Journal of Planning Education and Research
http://jpe.sagepub.com/

Do All Impact Fees Affect Housing Prices the Same?

Shishir Mathur

Journal of Planning Education and Research published online 23 July 2013
DOI: 10.1177/0739456X13494241

The online version of this article can be found at:
http://jpe.sagepub.com/content/early/2013/07/22/0739456X13494241

Published by:
SAGE
http://www.sagepublications.com

On behalf of:
Association of Collegiate Schools of Planning

Journal of Planning Education and Research
XX(X) 1–14

DOI: 10.1177/0739456X13494241
jpe.sagepub.com
SAGE

Do All Impact Fees Affect Housing Prices the Same?

Shishir Mathur[1]

Abstract

The study empirically estimates the effects of four types of impact fees (road, school, park, and fire protection impact fees) on new and existing housing, as well as the fees' differential effects on price as determined by housing quality. The results indicate that impact fees generally raise the price of new housing. Further, the magnitude and the direction of the housing price effect of individual impact fees vary substantially. For example, the park impact fee increases the price of new and existing housing, whereas the fire protection impact fee has no effect or has a negative effect on housing prices.

Keywords

housing prices, infrastructure finance, impact fee, municipal finance, hedonic regression, spatial econometrics

Introduction

In a recent report, the American Society of Civil Engineers (ASCE) gave the United States' infrastructure an overall Grade of D (ASCE 2009). The same report estimated that, of a total infrastructure investment need of $2.2 trillion over the next five years, the United States would face a funding shortfall of $1.1 trillion. The nation bears the cost of underfunded infrastructure in several ways. For example, losses due to time spent stuck in traffic total more than $100 billion per year (Schrank, Lomax, and Eisele 2011). In addition, 20 percent of our drinking water is lost because of leakage (CBO 2002). The infrastructure funding gap remains an area of concern because of the continued fiscal woes of the federal government and of many state governments. Furthermore, in several states, property tax rate limitations have diminished the role of property tax revenues in funding infrastructure. Because of limited and uncertain federal and state support and constrained local revenue sources, local governments across the country must increasingly rely on nontax revenue sources such as impact fees to fund local infrastructure and services.

Impact fees are used to fund a variety of services and infrastructure projects; these include traditional services such as water, sewers, roads, parks, and fire protection. However, some governments have established more innovative programs, such as the general government impact fee charged by the cities of Gilroy and Paso Robles in California. Always paid by developers, an impact fee should fulfill the "rational nexus" and "rough proportionality" requirements; that is, it should be proportional to the costs borne by local governments in mitigating the proposed development's impacts on services and infrastructure. Furthermore, the fees should be used to mitigate only those impacts for which they are charged. For example, a park impact fee can only be used to fund parks. Finally, the proposed development should derive benefits from the fee-funded infrastructure. For example, the parks developed using park impact fee revenues should benefit the proposed development.

Efficiency-, equity-, and legality-related concerns regarding the use of impact fees have been raised by both researchers (see Been, 2005; Altshuler and Gómez-Ibáñez 1993; Nicholas 1987; Porter 1988; Snyder and Stegman 1987) and the real estate developer community (see DPFG 2008). The latter often finds that the fees are an obstacle to home construction and argues that the fees lead to higher housing prices, thereby reducing housing affordability.

Motivated by equity concerns, a large body of empirical literature estimates the effect of impact fees on housing prices. This body of literature (see, e.g., Delaney and Smith 1989a, 1989b; Evans-Cowley et al. 2009; Ihlanfeldt and Shaughnessy 2004; Mathur 2007; Mathur, Waddell, and Blanco 2004; Singell and Lillydahl 1990) generally finds that impact fees increase home prices. Four such studies published over the last 10 years find a wide range of price effects. Specifically, Ihlanfeldt and Shaughnessy (2004) studies the price effect of impact fees in Dade County, Florida; Mathur,

Initial submission, February 2012; revised submissions, September 2012, January and March 2013; final acceptance, May 2013

[1]San Jose State University, San Jose, CA, USA

Corresponding Author:
Shishir Mathur, San Jose State University, WSQ 216E, One Washington Square, San Jose, CA 95192-0185, USA.
Email: shishir.mathur@sjsu.edu

Table 1. Empirical Studies Estimating the Effect of Impact Fees on Housing Prices.

Author(s)	Year of Publication	Study Area	Study Period	Study Findings (Price Effect of Impact Fees)
Evans-Cowley et al.	2009	Dallas-Fort Worth area, Texas	1999	Impact fees raise home prices by 537% of the amount of the fee. The increase is 176% for new homes and 603% for existing homes.
Mathur	2007	King County, WA	1991-2000	Impact fees raise existing home prices by 83% of the amount of the fee. The increase is 103% for high-quality homes and is not statistically significant for low-quality homes.
Burge and Ihlanfeldt	2006	41 counties in Florida	1993-2003	Water/sewer impact fees do not impact housing prices. Nonwater/sewer impact fees increase the price of small, medium, and large homes by 39%, 82%, and 127% of the amount of the fee, respectively.
Ihlanfeldt and Shaughnessy	2004	Dade County, FL	1985-2000	Impact fees raise new and existing home prices by 160% of the amount of the fee.
Mathur, Waddell, and Blanco	2004	King County, WA	1991-2000	Impact fee raise the price of new housing by 166% of the fee amount. The increase is 358% for high-quality homes and is not statistically significant for low-quality homes.
Lawhon	1996	Loveland, CO, and Fort Collins, CO	1983-1986	Statistically insignificant effect.
Singell and Lillydahl	1990	Loveland, CO	1984	Impact fees raise new home prices by 321% and existing home prices by 592% of the amount of the fee.
Delaney and Smith	1989a	Four cities (Dunedin, Clearwater, Largo and St. Petersburg) in Florida	1971-1982	Impact fee raises new home prices in Dunedin (the impact fee charging city) compared to the other three cities, but the difference dissipates after six years
Delaney and Smith	1989b	Dunedin, FL and Clearwater, FL	1971-1982	Impact fee raises new home prices in Dunedin (the impact fee charging city) compared to Clearwater by 143% of the fee amount from year two to seven after impact fee imposition.

Waddell, and Blanco (2004) and Mathur (2007) study impact fees in King County, Washington; and Evans-Cowley et al. (2009) studies impact fees in the Dallas-Fort Worth metropolitan area in Texas. Ihlanfeldt and Shaughnessy (2004) finds that impact fees increase the price of both new and existing housing by 160% of the fee amount, while Mathur, Waddell and Blanco (2004) and Mathur (2007) find the price effect to be 166 and 83 percent of the fee amount for new and existing housing, respectively. Finally, Evans-Cowley et al. (2009) finds that impact fees increase the price of new housing and existing housing by 144% and 645%, respectively. Table 1 summarizes the existing studies' key findings.

The increase in the price of existing housing could be primarily attributed to two factors. First, impact fees directly increase the price of new homes. This price increase, in turn, increases the prices of homes that are close substitutes for the new homes—the existing homes (the "substitution effect"). Second, prices can increase if impact fees also benefit existing homes; for example, an impact fee–funded park could potentially be used by the existing residents. The expected price effect should be positively related to how difficult it is to exclude existing residents from using the new infrastructure. Furthermore, the price increase can be viewed in two different ways. On the one hand, the price increase could lead to a lack of affordable housing; on the other hand, it can be viewed as an increase in property owners' wealth (Chapin 2007).

