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미국 메트로폴리탄 도시의 주택특성이 개발영향부담금 정책채택에 미치는 영향

Effect of City Housing Characteristics on the Adoption of Impact Fee Policy in U.S. Metropolitan Areas

박 치 형*
Park, Chi-Hyoung

목 차

이 연구는 미국 메트로폴리탄 도시의 주택특성(Housing Characteristics)이 개발영향부담금정책 채택에 어떻게 영향을 미치는지를 조사한다. 연방 및 주정부 기금의 감축과 지방세금에 대한 저항에 기인하여 지방정부들은 새로운 주택개발에 관련한 인프라구축에 재정적 어려움을 겪고 있다. 이러한 재정적 압박 때문에 지방정부들은 실증적 비교 평가 없이 광범위한 개발영향부담금정책을 채택하고 있는 실정이다. 문헌조사에서 개발영향부담금정책 채택 과정을 설명하기 위하여 공공선택이론(Public Choice Theory)이 검토되며, 연구방법은 이진 로지스틱 회기분석(Binary Logistic Regression)이 사용된다. 연구범위는 미국

* 성균관대학교 국정관리대학원 BK 핵심인재 양성사업단
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전체 361개의 메트로폴리탄 중에서 인구 50만 명 이상을 가지고 있는 97개의 메트로폴리탄으로 한정하며, 그 97개의 메트로폴리탄 안에서 인구 2만 5천명 이상을 갖고 있는 827개의 도시 중 무자기 샘플 276개의 도시를 조사한다. 실증적 증거는 개발영향부담금정책 채택에 영향을 미치는 메트로폴리탄 도시의 주택특성정보를 제공한다. 이러한 연구결과를 바탕으로 개발영향부담금정책 채택과 관련된 다른 부가적인 도시요인들과의 관계규명을 위한 추가적 연구들이 필요할 것이다.

□ 주제어: 개발영향부담금정책, 지방재정정책, 지역주택개발

This research investigates what U.S. metropolitan city housing characteristics affect the adoption of development impact fee policy. Local governments have had continual problems with financing infrastructure to support new residential development because the decline of Federal and State aid and the resistance to any kind of local taxes. Public choice theory is employed to be explaining the process of development impact fee policy adoption for new residential development in the literature review, explaining that fiscal stress on local governments led to their widespread development impact fee policy adoption without prior and effective comparative evaluations. A binary logistic regression model is developed as for this research design. This research examines a random sample of 276 local governments out of 827 local governments exceeding 25,000 in 97 Metropolitan Statistical Areas (MSAs) having populations exceeding 500,000. Empirical evidence provides the information of city housing characteristics for local governments to adopt development impact fee policy. These findings have encouraged additional research that helps clarify and understand the importance of different city factors for adopting development impact fee policy.

□ Keywords: Development Impact Fee Policy, Local Finance, Residential Development

Ⅰ. Introduction

There is a need to currently assess the adoption of impact fee policy with regard to new residential development of cities in metropolitan regional settings. According to U.S. Census Bureau data collected during the 1990s, 80.3 percent of U.S. population lived in metropolitan areas and the population change rate within metropolitan areas grew by 14 percent (Perry & Mackun, 2001). Due to this trend of growth, most metropolitan local governments are inevitably faced with new residential development issues in financing their public facilities and infrastructure. Also, the decline of federal and state aid for infrastructures raises local budgeting stress for new residential developments (Carrion & Libby, 2001). In order to solve financial problems, development impact fees, as fiscal and regulation policy tools for urban growth management, are suggested (Frank & Downing, 1988; Nicholas & Nelson, 1988; Ihlanfeldt & Shaughnessy, 2004).

A main reason for adopting impact fee policy is that local governments easily impose the costs of public facilities and infrastructure on developers and builders for new residential developments (Ihlanfeldt & Shaughnessy, 2004). However, builders or developers try to transfer their burdens of infrastructure provision to new home buyers to return the costs; that is, it is complicated to determine who actually pays impact fees in the costs of increased infrastructure costs with the competitiveness of housing market for new residential development (Weitz, 1985; Been, 2005; HUD, 2007). Therefore, the purpose of this study is to explore what U.S. metropolitan city housing characteristics affect the adoption of development impact fee policy. The empirical study of U.S. metropolitan city housing characteristics for adopting impact fee policy can now be developed using a more set of data that can produce fresh conclusions about the comparative use, amounts, and methods of application across different metropolitan regions, using a logistic regression model with cross sectional data.

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 (Delany, 1987; Nicholas, Nelson, and Juergensmeyer, 1991; Evans, 2000; Jeong, 2004). Even though there exist various types of impact fees across U.S. cities, 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 fee is imposed on the developers or builders at the time of platting 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 & Schwanke, 1992). 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. Today, impact fees are used to finance a variety of infrastructure.

According to 2005 National Impact Fee Survey, the property of impact fees is that "(1) they are charged only to new development, (2) they are standardized fees as opposed to ad hoc, negotiated payments and (3) they are designed and used to fund capital improvements needed to serve growth" (Mullen, 2005). That is, impact fees are one time charges applied to new development to raise revenue for the construction or expansion of infrastructure and public facilities (Nicholas, Nelson, & Juergensmeyer 1991; Evans 2000; Jeong 2004).

