549</td>
<td>-1,6360</td>
</tr>
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