Furthermore, empirical research examining the effect of impact fees on other dimensions of urban development find a positive effect on job growth (Nelson and Moody 2003) and rate of residential development (Burge and Ihlanfeldt 2006). Burge and Ihlanfeldt (2006) argues that impact fees could positively impact housing supply by reducing jurisdictions' propensity to limit residential development for fiscal reasons. Assured of impact fee revenues, jurisdictions are more likely to approve residential development permits and zone land for residential use. Furthermore, impact fees often replace lengthy and resource-consuming negotiated development exactions[1] and provide certainty of the development of infrastructure required to serve new growth; this certainty further facilitates new growth. However, if the fees act like a tax on the development industry and new homeowners, it is likely to reduce housing supply. Burge and Ihlanfeldt (2006) uses data from sixty-four counties in Florida and finds that while water and sewer impact fees have neither a positive nor a negative effect on the home construction rate, the fees

used to fund nonwater and nonsewer infrastructure (infrastructure typically funded by property taxes) increase the home construction rate. Nelson and Moody (2003) also focuses on Florida and establishes further support that the impact fees are not a deadweight-loss-creating tax; instead, these fees spur infrastructure development. The main finding is that the fees had a positive impact on economic growth during the period from 1993 to 1999.

Need for the Study

Although impact fees can be used to fund a variety of services and infrastructure projects, the empirical literature largely treats the fees as homogeneous; that is, the studies estimate the effect of total impact fees on housing prices. The recent literature (see Chapin 2007; Burge and Ihlanfeldt 2006) notes that the price effect could vary based on the type of infrastructure funded by the fee.

The purpose of this article is to examine the effects of various types of impact fees on the prices of new and existing single-family homes in King County, Washington. The empirical analysis uses an inventory of single-family housing sales in the thirty-eight cities and towns of King County from 1991 through 2000.

The State of Washington's Growth Management Act (GMA) allows local jurisdictions to charge impact fees to fund roads, parks, fire protection, and schools. In King County, Washington, GMA impact fees were first charged in 1994 by two cities. By 2000, fourteen cities were charging impact fees. The most popular types of impact fees are road and school impact fees, which are charged by ten and nine jurisdictions, respectively. Park and fire protection impact fees, which are charged by four and three jurisdictions, respectively, are somewhat less popular. The fees paid by single-family houses vary significantly. In the year 2000, the road impact fee ranged from $750 to $2,610, the park impact fee ranged from $591 to $2,147, the fire protection impact fee ranged from $113 to $2,725, and the school impact fee ranged from $980 to $6,181. Table 2 lists the King County jurisdictions that charge impact fees.

Conceptual Framework for Analyzing the Price Effect of Impact Fees

The legal incidence of an impact fee is on developers, who usually pay the fee to the local government at the time they apply for a building permit. However, the economic incidence of the impact fee may fall on the land owners, the home buyers, or both groups. Two views, named the "old view" and the "new view," provide a conceptual framework for examining the incidence and housing price effect of an impact fee (Ihlanfeldt and Shaughnessy 2004).

The old view treats an impact fee as a tax that provides no value to the homeowners (Benn 2005) and is a burden on the developers (Mathur, Waddell, and Blanco 2004). In this case, the developers are likely to attempt to shift the cost of the fee onto the landowners or to the home buyers. However, developers' ability to pass on the cost of the fee depends upon the price elasticities of housing demand and supply. The developers are likely to pass on the fee to home buyers when the price elasticities of housing supply and demand are low (tight market conditions), whereas the land owners and developers are likely to absorb most of the fee when the price elasticities are high (soft market conditions) (Altshuler and Gómez-Ibáñez 1993). Furthermore, an increase in the price of new homes is likely to increase the price of close substitutes for new homes, which include existing homes. Finally, the price effect of the fee would vary "depending upon the quality of the house as the price elasticity of the demand and supply of housing is likely to differ depending upon its quality" (Mathur, Waddell, and Blanco 2004, 1304).

Whereas the "old view" treats impact fees as a tax, Yinger (1998) propounds the "new view," which argues that impact fee–funded infrastructure provides value to the home buyers; therefore, such an instrument is a fee and not a tax. Furthermore, as per the "new view," home buyers should not bear the full cost of the fee because the impact fee–led increase in housing prices is subject to property taxes. Therefore, the housing price should rise less than the dollar amount of the fee.

In considering the price effect of the fee on existing housing, the "new view" notes that the tax base of jurisdictions that charge impact fees would increase with the rise in property values; therefore, if all other funding remains constant, jurisdictions should decrease their property tax rate. This decrease, in turn, would increase the price of existing housing. The price of existing housing could increase further if the existing homes benefit from the impact fee–funded infrastructure (Mathur 2007).

Conceptual Framework for Analyzing the Housing Price Effect of Different Types of Impact Fees

Chapin (2007) highlights additional variables that influence the housing price effects of impact fees, such as the degree of excludability, visibility, and desirability of the fee-funded infrastructure and services. The study argues that impact fees can be divided into three categories based on the infrastructure funded and the likely effect of the fees on housing prices:

1. Basic service impact fees, such as those for water, sewer, and storm water. These fees primarily benefit new housing development and are therefore likely to increase the price of new housing but not the price of existing housing;
2. System expansion impact fees such as school, fire protection, and transportation impact fees that help to expand the existing infrastructure system. These fees benefit both new and existing housing and are therefore likely to increase the price of both these housing types; and

Table 2. Type of Impact Fees Used by King County Jurisdictions: 1994-2000.

Jurisdictions Charging Impact Fees	Year						
	1994 (2 Cities)	1995 (3 Cities)	1996 (8 Cities)	1997 (9 Cities)	1998 (12 Cities)	1999 (14 Cities)	2000 (14 Cities)
↓	Duvall (R, P, S)	Duvall (R, P, S)	Bellevue (F, S)	Bellevue (F, S)	Bellevue (R, F, S)	Bellevue (R, F, S)	Bellevue (R, F, S)
	Seatac (R)	Issaquah (S)	Bothell (R)	Bothell (R)	Bothell (R, P, S)	Bothell (R, P, S)	Bothell (R, P, S)
		Seatac (R)	Carnation (S)	Carnation (S)	Carnation (S)	Carnation (S)	Carnation (S)
			Duvall (R, P, S)	Duvall (R, P, S)	Duvall (R, P, F)	Covington (S)	Covington (S)
			Federal Way (S)	Federal Way (S)	Enumclaw (R, F)	Duvall (R, S)	Duvall (R, S)
			Issaquah (S)	Issaquah (S)	Federal Way (S)	Enumclaw (R, F)	Enumclaw (R, F)
			Kent (S)	Kent (S)	Issaquah (S)	Federal Way (S)	Federal Way (S)
			SeaTac (R)	Maple Valley (R, S)	Kent (S)	Issaquah (R, P, F, S)	Issaquah (R, P, F, S)
				SeaTac (R)	Maple Valley (R, F, S)	Kent (S)	Kent (S)
					Northbend (P, S)	Kirkland (R, P)	Kirkland (R, P)
					Redmond (R, P, F)	Maple Valley (R, S)	Maple Valley (R, S)
					SeaTac (R)	Northbend (P, S)	Northbend (P, S)
						Redmond (R, P, F)	Redmond (R, P, F)
						SeaTac (R)	SeaTac (R)

Note: The impact fee type is listed in the parentheses. R = road impact fee; P = Park impact fee; F = Fire Protection impact fee; S = School impact fee.