Ⅲ. Literature Backgrounds

1. Public Choice Theory

Public Choice is neoclassical economic theory commonly applied to the public sector. Public Choice theory states that self-interests, rational choices, and individuals' utility-maximizing can be applied as an effective model for public agency decision making (Buchanan & Tullock, 1962; Ostrom, 1975; Scaff & Ingram, 1987; Stretton & Orchard, 1994; Fahy, 1998; Igor, 2003; Frederickson & Smith, 2003; Heine & Mause, 2004). With Buchanan and Tullock, the implications of Public Choice theory for the public sectors could be ignored no longer. Buchanan (1972; 2003) refers that the critically important bridge between the behavior of persons who act in the marketplace and the behavior of persons who act in the political process must be analyzed.

Impact fee policy adoption process for financing infrastructure relates to local public making decisions for maximizing self-interest as a primary motive. If residents resist higher local taxes such as property tax and federal or state funds for local infrastructure is limited, local governments will be moving toward an alternative source of financing infrastructure. Thus, local governments will need to adopt impact fees as a fiscal policy to finance infrastructure for urban growth (Carrion & Libby, 2004). The adoption process of impact fee policy is sensitive as a local decision making process because there are many different opinions to decide the share of the cost of local infrastructure in many different actors (Fahy, 1998; Igor, 2003).

Public Choice theory in adopting impact fee policy is affected by existing and new residents, interest groups such as builders and developers, and local elected officials. These local actors attempt to maximize their self-interests through their support or opposition to local impact fee ordinances. According to Blewett and Nelson (1988), when Public Choice theory explains the existing residents' behavior with impact fee policy adoption, they will support new development if they can obtain the free access of new infrastructure and

facilities without their burden of the costs for imposing impact fees on developers, builders, or new residents. On the contrary, if they have to share the burden of costs for new development through higher local taxes, the new development will be resisted by them. For example, the provision of education is a problem because urban growth brings more population. Because public schools are financed by the community at large, new developments for public schools cause the more local burden on the existing residents through the property tax structure. In this sense, the existing residents set up impact fees to maximize their self-interests while allowing new residents into their communities. Impact fees then are imposed to prevent the existing residents from suffering declining welfare since they would not be compensated for the loss of welfare due to the overuse of public infrastructure and facilities with population growth. If the population growth continues to cause insufficient infrastructure and facilities and the more rising costs on the existing residents, additional developments for new residents may be opposed by the existing residents regardless of the benefits to society as a whole (Blewett and Nelson, 1988).

New home-buyers don't actually want to bear the burden of impact fees; however, the imposition of an impact fee in a competitive housing market results in a higher price paid by new home-buyers. That is, new home-buyers have to pay more money for a new house with cities adopting impact fees, even know that they are paying for impact fees, or that they even know what an impact fee is.

Impact fee policy adoption is vulnerable to developers or builders in Public Choice theory because they cannot maximize their self-interests due to impact fees as a part of development benefits imposed on them. According to Blewett and Nelson (1988), if the net benefits of development do not exceed the public service costs, they will not find it in their development benefits to build. That is, they will not pay impact fees for the low portion of their development profits because if their development profits are the levels of returns to justify the costs and risk of invest capital, they will stop investments and not resume until their profits exceed the costs to a point to maximize their profits

(Huffman, Nelson, Smith, & Stegman, 1988).

Local governments' adoption of impact fee policy in U.S. MSAs can cause a shift related to local development because impact fee policy adoption will force developers and builders to reduce production and leave the market in Public Choice theory (Blewett & Nelson, 1988). Accordingly, developers and builders generally will not bear the reduction of their profit margins due to impact fee adoption and they will try to transfer the portion of impact fees on new consumers for maximizing their development benefits (Levine, 1994). For example, the National Association of Home Builders (1984) argue that new home-buyers will pay more for new housing because impact fees are designed to impose the burden of new infrastructure costs on new development for new home buyers. In Public Choice theory, even though local governments want to adopt impact fees to impose the burden of infrastructure on developers and builders, they will resist the adoption of impact fees, or will try to transfer the burden of impact fees over new home-buyers to maximize their development benefits.

Public Choice theory provides insights about governmental institutions to help explain behaviors that lead to impact fee policy adoption decision (Jeong, 2004, Jeong & Feiock, 2006). According to Blair (1995), even though a naive view of government is altruistic in contrast to the selfish motives such as private sectors, the Public Choice perspective is that all people act in self-interest, regardless of whether they are elected officials such as mayors and council members. Therefore, most studies of policy concentrate on policy decision-makers and elected officials because they are stakeholders in public policy decision making process (Berry & Berry, 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 policy 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.