3. Impact fees that enhance quality of life (QOL) of a residential neighborhood by funding amenities such as libraries and parks. Because QOL-enhancing infrastructure and amenities are highly valued by property owners, these fees are likely to significantly impact the prices of both new and existing housing.

Highlighting the role of alternative financing mechanisms, Burge and Ihlanfeldt (2006) argues that the effect of impact fees on housing supply would vary depending upon whether the infrastructure funded by the fees would have been otherwise funded through (1) property taxes or (2) user fees. Denoting impact fees that fund infrastructure that would otherwise have been funded by property taxes IF_T (examples of such infrastructure and services include transportation, schools, parks, libraries, and fire protection services); the study notes that such fees exert two countervailing pressures. On the one hand, IF_T are expected to either lead to reduced property taxes or to a higher level of services; in both of these scenarios, home values are likely to increase. On the other hand, IF_T add another layer of regulation and therefore could increase developers' project approval costs. The local jurisdiction could try to compensate for these increased costs in two ways. First, the jurisdiction could zone more land for residential use (the jurisdictions would have additional impact fee revenues to service land) to reduce land prices. Second, the jurisdiction could make the approval process more developer-friendly; for example, it could institute a faster, more efficient permit approval process. In summary, the final effect of IF_T would depend upon the magnitude of these two countervailing pressures. Burge and Ihlanfeldt (2006) examines impact fee use by 41 counties in Florida and find that IF_T lead to higher housing supply and higher home prices. The study finds that a \$1 increase in IF_T increases the price of small homes (600 square feet to 1,500 square feet floor area) by \$0.39. The non-IF_T fees (in this case, the water and sewer impact fees) do not affect housing prices.

This article extends Burge and Ihlanfeldt's (2006) arguments by proposing that in cases in which property taxes do

not decrease after the imposition of impact fees and the level of services does not increase,[2] the fee essentially acts like a tax; however, this implicit tax is paid only by the owners of new homes. Therefore, the fee should be negatively capitalized into the price of new homes. However, the price of existing homes could still rise because their owners could benefit from the impact fee–funded infrastructure without paying for it.

This study further argues that the spatial scale of mitigated impacts could also influence the housing price effect of impact fees. If the fees mitigate the local impacts but not the regional impacts of new development, then the fees might reduce the price of existing housing; for example, suppose that the impacts on local streets and neighborhood elementary schools are mitigated by the fees, but the impacts on citywide streets and on middle and high schools are not.

Furthermore, the visibility and premium that residents put on impact fee–funded infrastructure could also influence the fees' housing price effect. For example, neighborhood parks are a highly visible and valued amenity. Furthermore, they can be used by both new and existing residents. Therefore, a park impact fee is likely to significantly increase the price of both new and existing housing. In contrast, fire protection services are largely invisible to the residents. Moreover, fire and police protection are assumed to be funded through property taxes. In this case, fire impact fees can be expected to have little or no effect on the price of new homes. These fees could even reduce the price of new homes, especially if they do not result in a proportional decrease in property tax rates. The existing houses should see either a price decrease, neither a decrease nor an increase, or a very small price increase due to such impact fees.

The discussion above highlights the key factors that influence the housing price effects of impact fees: the degree of excludability, visibility and desirability of the fee-funded infrastructure and services; the spatial scale of fee-mitigated impacts; the government policies to reduce the fee's price impacts; the extent to which the fees help lower residential property taxes; and the quality of the house. Finally, the discussion highlights the need for jurisdictions that employ several types of impact fees to be concerned not only about the aggregate effect of impact fees on housing prices but also about the effect of each type of impact fee on housing prices. Estimation of such finer-grained effects would help jurisdictions choose a suitable mix of sources for financing infrastructure; such estimations could also help jurisdictions fine-tune additional strategies, such as impact fee waivers, to mitigate the effects of impact fees on housing prices.

Research Questions

This paper uses new and existing single-family housing sales recorded by the King County, Washington, Tax Assessor's Office for cities and towns from 1991 through 2000 to answer the following research questions:

1. Is the effect of aggregate impact fees on housing prices different from the effect of each individual type of impact fee?
2. If the answer to the question 1 is yes, does the price effect vary with the quality and age (old vs. new) of the house?
3. Does the price effect vary across the different types of impact fees?

Data Description and Model Structure

Data Description

The King County Tax Assessor's files provided data on the structural and locational attributes of the single-family homes sold during the study period. Geographic information system software was used to include other variables that might impact housing prices, such as the distance from each single-family house to such key features as the nearest urban center. Data on crime rates, school expenditures, municipal expenditures, mortgage rates, mitigation fees, and impact fees were also collected for the study period. The pooled data allow for the control of temporal variations that may affect the price of housing.

The data set consists of 97,963 sales transactions. This data set was divided into two subsets: new housing (sale year is within one year after the year of construction) and existing housing. The existing housing data set consists of sales transactions for 87,223 existing single-family houses, and the new housing data set consists of sales transactions for 10,740 new single-family houses. These two data sets are further subdivided by housing quality. The King County Tax Assessors' records use the variable "Building grade" to measure the quality of a house in the following 13 categories that, in ascending order of quality, are as follows: Cabin, Substandard, Poor, Low, Fair, Low, Average, Good, Better, Very good, Excellent, Luxury, and Mansion. The lower-quality housing data set contains sales transactions of houses with Low average and Average quality, while the higher-quality housing data set contains sales transactions of houses of Good to Mansion quality.[3] The lower-quality existing housing data set contains 59,502 sales transactions, and the higher-quality existing housing data set contains 27,221 transactions. The lower-quality new housing data set contains 3,698 sales transactions, and the higher-quality new housing data set contains 7,042 transactions.