New and existing residents, interest groups such as builders and developers,

local elected officials may have mostly different views related to the adoption of impact fee policy for maximizing their self-interests in Public Choice theory. New residents, builders, and developers may oppose the adoption of impact fee policy based on their perceptions that their property rights and overall city resources do not match their self-interests. On the other hand, the existing residents support for adopting impact fee policy without the burden of the costs such as higher property taxes for new development. Also, local elected officials attempt to maximize their self-interests through impact fee adoption decision for their reelections. Therefore, Public Choice theory can be applied for the local actors to maximize their self-interests through impact fee policy adoption. In summary, Public Choice theory appears to have gained a dominant position on local fiscal policy in the American literature; however, research into Public Choice theory related to impact fee policy adoption process is limited. The literature is lacking and empirical studies are essential before concluding that adopting impact fee policy can be best for certain kinds of new development (Bruecker, 1997).

2. Housing and Impact Fees

Petersen (1990) mentions that urban rapid residential growth provides a variety of challenges to local governments. He argues that the important one of the challenges is how to provide infrastructure to meet urban residential growth due to the rapid growth of population. That is, the housing characteristic of cities such as pressures of residential growth on the limited revenue-raising capabilities of local government have stimulated alternative means of financing infrastructure. Burchell, Downs, McCann, and Mukherji (2005) state that the causes of infrastructure problems such as traffic congestion and the lack of school facilities in U.S. MSAs are related to the residential growth because of the rapid growth of population.

Frank and Rhodes (1987) mention that cities' growth such as rapid residential growth can be associated with the adoption of impact fees. Higher or fast residential growth cities are more likely to adopt higher impact fees

than lower residential growth cities. That is, new residential developments are related to the number of single housing development permits issued (Evans, 2000; Jeong, 2004). There are two categories of residential building permits such as single family housing and multi-family housing permits. Each local government can issue a different number of housing permits depended on their cities' situations such as urban residential growth rate and local financial conditions. According to Evan (2000), single family houses require higher infrastructure costs than multi family housing for residential infrastructure. For example, in the Home Builders of Metro Orlando v. Osceola (2005), on May 1, 2004, Osceola County amended the existing impact fee by increasing the amount of the impact fee from $2,828 to $9,708.30 for a single-family housing, and from $1,003 to $6,346.06 for a multi-family housing (Evan, 2000). Therefore, the cities with high impact fees will issue the more number of single residential building permits than the cities with the number of multi-residential building permits.

Ihlanfeldt and Shaughnessy (2004) argue that there are a main reason in the adoption of impact fees for new residential developments. Impact fees are more efficient and more equitable than alternative financing mechanisms because private investments reproduce marginal social costs and the fees are based on the benefit principle of just taxation. However, the adoption of impact fees affects housing prices and home ownership in urban residential growth (Dresch & Sheffrin, 1997; Evans, 2000; Been, 2005; HUD, 2007) because the adoption of impact fees have prevent low-moderate income people from the opportunities to buy houses in a good place (Judd & Swanstrom, 2004).

The adoption of impact fees has been commonly found in new residential development because a major critique of impact fees is that they are not equitable in who pays impact fees related to residential development (Evans, 2000). Although local governments impose impact fees on builders and developers to shift the burden of financing new infrastructure from the community at large (Huffman, Nelson, Smith, & Stegman, 1988,), builders and developers don't want to pay the burden of infrastructure cost for new residential development. In this sense, the National Association of Home

Builders (NAHB, 1984) argues that buyers of new housing will pay more due to impact fees added to housing price because impact fees are originally designed to impose the burden of new infrastructure costs on more new home buyers than developers and builders for new residential development. Therefore, one of the arguments for impact fee adoption is serious undermined by increasing the price of housing in contemporary metropolitan areas (Wallis, 1996). The adoption of impact fees for new residential development have led to the higher housing prices (HUD, 2007).

For example, the higher prices of housing have denied many people the opportunities to move into a good place because they cannot afford the higher housing costs produced by higher local impact fees (Wallis, 1996; Judd & Swanstrom, 2004). Higher impact fees may be a barrier in U.S. MSAs. For example, impact fees add to higher housing costs. According to Snyder & Stegman (1986), a Colorado Springs builder with an impact fee of $ 6,170 imposed its impact fee burden on new buyers to $7,900 on a $75,000 house. This case suggests who ultimately pay the cost of the impact fee because the impact fee added to the cost of housing.

In recent impact fee research on the home ownership, Evans (2000) reports that unfortunately there is no respectable empirical analysis to measure how the adoption of impact fees affect home ownership. That is, there are few empirical studies for researching the adoption of impact fees on the affordability of housing. Evans (2000) argues that the effects of adoption of impact fee on home ownership will be quite significant because the adoption of impact fees raises house prices by the amount of the impact fees. Also, Been (2005) argues that even though the potential adoption of impact fees on the home ownership is little known due to quite a complicated issue, the adoption of impact fees will limit on the affordability of housing. That is, impact fees can prevent low-and moderate-income households from buying new houses (HUD, 2007). Thus, there is a relationship between the adoption of impact fees and housing prices related to the home ownership (HUD, 2007).