To reduce the effects of outliers and the problem of miscoded extreme values, the top and bottom 1 percent of the records with respect to the sale price and the areas of the house and of the lot were dropped. In addition, only houses with one to six bedrooms and at least one bathroom were analyzed.[4]

Model Specification and Structure

The basic econometric approach is an ordinary least squares (OLS) regression that includes dummy variables for the year

of sale of a house and the jurisdiction in which a house was located at the time of sale. Furthermore, the model controls for the physical attributes (square feet of living space, lot size, total number of bathrooms and bedrooms, and quality of construction) and locational attributes (view of lakes and mountains, transportation accessibility, and distance to the nearest urban center) of the house, and attributes of the relevant jurisdiction and region (crime rate, school quality, level of service, and whether a jurisdiction charges other mitigation fees apart from impact fees). Finally, the model accounts for the seasonal nature of residential real estate by controlling for the season in which the house is sold. The resulting model consists of the following two equations:

$$\ln P_{ij} = \alpha_0 + \beta \boldsymbol{S}_i + \pi \boldsymbol{L}_i + \alpha_1 \boldsymbol{J}_k + \alpha_2 I_{kt} + \alpha_3 \boldsymbol{S}_d + \alpha_4 \boldsymbol{T}_d + \alpha_5 \boldsymbol{J}_d + \varepsilon_i, \quad (1)$$

$$\ln P_{ij} = \alpha_0 + \beta \boldsymbol{S}_i + \pi \boldsymbol{L}_i + \alpha_1 \boldsymbol{J}_k + \alpha_2 R_{kt} + \alpha_3 F_{kt} + \alpha_4 S_{kt} + \alpha_5 P_{kt} + \alpha_6 \boldsymbol{S}_d + \alpha_7 \boldsymbol{T}_d + \alpha_8 \boldsymbol{J}_d + \varepsilon_i, \quad (2)$$

where $\ln P_{ij}$ is the natural log of the sale price of the *i*th house in the *j*th jurisdiction. $\boldsymbol{S}_i$ is a vector of physical attributes and $\boldsymbol{L}_i$ is a vector of locational attributes of the *i*th house. $\boldsymbol{J}_k$ is a vector of jurisdictional and/or regional attributes. I_{kt} is the total impact fee charged by the *k*th jurisdiction in the year *t*. R_{kt} is the road impact fee charged by the *k*th jurisdiction in the year *t*. F_{kt} is the fire protection impact fee charged by the *k*th jurisdiction in the year *t*. S_{kt} is the school impact fee charged by the *k*th jurisdiction in the year *t*. P_{kt} is the park impact fee charged by the *k*th jurisdiction in the year *t*. $\boldsymbol{S}_d$ is a vector of season dummies, $\boldsymbol{T}_d$ is a vector of time (year) dummies, and $\boldsymbol{J}_d$ is a vector of jurisdiction dummies. ε_i is the error term. Table 3 provides a description of the independent variables included in the final models.

Equations (1) and (2) are same in all respects, except that equation (1) includes the total impact fee as the independent variable, whereas equation (2) includes a separate variable for each type of impact fee: road, fire, park, and school impact fees.

Two sets of regression models are estimated, with each set containing six regressions, for a total of 12 regressions. Set 1, containing models 1 through 6, estimates the effect of total impact fees on new single-family housing. Models 1 and 2 include observations for all new single-family housing sales transactions. Model 1 contains the total impact fee amount as an independent variable, whereas model 2 contains the four type-specific impact fee variables. Models 3 and 4 include only high-quality new single-family housing sales transactions, and models 5 and 6 include only lower-quality new single-family housing sales transactions. The set 2 models (models 7 through 12) include only the existing single-family housing sales transactions, and are organized similar to those in set 1. Models 7 and 8 include observations for all existing single-family housing sales transactions. Models 9 and 10 include only higher-quality existing single-family housing sales transactions, and models 11 and 12 include only lower-quality existing single-family housing sales transactions.

Next, the basic OLS assumptions of normality and homoskedasticity are tested for each of the 12 models. All the models display heteroskedasticity. Hence, White's heteroskedasticity-consistent estimator is used to calculate the standard errors for the OLS regression models.

Finally, spatial autocorrelation is suspected because of the data's spatial-temporal nature. First, Global Moran's *I* test is conducted to test for spatial autocorrelation. The test indicates that all of the models exhibit spatial autocorrelation. Next, following Anselin (1988), Lagrange multiplier (LM) tests are used to determine the type of spatial dependence exhibited by the models: spatial lag, spatial error, or both. The LM tests are used as follows: the simple LM test is used for error dependence (LMerr), the simple LM test is used for a missing spatially lagged dependent variable (LMlag), the RLMerr test is used for error dependence in the possible presence of a missing lagged dependent variable, and the RLMlag test is used for a missing lagged dependent variable in the presence of error dependence (Bivand and Bernat, n.d.).

Models 1, 2, 5, and 6 exhibit spatial error autocorrelation. The LM tests for models 3 and 4 are statistically insignificant. However, because the Global Moran's *I* test is significant, a conservative approach is adopted, and spatial autocorrelation is assumed for these models. Therefore, both spatial lag and spatial error models are estimated for models 3 and 4. The marginally higher log likelihood of the spatial error model is indicative of a better model fit. The LM tests indicate that all existing housing models (models 7 through 12) exhibit both spatial error and spatial lag autocorrelation.

Furthermore, data for the spatial lag and spatial error models are weighted to take into account both the physical and the temporal proximity of the housing sale transactions. For a given transaction, the four nearest sale transactions are included in the spatial weight calculation. These four transactions are weighted by the sale year. Transactions in the same year as the observation of interest are given a weight of one, transactions two years apart are given a weight of 0.5, transactions three years apart are given a weight of 0.33, and so on.

Tables 6 and 7 report the regression results for the new housing models and existing housing models, respectively. The tables also provide the results of the Global Moran's *I* and LM tests. To economize on table length, the coefficients and standard errors for the dummy variables representing the season (winter, spring, and fall, with summer as the referent), the year of sale, and the jurisdiction of the house at the time of the sale are not shown.

Table 3. Description of Independent Variables Included in the Final Models.

Variable	Description	Data Source
Structural attributes		
House size	Square feet of living space	King County Tax Assessor File
Bathrooms	Number of bathrooms	King County Tax Assessor File
Lot size	Square feet of the lot	King County Tax Assessor File
Age	Age of the house	King County Tax Assessor File
Bedrooms	Total number of bedrooms	King County Tax Assessor File
Low quality	Dummy variable for the lower-quality house	King County Tax Assessor File
Fireplace	Total number of fireplaces in the house	King County Tax Assessor File
Locational attributes		
View of lakes	This variable measures the presence or absence of view of lakes.	King County Tax Assessor File
View of mountains	This variable measures the presence or absence of view of mountains.	King County Tax Assessor File
Job accessibility by auto	Auto nonretail job accessibility. This variable measures the degree of accessibility, by automobile, to nonretail jobs.	Transport accessibility index created by Franklin and Waddell (2003) who used the Puget Sound Regional Council's regional transportation model for index construction.
Inv. dist. to urban center	Inverse of distance to the nearest urban center	GIS analysis using the King County Shape file available from WAGDA
Jurisdictional/regional attributes		
Expenditure per person	Per capita municipal expenditure. Although not a direct performance measure, this variable measures the overall quality of amenities and services in a municipality.	Washington State Auditor's Office
Expenditure per pupil	Expenditure per pupil. This variable measures the level of service of the school district.	Washington State Office of Superintendent of Public Instruction
Property crime rate	Total property crimes per 1,000 people.	Washington Office of Sheriffs and Police Chiefs
Violent crime rate	Total violent crimes per 1,000 people.	Washington Office of Sheriffs and Police Chiefs
Impact fee	Impact fees charged under Washington State Growth Management Act	Association of Washington Cities' Annual Tax and User Fee Survey
Road impact fee	Road impact fee	Association of Washington Cities' Annual Tax and User Fee Survey
Fire impact fee	Fire protection impact fee	Association of Washington Cities' Annual Tax and User Fee Survey
School impact fee	School impact fee	Association of Washington Cities' Annual Tax and User Fee Survey
Park impact fee	Park impact fee	Association of Washington Cities' Annual Tax and User Fee Survey
SEPA mitigation fee	This is a dummy variable that measures whether a municipality charges mitigation fees including those charged under the State Environmental Policy Act (SEPA).	Association of Washington Cities' Annual Tax and User Fee Survey

Preliminary testing was performed by analyzing the partial Pearson correlations and checking the variance inflation factor (VIF) for the independent variables. Variables were dropped if they had VIF greater than 10, did not affect the coefficient of the impact fee variable, and did not enhance the models' predictive powers. Variables excluded in this manner were those measuring personal income, population growth rate, number of single-family permits issued annually, mortgage rate, and unemployment rate. Tables 4 and 5 provide descriptive statistics of the continuous variables included in the final models.

Model Results

Models 1 through 6: New Single-Family Housing Regression Models

The models' adjusted R^2 values range from 0.85 (for all new housing) to 0.73 (for all lower-quality new housing). Spatial

Table 4. Descriptive Statistics of Continuous Variables Included in the Existing Housing Models.

Variable	Minimum (Low/High)	Maximum (Low/High)	Mean (Low/High)	Standard Deviation (Low/High)
Sale price of the house ($)	47,000 (47,000/52,678)	769,000 (760,000/769,000)	199,786 (162,186/280,494)	99,116 (60,172/116,580)
Total living space (in square feet)	680 (680/700)	4,240 (4,150/4,240)	1,696 (1,422/2,286)	650 (457/611)
Lot size (in square feet)	2,626 (2,628/2,626)	99,752 (98,881/99,752)	8,637 (7,806/10,399)	6,474 (5,268/8,089)
Total number of bathrooms	1 (1/1)	7 (6/7)	1.93 (1.61/2.60)	0.84 (0.71/0.71)
Total number of bedrooms	1 (1/2)	6 (6/6)	3.15 (2.98/3.53)	0.88 (0.86/0.81)
Age of the house (in years)	2 (2/2)	100 (100/99)	41.75 (47.03/30.41)	25 (23.92/23.47)
Total number of fire places	0 (0/0)	4 (2/4)	0.87 (0.83/1.14)	0.51 (0.39/0.48)
Total per capital municipal expenditure per person ($)	223 (223/323)	9,828 (9,828/4,794)	2,065 (2,147/1,889)	1,159 (1,179/1,092)
School district expenditure per pupil ($)	4,360 (4,360/4,836)	12,515 (12,515/12,515)	6,764 (6,809/6,669)	1,046 (1,036/1,060)
Total property crimes per 1000 people	0 (0/7)	232 (232/232)	72.68 (76.58/64.31)	31.71 (32.11/29.11)
Total violent crimes per 1000 people	0 (0/0)	16 (16/16)	6.58 (7.19/5.27)	4.18 (4.04/4.19)
Total impact fees[a]	0 (0/0)	6,142 (6,142/6,142)	556 (450.50/782)	1,253 (1,146/1,432)
Road impact fee[b]	0 (0/0)	2,710 (2,710/2,710)	98 (83/130.5)	362 (343/397)
School impact fee[c]	0 (0/0)	6,181 (6,181/6,181)	403 (324/571)	992 (907/1,135)
Fire impact fee[d]	0 (0/0)	2,725 (2,725/2,725)	31 (27/39)	207 (218/182)
Park impact fee[e]	0 (0/0)	3,147 (3,147/3,147)	34 (22/60)	229 (180/308)

[a]Among the jurisdictions that charge impact fees, the minimum is 773, the maximum is 6,142, and the mean is 2,921.
[b]Among the jurisdictions that charge road impact fee, the minimum is 471, the maximum is 2,710, and the mean is 1,101.
[c]Among the jurisdictions that charge school impact fee, the minimum is 1,707, the maximum is 6,181, and the mean is 2,699.
[d]Among the jurisdictions that charge park impact fee, the minimum is 613, the maximum is 3,147, and the mean is 1,280.
[e]Among the jurisdictions that charge fire impact fee, the minimum is 78, the maximum is 2,725, and the mean is 431.

error models provide the best fit for all of the models. Hence, further discussion will focus on these model results. Table 6 provides regression results.

The coefficients for all of the variables that are significant at the 5 percent level have the expected signs, except for the crime rate, number of bedrooms, job accessibility, and municipal expenditure variables.[5] The models confirm the significant price effect of various independent variables. For example, model 1 shows that for the average priced new house in the data set[6], 100-square-foot increases in house size and lot size raise the housing price by 3% (coefficient of 3.0×10^{-4}) and 0.036% (coefficient of 3.6×10^{-6}), respectively. These percentage changes translate to dollar amounts of $7,210 ($3 \times 10^{-4}$ times $240,388 times 100) and $87 ($3.6 \times 10^{-6}$ times $240,388 times 100). Furthermore, the lower-quality houses sell for 14.5% less than do the higher-quality houses (coefficient of –0.1454). Views of the lakes and mountains increase housing prices by 33% (coefficient of 0.3277) and 9% (coefficient of 0.0903), respectively.

Regarding the effect of impact fees, the estimates of model 1 find that a $1 increase in impact fee raises the price of all new average-priced houses by $1.51: 6.3×10^{-6} times $240,388. For higher-quality housing the price increase is $2.22 for an average priced house: 7.9×10^{-6} times $280,431 (see model 2).[7] The price increase is statistically insignificant for lower-quality housing:

Table 5. Descriptive Statistics of Continuous Variables Included in the New Housing Models.

Variable	Minimum (Low/High)	Maximum (Low/High)	Mean (Low/High)	Standard Deviation (Low/High)
Sale price of the house ($)	52,000 (55,000/55,000)	759,950 (543,000/759,950)	240,338 (163,990/280,431)	103,172 (38,256/103,910)
Total living space (in square feet)	810 (810/1,150)	4,230 (3,470/4,230)	2,255 (1,806/2,491)	599 (395/552)
Lot size (in square feet)	2,644 (2,644/2,657)	96,267 (81,033/96,267)	8,728 (7,520/9,426)	4,745 (3,412/5,224)
Total number of bathrooms	1 (1/1)	8 (5/8)	2.94 (2.74/3.05)	0.45 (0.49/0.39)
Total number of bedrooms	1 (1/1)	6 (6/6)	3.54 (3.42/3.61)	0.65 (0.66/0.63)
Total number of fire places	0 (0/0)	4 (2/4)	1.08 (0.83/1.21)	0.54 (0.39/0.56)
Total per capital municipal expenditure per person ($)	323 (323/323)	4,794 (4,794/4,794)	1,652 (1,695/1,630)	825 (888/789)
School district expenditure per pupil ($)	4,360 (4,837/4,360	12,515 (12,515/12,515)	6,308 (6,430/6,243)	1,127 (1,247/1,054)
Total property crimes per 1,000 people	7 (7/7)	232 (232/216)	67.36 (74.91/63.39)	29.80 (34.03/26.47)
Total violent crimes per 1,000 people	0 (0/0)	16 (16/16)	4.91 (6.11/4.28)	3.63 (3.99/3.26)
Total impact fees[a]	0 (0/0)	5,809 (5,809/5,809)	834 (528/995)	1,556 (1,206/1,689)
Road impact fee[b]	0 (0/0)	2,710 (2,710/2,710)	188 (62/253)	595 (372/674)
School impact fee[c]	0 (0/0)	3,246 (3,246/3,246)	552 (451/605)	1,097 (1,035/1,124)
Fire impact fee[d]	0 (0/0)	2,096 (2,096/2,096)	30 (9/41)	173 (134/190)
Park impact fee[e]	0 (0/0)	2,147 (1,345/2,147)	64 (6/95)	275 (77/331)