The adoption of impact fee on housing markets relatively are sensitive. In this sense, if there are some negative aspects of the adoption of impact fees

with regard to the housing price, the higher price of housing with impact fees reflect on high income people in the local housing market (Been, 2005). Therefore, the adoption of impact fees does not coincide in pure public finance motives of equity because impact fees are levied unjustified burdens on new home buyers such as low-moderate income people (Been, 2005; HUD, 2007). However, the economic incidence of impact fee is not much known for applying residents′ economic conditions to actually buy new houses (Ihlanfeldt & Shaughnessy, 2004). Therefore, Huffman et al. (1988) argue that it is an important issue to address the relationship the adoption of impact fees and household economic conditions such as household income in local hosing market. That is, it is complicated to determine the relationship between the adoption of impact fees and household economic conditions in the costs of increased infrastructure costs with the competitiveness of housing market for new residential development (Been, 2005; HUD, 2007).

Ⅳ. Data, Hypothesis, Methods

1. Data

1) Data Sampling

This study collects a random sample of 276 local governments out of 827 local governments exceeding 25,000 in 97 Metropolitan Statistical Areas (MSAs) having populations exceeding 500,000 in the United States. U.S. Census Bureau reports total 361 Metropolitan Statistical Areas in 2006 State and Metropolitan Area Data Book.

2) Dependant variable

The dependant variable for the analysis is impact fee policy adoption for 2005 in local governments. 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 whether local government has impact fee policy or not. According to Leithe and Montavon (1990), three types of impact fees such as sewer/water, transportation, and parks are generally adopted by local governments. Even though there are various types of impact fees depending on local governments, this empirical study for dependant variable will examine local government adopting impact fee policy related to the following impact fee types such as roads, water, sewer, schools, parks, police, fire protection, and etc. Accordingly, the dependent variable in this research is impact fee policy adoption. The relationship between local governments' impact fee policy adoption and metropolitan city housing characteristics may be analyzed in this study.

3) Independent Variables

There are five independent variables: (1) rate of growth in housing units (1990-2000), (2) mean ratio of single family housing permits divided by the total housing permits (1996-2000), (3) growth in home-ownership rates (1990-2000), (4) rate of growth in median value of owner-occupied housing units (1990-2000), and (5) rate of growth in median household income (1990-2000)1) through local governments in U.S MSAs. New residential developments are associated with the rate of growth of housing units and the number of development permits (Evans 2000; Jeong 2004). Been (2005) argues that the increasing impact fees to fund infrastructure will limit on the affordability of housing. There is the relationship between impact fees and housing prices related to the housing affordability (Been, 2005, 139; HUD, 2007). Medium household income is important to know who move into the new

residential development areas because the medium household income is a local housing characteristic to explain local standard life value for individual economic conditions (Hausrath, 1988).

<Table 1> Variables and Data Sources

Variables	Data Sources
Dependent variable	
Impact Fee Adoption (2005) Adoption of impact fees (adoption: 1; non-adoption: 0)	City Information
Independent Variables	
Metropolitan City Characteristics of Housing ▪ Rate of growth in the number of housing units (1990-2000) ▪ Mean ratio of single family housing permits divided by the total housing permits (1996-2000) ▪ Growth in home-ownership rates (1990-2000) ▪ Rate of growth in median value of owner-occupied housing units (1990-2000) ▪ Rate of growth in median household income (1990-2000)	U.S. Census Bureau

2. Hypothesis

1) Hypothesis 1

The cities with the higher growth rate of the number of housing units between 1990 and 2000 will be more likely to adopt impact fees than the cities with the lower growth rate of the number of housing units between 1990 and 2000.

Burchell, Downs, McCann, and Mukherji (2005) state that the higher growth rate of the number of housing units as a reason expanding and building new infrastructure due to the rapid growth of population. They argue that the suburban areas of U.S metropolitan areas rapidly urbanized undergo

infrastructure problems such as need for schools and improved water systems due to rapid the higher growth rate of the number of housing units. That is, a higher rate of growth in the number of housing units requires expanding infrastructure such as new roads, water and sewer systems, and schools. Conceptually, the higher rate of growth in the number of housing units in a city should intensify or alleviate many of the urban growth oriented problems. As a result, the search for a relationship between the growth in the number of housing units 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. Therefore, cities with the higher rate of growth in the number of housing units between 1990 and 2000 are more likely to adopt impact fees than cities with the lower rate of growth in the number of housing units between 1990 and 2000.

2) Hypothesis 2

The cities with the higher mean ratio of the single family housing permits between 1996 and 2000 divided by the total housing permits during that time will be more likely to have impact fees than the cities with the lower mean ratio of the single family housing permits between 1996 and 2000 divided by the total housing permits during that time.

Local residential developments are controlled by housing permits. Even though there are several types of development permits such as residential, commercial, and industrial permits, this study only focuses on residential development permits in investigating the relationship between housing and impact fee adoption (Jeong, 2004). Two types of residential permits consist of single- and multi-family housing permits. However, the application of impact fees for the two types is different because single-family housing impact fees are much higher than multi-family housing impact fees (Evan, 2000).