[a]Among the jurisdictions that charge impact fees, the minimum is 773, the maximum is 5,809, and the mean is 3,241.
[b]Among the jurisdictions that charge road impact fee, the minimum is 750, the maximum is 2,710, and the mean is 1,605.
[c]Among the jurisdictions that charge school impact fee, the minimum is 1,707, the maximum is 3,246, and the mean is 2,649.
[d]Among the jurisdictions that charge park impact fee, the minimum is 613, the maximum is 2,147, and the mean is 1,134.
[e]Among the jurisdictions that charge fire impact fee, the minimum is 78, the maximum is 2,096, and the mean is 407.

Models 2, 4, and 6 estimate the price effect of each specific type of impact fee. For example, the models find that the school impact fee does not impact new housing prices. This lack of an effect holds at both the aggregate and submarket levels; hence, the coefficient of the impact fee variable is statistically insignificant in models 2, 4, and 6. On the other hand, a park impact fee raises the price of all new housing by increasing the price of new higher-quality housing. The fee does not impact the price of new lower-quality housing. Furthermore, a fire impact fee reduces the housing prices for all new single-family housing by negatively impacting the price of new higher-quality housing. The fee has no price impact on new lower-quality housing. Finally, a road impact fee does not impact new housing prices. However, at the submarket level, it reduces the price of new lower-quality housing and increases the price of new higher-quality housing. Table 8 provides the price effect of a $1 increase in impact fee on the average-priced new homes.

Models 7 through 12: Existing Single-Family Housing Regression Models

The adjusted R^2 values for models 7 through 12 range from 0.73 (for all existing housing) to 0.59 (for all lower-quality existing housing). Spatial error models provide the best fit for all the models. Again, further discussion will focus on these model results. Table 7 provides regression results.

Table 6. Regression Results for New Housing Models.[a,b]

	All Housing		Lower-Quality Housing		Higher-Quality Housing	
Variable	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Constant	11.278**	11.291**	11.214**	11.218**	11.314**	11.358**
Total impact fee	6.3E–06**	–	1.9E–06	–	7.9E–06**	–
Road impact fee	–	1.0E–05	–	–6.2E–05*	–	2.3E–05*
School impact fee	–	1.1E–06	–	2.7E–06	–	–1.3E–06
Park impact fee	–	4.4E–05**	–	3.4E–05	–	3.8E–05**
Fire impact fee	–	–2.6E–05*	–	7.6E–05	–	–3.1E–05*
House size	3.0E–04**	3.0E–04**	2.2E–04**	2.2E–04**	3.2E–04**	3.2E–04**
Lot size	3.6E–06**	3.7E–06**	2.8E–06**	2.9E–06**	3.7E–06**	3.8E–06**
Bedrooms	–0.0386**	–0.0387**	–0.0079*	–0.0078*	–0.0394**	–0.0394**
Bathrooms	0.0091*	0.0948**	0.0211**	0.0205**	–0.0072	–0.0060
Low quality	–0.1454**	–0.1450**	NA	NA	NA	NA
Fireplace	0.0714**	0.0716**	0.0511**	0.0505**	0.0716**	0.0722**
View of lakes	0.3277**	0.3276**	0.1670	0.1676	0.2840**	0.2827**
View of mountains	0.0903**	0.0901**	0.0297	0.0293	0.0822**	0.0828**
Inv. dist. to urban center	0.2183**	0.2172**	0.1544**	0.1537**	0.2467**	0.2459**
Job accessibility by auto	–1.5E–06	–1.7E–06*	–8.0E–06**	–8.2E–06**	–1.2E–06	–1.4E–06
Property crime rate	2.7E–04*	2.4E–04	2.9E–05*	3.0E–04*	3.4E–05	–2.2E–05
Violent crime rate	0.0046***	0.0028	0.0026	0.0028	0.0071**	0.0038
Expenditure per person	–6.4E–06	–1.4E–05*	–2.4E–05**	–2.3E–05**	–5.6E–06	–1.8E–05*
Expenditure per pupil	4.9E–06**	4.5E–06*	–5.2E–06*	–6.3E–06**	9.0E–06**	7.6E–06**
SEPA mitigation fee	–0.0381**	–0.0343**	–0.0130	–0.01436	–0.0339**	–0.0252**
Model statistics						
N	10,740	10,740	3,698	3,698	7,042	7,042
Adjusted R^2	0.85	0.85	0.73	0.73	0.77	0.77
Log likelihood	5,025.74	5,046.89	2,811.55	2,813.82	2,818.70	2,835.07

Note: The coefficients for the year, season and the jurisdictions dummies have not been shown to economize on table length. NA = not applicable.
[a]The natural log of the sale price of the house is the dependent variable.
[b]Results for OLS and spatial lag models are available upon request.
**Significant at 1%; * Significant at 5%.

The coefficients for all of the variables that are statistically significant at the 5 percent level have the expected signs, except for the number of bedrooms and the property crime variables. The possible reasons for these counterintuitive signs are discussed in endnote 5. The magnitude of the price effects of variables such as the size of the house, the size of the lot, the quality of the house, and the view of the lakes and mountains are similar to those for the new housing models.

Regarding the effect of impact fees, the models find that at the aggregate level, the impact fees do not raise the price of all existing housing; the fees also do not affect the price of lower- and higher-quality existing housing when separately broken out. These results are demonstrated by the statistically insignificant coefficients for the impact fee variable in models 7, 9, and 11.

Estimating the price effect of each type of impact fee, the models find that road and fire impact fees do not impact existing housing prices. Again, there is no effect at either the aggregate or submarket level, which is demonstrated by the statistical insignificance of these variables in models 8, 10, and 12. Finally, a \$1 increase in the school impact fee raises the price of an average-priced existing house by \$1: 5×10^{-6} times \$199,786.[9] A \$1 increase in the park impact fee raises the price of an average-priced existing house by \$4.40: 2.2×10^{-5} times \$199,786 (see model 8); the same fee change increases the price of an average-priced higher-quality existing house by \$5.89: 2.1×10^{-5} times \$280,494 (see model 12).[10] Table 9 presents the price effect of a \$1 increase in impact fee on an average-priced existing home.

How Do the Regression Results Help Answer the Research Questions?

1. Does the overall effect of impact fees on housing prices differ from the effect of each type of impact fee?

The regression results show that the overall effect of impact fees on housing prices is indeed different from the effect of individual impact fees. Specifically, the impact fee coefficients for the new housing models show that a \$1 increase in aggregate impact fees raises the price of a new average-priced home by \$1.51; however a \$1 increase in the park

Table 7. Regression Results for Existing Housing Models.[a,b]

	All Housing		Lower-Quality Housing		Higher-Quality Housing	
Variable	Model 7	Model 8	Model 9	Model 10	Model 11	Model 12
Constant	11.053**	11.045**	10.858**	10.856**	10.991**	11.041**
Total impact fee	2.1E–06	–	1.2E–06	–	3.4E–06	–
Road impact fee	–	-4.8E–06	–	–8.9E–06	–	2.2E–06
School impact fee	–	5.0E–06**	–	2.4E–06	–	2.7E–06
Park impact fee	–	2.2E–05**	–	1.2E–05	–	2.1E–05**
Fire impact fee	–	–4.9E–06	–	–2.1E–06	–	–2.1E–06
House size	2.4E–04**	2.3E–04**	2.2E–04**	2.2E–04**	2.7E–04 **	2.7E–04**
Lot size	3.6E–06**	3.9E–06**	3.5E–06**	3.5E–06**	4.4E–06**	4.2E–06**
Age	6.0E–04**	4.7E–04**	5.2E–04**	5.2E–04**	7.9E–04**	0.0010**
Bedrooms	–0.0154**	–0.0111**	–0.0019	–0.0019	–0.0423**	–0.0441**
Bathrooms	0.0430**	0.0414**	0.0452**	0.0452**	0.0424**	0.0430**
Low quality	–0.1842**	–0.1806**	NA	NA	NA	NA
Fireplace	0.0929**	0.0902**	0.1043**	0.1043**	0.0809**	0.0825**
View of lakes	0.3035**	0.2999**	0.4333**	0.4336**	0.2374**	0.2249**
View of mountains	0.07922**	0.0804**	0.0966**	0.0964**	0.0069**	0.0775**
Inv. dist. to urban center	0.2117**	0.2007**	0.1229**	0.1236**	0.0701**	0.1087**
Job accessibility by auto[c]	1.5E–06**	2.0E–06**	–	–	–0.0018	0.0053
Property crime rate	5.4E–04**	5.3E–04**	6.5E–04**	6.5E–04**	–	–
Violent crime rate	–0.0052**	–0.0051**	–0.0056**	–0.0063**	–	–
Expenditure per person	2.0E–05**	2.0E–05**	2.0E–05**	2.2E–05**	2.0E–05**	1.7E–05**
Expenditure per pupil	1.2E–05**	1.4E–05**	1.2E–05**	1.3E–06**	1.3E–05**	1.5E–05**
SEPA mitigation fee	–	–	–0.0102	–	–0.0035	3.12E–05
Model statistics						
N	87,223	87,223	59,502	59,502	27,721	27,721
Adjusted R^2	0.73	0.73	0.59	0.59	0.64	0.64
Log Likelihood	8,835.72	9,542.32	7,746.27	7,746.97	1,694.41	1,563.49

Note: The coefficients for the year, season and the jurisdictions dummies have not been shown to economize on table length. NA = not applicable.
[a]The natural log of the sale price of the house is the dependent variable.
[b]Results for OLS and spatial lag models are available upon request.
[c]Natural log taken for model 11.
**Significant at 1%; *Significant at 5%.

impact fee raises home prices by $10.57 (see Table 8). Similarly, the existing housing models show that a $1 increase in aggregate impact fees does not raise home prices; however, a $1 increase in the school and park impact fees raises home prices by $1 and $4.30, respectively (see Table 9).

The above findings indicate that the aggregate price effect of impact fees is a combination of the price effects of each specific type of impact fee charged by a jurisdiction. Therefore, the aggregate impact fees' price effect could vary across jurisdictions depending upon the bundle of impact fees. For example, in King County, Washington, the aggregate price effect is likely to be smaller for a jurisdiction that charges only fire and school impact fees compared to the aggregate price effect in a jurisdiction that charges park impact fees in addition to the fire and school impact fees.

2. Does the effect of impact fees on housing prices vary by the quality of the house?

The effect does indeed vary by housing quality; this variation is observed for both aggregate impact fee and individual impact fees. For example, an increase in aggregate impact fees raises the price of new higher-quality homes, but the analogous effect for lower-quality homes is statistically insignificant. To the extent that affordable housing in the study area is likely to be lower quality compared to market-rate housing, the impact fee waivers provided to affordable housing developments by several King County cities could partially explain this statistical insignificance (Mathur 2007). Furthermore, the price effects of individual types of impact fees also vary by the quality of the house. For example, park impact fee increases the price of new and existing higher-quality housing, but the analogous effect for lower-quality housing is statistically insignificant (see Tables 7 and 9).

3. Does the effect of impact fees on housing prices vary among fees of different types?

The model results indicate that the price effect could vary both in magnitude and direction depending on the individual impact fee of interest. For example, a park impact fee increases the prices of higher-quality new and existing

Table 8. Effect of $1 Increase in Impact Fee on the Price of Average-Priced New Housing.

	All Impact Fees Combined	Road Impact Fee	School Impact Fee	Park Impact Fee	Fire Impact Fee
All new housing	1.51 (0.26 to 2.76)	NS	NS	10.57 (6.59 to 14.56)	–7.01 (–0.93 to –13.09)
Low-quality new housing	NS	–10.24 (–0.36 to –20.85)	NS	NS	NS
High-quality new housing	2.22 (0.70 to 3.73)	6.67 (0.78 to 12.56)	NS	10.52 (5.19 to 15.86)	–8.89 (–0.39 to –17.38)

Note: NS = not statistically significant at $p = 0.05$ level. Mean sale price of all new housing is 240,338, mean sale price of low-quality new housing is 163,990, and mean sale price of high-quality new housing is 280,590. Values within parentheses are 95% confidence intervals.

Table 9. Effect of $1 Increase in Impact Fee on the Price of Average-Priced Existing Housing.

	All Impact Fees Combined	Road Impact Fee	School Impact Fee	Park Impact Fee	Fire Impact Fee
All existing housing	NS	NS	1.00 (0.18 to 1.82)	4.40 (1.83 to 6.77)	NS
Low-quality existing housing	NS	NS	NS	NS	NS
High-quality existing housing	NS	NS	NS	5.89 (1.08 to 10.44)	NS

Note: NS = not statistically significant at the $p = 0.05$ level. Mean sale price of all existing housing is 199,786, mean sale price of low-quality existing housing is 162,186, and Mean sale price of high-quality existing housing is 280,494. Values within parentheses are 95% confidence intervals.

homes, while a school impact fee only increases the price of existing housing and has no effect on new housing. These findings support the assertion that impact fees that fund highly visible and valued amenities (such as parks) are likely to significantly increase housing prices; to the extent that such amenities benefit both existing and new housing, the fees would raise the price of both the types of housing.