Single family dwelling units require higher amount of more impact fees than multi family dwelling units for infrastructure. Thus, cities with the higher

ratios of single family housing permits to the total housing permits should be likely to adopt impact fees. However, single housing permit data are not available between 1990 and 1995 in U.S. Census Bureau. Therefore, the data with single housing permit between 1996 and 2000 are employed in this research. Even though the time frame is different between single housing permit variable and other variables, this time frame of single housing permit variable can also affect the dependent variable in 2005. The cities with the higher mean ratios of single family dwelling unit permits between 1996 and 2000 divided by the total dwelling unit permits during the time will be more likely having impact fees than cities with the lower mean ratio of single family dwelling unit permits between 1996 and 2000 divided by the total dwelling unit permits during the time.

3) Hypothesis 3

The cities with the higher growth rate of the home ownership between 1990 and 2000 will be more likely to adopt impact fees than the cities with the lower growth rate of the home ownership between 1990 and 2000.

Impact fees are more efficient and more equitable than alternative financing mechanisms for new residential development (Ihlanfeldt & Shaughnessy, 2004). However, Huffman et al. (1988) argue that there are some negative aspects of the use of impact fees on the home ownership because developers or builders transfer their burdens of infrastructure provision to new home buyers to pay the costs (Huffman et al., 1988). According to Been (2004), impact fee adoption can exclude low-and moderate-income residents; therefore, the cities with impact fees have high-income residents due to the higher prices of housing. Also, HUD (2007) mentions that low and moderate income home buyers cannot afford high impact fees, and then the cities with impact fees will be the higher home ownership with high income residents. Therefore, the adoption of impact fees on the home ownership is hotly debated (HUD, 2007). The cities with the higher growth in the home ownership rate between 1990

and 2000 will be more likely to adopt impact fees than the cities with a lower change in home ownership rate between 1990 and 2000.

4) Hypothesis 4

The cities with the higher rate of growth in the median value of owned-occupied housing units between 1990 and 2000 will be more likely having impact fees than the cities with the lower rate of growth in the median value of owned-occupied housing units between 1990 and 2000.

An empirical study provided results from estimating impact fees on the prices of new and existing single-family house for Dade County, Florida (Ihlanfeldt & Shaughnessy, 2004). They mention that the adoption of impact fees affected the increases in both new and existing housing prices. However, even though there are some studies, the empirical research on the relationships between impact fees and residential development are comparatively thin (Burge & Ihlanfeldt, 2006). The International City Management Association points out that there is few empirical analysis to measure the relationship impact fees and housing prices (HUD, 2007). Also, HUD (2007) mentions that the cities with impact fees will have the lower rate of growth in housing price because the cities′ houses are very expensive for the first time. However, Evans and Lawhon (2003) argue that there are limited empirical studies that address the relationship between the adoption of impact fees and the growth rate of housing prices. Therefore, the adoption of impact fees on the growth rate of housing prices is still discussed (Evans and Lawhon, 2003; HUD, 2007).

Housing price comparison with impact fee adoption over different MSAs is also not meaningful because housing prices with the same types of housing vary over different places such as California, New York, Arizona, Texas, and so on. Therefore, this research uses the rate of growth in median value of owned-occupied housing units between 1990 and 2000 to compare in the different regional settings. The rate of growth in median value of owned-occupied housing units will be a housing characteristic on each city. Accordingly, the

cities with the higher rate of growth in median value of owned-occupied housing units between 1990 and 2000 will be more likely having impact fees than the cities with the lower rate of growth in median value of owned-occupied housing units between 1990 and 2000.

5) Hypothesis 5

The cities with the higher growth rate of the median household income between 1990 and 2000 will be more likely to adopt impact fees than the cities with the lower growth rate of the median household income between 1990 and 2000.

Been (2004) argues that impact fee adoption can exclude low-and moderate-income residents; therefore, high-income residents will be living in the cities with impact fees. Also, HUD (2007) worries that low and moderate income home buyers have to pay impact fees, and then the cities with impact fees will be excluding them due to the higher prices of housing.

This research employs median household income to explain residents′ economic conditions. Accordingly, the median household income is defined herein as change in residents′ economic conditions (Hausrath, 1988; Blair, 1995). That is, residents′ economic conditions will relate to household income growth. Therefore, it will be anticipated that the cities with the higher rate of growth in median household income between 1990 and 2000 will be more likely to adopt impact fees than the cities with lower rate of growth in median household income between 1990 and 2000.

3. Methods

The 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:

$$\ln(P/1-P) = b0 + b1X1 + b2X2 \cdots\cdots + bnXn$$

b0 and bp are the estimated regression coefficient. For several predictors (X1, ……Xn), the probability of an event can be written as

$$P = 1/1+e^{-(b + b1X1 + b2X2 \cdots\cdots + bnXn)}$$

or

$$P = 1/1+e^{-Z}$$

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

$$Z = b0 + b1X1 + b2X2 \cdots\cdots + bnXn$$

The equation follows:

Logit (ImpactFeesAdoption) = b0 + b1Rate Of Growth In The Number Of housing units + b2 Mean Ratio of Single Family Housing Permits Divided by the Total Housing Permits + b3 Change In home-ownership rates + b4 Rate Of Median Value Of Owner-Occupied Housing Units + b5 Rate Of Growth In Median House hold Income, Where, b0: constant

A linear combination (Z) is an equation related to the relationship between impact fee adoption and independent variables in a binary logistic regression. Thus, the binary logistic regression is applied to the relationship between impact fee adoption and these independent variables with metropolitan city housing characteristics through 276 cities in the 97 U.S metropolitans.

The probability of the event occurring is as follow:

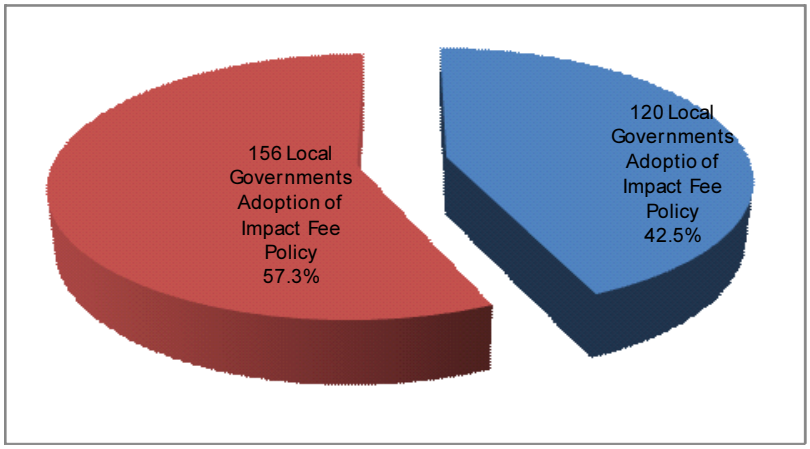
Probability (no event) = 1 - Probability (event)

V. Findings and Analysis

1. Findings for 276 local governments

Figure 1 shows Adoption 156 local governments and Non-adoption 121 local governments. This split of 56.5 percent versus 42.5 percent does not differentiate between the variety of names for impact fees, such as capacity fees, facility fees, system development charges, capital recovery fees, Fees-in-Lieu of dedication, development taxes, and availability fees. That is, 56.5 percent of the 276 local governments have at least one or more impact fee types, and 43.5 percent of them do not have any impact fee types.

<Figure 1> Impact Fee Adoptions for 276 local governments in the 97 U.S. MSAs



Binary logistic regression analysis identifies the relationship between impact fee adoption and the metropolitan city housing characteristics using cross-section data. For the binary logistic regression model analysis, means and standard deviations of independent variables are shown in Table 2.

<Table 2> Means and Standard Deviations of Independent Variables

	156 cities with adopting impact fees		120 cities without adopting impact fees		Total 276 cities	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
Rate of growth in the number of housing units	31.04	38.39	11.62	26.41	22.59	35.00
Mean ratio of single family housing permits divided by the total housing permits	70.09	25.22	64.96	29.12	67.87	27.04
Growth in home-ownership rates	2.65	4.00	0.58	2.39	1.75	3.54
Rate of growth in median value of owner-occupied housing units	41.25	29.27	38.58	35.05	40.09	31.88
Rate of growth in median household income	42.04	13.13	35.38	10.40	39.15	12.45

2. Analysis for 276 local governments

The bivariate correlations are checked by computing Pearson's correlation coefficient with their significance levels in Table 3. The correlations measure how variables or rank orders are related. Accordingly, Before calculating the binary logistic regression, screen this for reducing multi-collinearity among independent variables. Table 3 shows that the all independent variables' Pearson's correlation coefficients are below .75; therefore, the all independent variables can be used for the binary logistic regression.

<Table 3> Pearson Correlations

	Impact Fee Adoption	Rate of growth in the number of housing units	Mean ratio of single family housing permits divided by the total housing permits	Growth in home-ownership rates	Rate of growth in median value of owner-occupied housing units	Rate of growth in median household income
Impact Fee Adoption	1	.275**	.094	.290**	.042	.266**
		(.000)	(.124)	(.000)	(.491)	(.000)
Rate of growth in the number of housing units (1990-2000)	.275**	1	.230**	.541**	.215**	.373**
	(.000)		(.000)	(.000)	(.000)	(.000)
Mean ratio of single family housing permits divided by the total housing permits (1996-2000)	.094	.230**	1	.254**	.017	.119
	(.124)	(.000)		(.000)	(.781)	(.051)
Growth in home-ownership rates (1990-2000)	.290**	.541**	.254**	1	.223**	.553**
	(.000)	(.000)	(.000)		(.000)	(.000)
Rate of growth in median value of owner-occupied housing units (1990-2000)	.042	.215**	.017	.223**	1	.567**
	(.491)	(.000)	(.781)	(.000)		(.000)
Rate of growth in median household income (1990-2000)	.266**	.373**	.119	.553**	.567**	1
	(.000)	(.000)	(.051)	(.000)	(.000)	

Correlation is significant at the (0.01 level, 2-tailed).

In the binary logistic regression model analysis, the results are shown in Table 3 Binary Logistic Regression Estimates in Impact Fees Adoption:

<Table 4> Binary Logistic Regression Estimates in Impact Fees Adoption

	B	S.E.	Wald	df	Sig.	Exp(B)
Constant	-1.280	.668	3.670	1	.055	.278
Rate of growth in the number of housing units (1990-2000)	.034	.009***	14.112	1	.000	1.034
Mean ratio of single family housing permits divided by the total housing permits (1996-2000)	-.001	.005	.044	1	.834	.999
Growth in home-ownership rates (1990-2000)	.101	.060*	2.869	1	.090	1.107
Rate of growth in median value of owner- occupied housing units (1990-2000)	-.013	.006**	5.747	1	.017	.987
Rate of growth in median household income (1990-2000)	.038	.018**	4.270	1	.039	1.038
N	268 (8 missing)					
Log Likelihood	312.248					
Pseudo R square	.247					
Chi square	54.428					

Note. *P= < 0.1; **P= < 0.05; ***P= < 0.01. Two-tailed significance tests

The rate of growth in the number of housing units between 1990 and 2000 reject the null hypotheses to explain impact fee adoption in 97 MSAs. The rate of growth in the number of housing units between 1996 and 2000 is statistically significant at the 0.05 significance level. The cities with the higher growth rate of the number of housing units between 1990 and 2000 are more likely to adopt impact fee policy than the cities with the lower growth rate of the number of housing units between 1990 and 2000. Accordingly, 3.4

percent change in odds for every 1-unit increase in the rate of growth in the number of housing units between 1996 and 2000, holding all other independents fixed.

The mean ratio of single family housing unit permits divided by the total number of housing unit permits defined here as the change in new housing production between 1996 and 2000 fails to reject the null hypotheses to explain impact fee adoption in 97 MSAs. The mean ratio of single family housing permits divided by the total housing permits between 1996 and 2000 is not statistically significant at the 0.1 significance level. That is, the single family housing permits issued between 1996 and 2000 do not explain local governments' impact fee policy adoption in 97 MSAs.

The growth in the home-ownership rates between 1990 and 2000 rejects the null hypotheses to explain impact fee adoptions in the 97 MSAs. The growth in the home-ownership rates between 1990 and 2000 is statistically significant at the 0.1 significance level. Particularly, 10.7 percent change in odds for every 1-unit increase in home-ownership rates between 1990 and 2000, holding all other independents fixed. Accordingly, the cities with the higher growth rate of the home ownership between 1990 and 2000 are more likely to adopt impact fee policy than the cities with the lower growth rate of the home ownership between 1990 and 2000.

The rate of growth in median value of owner occupied housing units between 1990 and 2000 reject the null hypotheses to explain impact fee adoptions for the sampled 97 MSAs. The rate of growth in median value of owner occupied housing unit between 1990 and 2000 is statistically significant at the 0.05 significance level. Accordingly, the cities with higher rates of growth in median value of owned-occupied housing units between 1990 and 2000 are less likely having impact fees than other cities because the direction of the coefficient estimate is negative as predicted. -1.3 percent change in odds for every 1-unit increase in median value housing unit between 1990 and 2000, holding all other independents fixed.

The rate of growth in median household income between 1990 and 2000 reject the null hypotheses to explain impact fee adoption in 97 MSAs. The rate

of growth in median household income between 1990 and 2000 is statistically significant at the 0.05 significance level. That is, 3.8 percent change in odds for every 1-unit increase the rate of growth in median household income in between 1990 and 2000, holding all other independents fixed. Therefore, the cities with the higher growth rate of the median household income between 1990 and 2000 are more likely to adopt impact fees than the cities with the lower growth rate of the median household income between 1990 and 2000.

The binary logistic regression directly shows the probability of an event occurring because there are the binary responses for impact fee policy adoption or not. In this binary logistic regression, the prediction equation below is as follow:

Prediction Equation, Z= -1.28 + .034 Rate of growth in the number of housing units + .044 Growth in home-ownership rates -.013 Rate of growth in median value of owner-occupied housing units + .038 Rate of growth in median household income

<Table 5> Probability of Impact Fee Adoption

	Estimated Coefficient	Hypothesis Value	Product
Rate of growth in the number of housing units (1990-2000)	.034	22.59	.768
Mean ratio of single family housing permits divided by the total housing permits (1996-2000)	-.001	0	0
Growth in home-ownership rates (1990-2000)	.101	1.75	.17675
Rate of growth in median value of owner-occupied housing units (1990-2000)	-.013	40.09	-.52117
Rate of growth in median household income (1990-2000)	.038	39.15	1.4877

For example, let us calculate the probability of impact fee adoption for Arlington city in Texas.

Prediction equation for Arlington city,

$$Z = -1.28 + .034\ (15.84) + .044\ (2.9) - .013\ (16.43) + .038\ (35.9)$$
$$= 0.53677$$

Probability (Impact Fee Policy Adoption)

$$= 1/1+e^{-.53677} = 1/(1+0.584633) = 0.63106$$

Therefore, the probability of impact fee adoption is about 63.1 percent. When the probability of impact fee adoption is above .50, we would predict the City of Arlington will be adopting impact fee policy. In another example, let us calculate the probability of impact fee adoption for Des Plaines city in Illinois.

Prediction equation for Des Plaines,

$$Z = -1.28 + .034\ (11.42) + .044\ (-.5) - .013\ (42) + .038\ (27.2) = -0.4718$$

Probability (Impact Fee Adoption) $= 1/1+e^{0.4718} = 1/(1+1.60287) = 0.38419$

Therefore, the probability of impact fee adoption is about 38.41 percent. When the probability of impact fee adoption is below .50, we would predict the City of Des Plaines will not be adopting impact fee policy.

Ⅵ. Conclusion

In summary, the findings disclose that the rate of growth in the number of housing units, the growth in home-ownership rates, the rate of growth in median value of owner-occupied housing units, and the median household

income statistically relate to development impact fee policy adoption; however, the mean ratio of single family housing permits divided by the total housing permits does not statistically relates to development impact fee adoption. In fact, the results show that the overall metropolitan city housing characteristics affect the adoption of impact fee policy. Even though this researcher expected that cities with impact fees would have lower home-ownership rates because impact fee policy adoption would limit on the affordability of housing (Been, 2005; HUD, 2007), cities having higher home-ownership rates are more likely to adopt impact fees than others because the cities with impact fees have more upper-middle income households than low-middle income households. Accordingly, Been (2005) and HUD (2007) argue that impact fee policy adoption may be critical on limiting housing opportunities for only low- and moderate-income groups.

Over recent decades, U.S. local governments have increasingly adopted development impact fee policy 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. the cities with rapid population growth (U.S. Census Bureau, 2000) have mitigated fiscal stress to provide public infrastructure for new residential development. Accordingly, local governments in higher housing units growth areas all across the U.S. have adopted various types of impact fees in their jurisdictions. In this vein, impact fee policy adoption is considered as a very important action enabling better long-term financial plan as an aid to new residential development. Even though impact fee policy have caught the attention of scholars and policy makers of local governments for about three decades, impact fee policy is relatively new public financial tools to supplement property tax revenues and other fees. Also, impact fee policy arguments have led to issues about the theoretical and actual effects of impact fees. Therefore, the conclusions of this research add to the debate and, hopefully, help clarify the importance of different city housing characteristics tending toward adoption.

Ⅶ. Policy Implication and Limitations

The overall housing characteristics of cities affect impact fee policy adoption because the adoption of impact fees is most likely to be found in residential growing city areas (Frank & Downing, 1988; Ihlanfeldt & Shaughnessy, 2004; Jeong, 2004). That is, this research has endeavored to develop the understanding of impact fee policy adoption about the housing characteristics of cities of U.S. metropolitan regions. The overall housing characteristics of cities can provide policy maker's new information about what housing factors local governments should consider and when local decision makers attempt to initiate impact fees to improve infrastructure and public facilities for new residential development (Jeong, 2004).

According to Jeong and Feiock (2006), although local governments have used fiscal policies such as property tax abatement and TIF (Tax Increment Finance) and local land use policy such as zoning ordinances, those fiscal policies have turned to impact fee policy to recover the costs of infrastructure due to urban residential growth beyond the carrying capacity of existing infrastructure. Currently, it is difficult for local governments to meet the costs of new residential development due to rapid population growth. Therefore, as one of the solutions to the additional infrastructure costs with urban residential growth, impact fee adoption as a control tool can be characterized as a form of taxation because local governments can impose high impact fees on developers and builders to control the sprawled residential developments. Also, the adoption of impact fees can be found in financial resources of local governments to accommodate urban residential growth. That is, impact fee policy are both financial and growth management tools used by local governments to pay for additional infrastructure costs and to control the growth of sprawl caused by new residential developments. Therefore, local governments have to consider the overall housing characteristics of cities to adopt impact fee policy.

This research examines the 278 local decisions of 97 MSAs about impact fee

adoption related to the overall housing characteristics of cities. However, this research design does not include 164 MSAs having below population 500,000 to explore the overall characteristics of cities related to impact fee adoptions. That is, this research does not provide the information of impact fee adoption in 164 small MSAs. Also, this study excludes the cities in rural areas outside of MSAs related to impact fee adoptions. To explore what overall housing characteristics of cities of the United States adopt impact fees, the further research would need to include information of impact fee adoption across U.S. to compare between rural and urban areas or non-metropolitan and metropolitan areas.

Specific better findings about comprehensive impact fee policy adoptions related to the overall characteristics of metropolitan cities such as local financial, economic, environmental or control factors have been needed for the further research. Also, the time frame for this research is a relatively short number of years 1990-2000, and may not be typical. Also, the logit model may be more effectively activated with cross section-longitudinal data in those years the wave of impact fee policy adoption. Therefore, further research will be needed obtaining more rich data for a longer period.

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