The price effect of a school impact fee most likely represents a situation in which owners of existing homes significantly benefit from the impact fee (e.g., if the impact fee funds middle and high schools), while new home owners are either unaware of the fee or assume that broad-based revenue sources such as property taxes fund schools.

Furthermore, a road impact fee increases the prices of higher-quality new homes and reduces the prices of lower-quality new homes. The negative effects of road impact fees on the prices of lower-quality new homes could be due to a situation in which the property taxes do not decrease after the imposition of impact fees and the level of services does not increase; therefore, the fee essentially acts like a tax. Moreover, the spatial scale of fee-funded infrastructure could have also contributed to the difference in a road impact fee's price effects. In the higher-quality new neighborhoods, the fee might have funded local roads that directly benefit new homes, while in the lower-quality new neighborhoods the fee might have primarily funded city- or regional-level roads and not local roads. Finally, the tax-like quality of impact fee could also explain the negative effects of fire impact fees on the prices of higher-quality new homes.

Conclusions and Policy Implications

This article advances research on the housing price effects of impact fees by finding that the magnitude and the direction of the price effect of each type of impact fee vary substantially compared to the effect of aggregate impact fees. For example, at the aggregate level, a $1 increase in impact fees raises the price of new housing by $1.51, but a $1 increase in park impact fees raises the price of new housing by $10.57. Similarly, the effects of school, road, and fire impact fees are less pronounced, statistically insignificant, and negative, respectively.

This article and the extant literature's findings should motivate local jurisdictions to consider the following two issues while developing and refining their impact fee programs.

By Funding Nonexcludable Infrastructure, Are Our Impact Fee Programs Acting Like a Tax?

In this study we find that aggregate impact fees do not increase the price of existing housing; however, individual impact fees do have such an effect. For example, a $1 increase in park impact fees raises prices of average-priced existing homes by $4.30, or 430%, while a $1 increase in school impact fees raises prices by $1, or 100%. Several existing empirical studies find similar effects of impact fees on housing prices. For example, Ihlanfeldt and Shaughnessy (2004) finds that impact fees increase the price of existing housing by 160% of the fee amount. Evans-Cowley et al.

(2009) finds that impact fees increase the price of existing housing by 645% of the fee amount. As discussed earlier, the substitution effect and nonexcludability could explain the effect of impact fees on the prices of existing housing. Although further empirical research is required to parse out the relative magnitude of the substitution and nonexcludability effects, it is safe to note that nonexcludability of the impact fee–funded infrastructure remains a concern regarding horizontal equity.

Are Our Impact Fee Programs Negatively Impacting Housing Prices?

Impact fees have been often criticized for increasing the prices of new and existing homes, thereby potentially reducing housing affordability.[11] Therefore, some jurisdictions exempt affordable housing developments from paying impact fees. This article finds that overall impact fees raise the price of new homes, which is consistent with the extant empirical literature. Furthermore, this article adds to the nascent, yet growing, body of literature arguing that the housing price effect of impact fees could vary depending upon the type of infrastructure funded by the fee (Chapin 2007; Burge and Ihlanfeldt 2006). For example, Burge and Ihlanfeldt (2006) finds that while water and sewer impact fees in Florida do not affect housing prices, nonwater and nonsewer impact fees increase housing prices. The present study not only finds support for the argument that the fees' price effects would depend upon the type of infrastructure funded by the fees, it also extends the previous research by empirically demonstrating that these price effects are mediated through the quality and age (new vs. existing housing) of the house.

Furthermore, this article finds that impact fees may not always increase housing prices; in some cases, the fees may have no impact or a negative impact on housing prices. This finding highlights the need for the scholarly community, local governments, and the real estate developer community to consider moving away from treating impact fees as a homogeneous entity and to instead evaluate the price effect of each type of impact fee separately. Such fine-grained evaluations of impact fees' housing price effects should help jurisdictions refine strategies for balancing the fees' housing price impacts with the need to generate revenue. For example, selective exemptions from impact fees could be provided to affordable housing developments; for instance, fee waivers could be granted only for the impact fees likely to increase housing prices.

Finally, the real estate developer community could be more nuanced in its opposition to impact fees. Across the country, a new impact fee or an increase in an existing impact fee is often met with opposition from the developer community. This study suggests that blanket opposition to impact fees might be ill advised; after all, not all impact fees affect housing prices the same way.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) received no financial support for the research, authorship, and/or publication of this article.

Notes

1. The impact fees are usually updated annually. The fee schedule is freely available, often on a jurisdiction's website.
2. Usually, impact fees cannot be used to raise the level of service (LOS).
3. See the following web page from the King County Assessor Office web site for a detailed description of the building grade variable: http://your.kingcounty.gov/assessor/eRealProperty/ResGlossaryOfTerms.html#BuildingGrade.
4. The more traditional outlier identification statistical techniques did not work for this data set, perhaps because of errors in the County Assessors data. For example, for the existing housing model, the following data outlier identification method was tried: first, the obviously erroneous data were removed. These included observations with a value of zero for any one of the following variables: sale price, number of bedrooms, number of bathrooms, the size of the house and the size of the lot. Next, the regression model was run and the standardized residual values were obtained. Thereafter, an observation was removed if the standardized residual value was less than –3 and more than 3. Even then, several variables had very low or very high values indicating data errors. For example, minimums for lot size and house size were six square feet and one square foot, respectively, while the maximums were 6.3 million square feet and 12,560 square feet, respectively. Even removing observations with standardized residuals outside the –2 and 2 range did not solve the data error problems. For example, the minimum lot and house sizes were 24 square feet and one square foot, respectively, and the maximum lot and house sizes were 5.8 million square feet and 12,560 square feet, respectively.
5. The negative sign for the variable measuring the number of bedrooms perhaps indicates that after controlling for the total living space of a house, an increase in the number of bedrooms reduces the bedroom size. Moreover, the published literature disagrees on the effect of the number of bedrooms on housing prices. Zietz, Zietz, and Sirmans (2007) note that of the 40 studies reviewed by Sirmans, MacPherson, and Zietz (2005), 21 studies find a positive impact of number of bedrooms on housing prices, nine studies find a negative impact, and the remaining 10 find no impact.

   Bivariate regression between home prices and the crime variables shows an intuitive negative relationship between crime levels and home prices. Furthermore, the signs for the crime variables remain negative if we do not include the jurisdiction dummies. Inclusion of these dummies turns the signs positive, perhaps indicating that other neighborhood-level attributes outweigh concerns regarding crime in household location decision-making. Similarly, the relationship between municipal and school expenditures and home prices remains positive until the inclusion of jurisdiction dummies, suggesting that households may be basing their location decision on other jurisdictional attributes.

Similarly, bivariate analysis shows an intuitive positive relationship between employment accessibility and home prices. Furthermore, the relationship remains positive if we do not include the year dummies in the models. The change in sign upon the inclusion of year dummies perhaps indicates a high volume of sale of high-priced homes far from employment during some of the study period years. Finally, strong multicollinearity is not suspected for the variables discussed above because their VIF is less than five, the variables retain statistical significance when other variables are omitted, and the models' adjusted R^2 values increase with the inclusion of time and jurisdiction dummies.

6. Average price for all new houses is $240,338.
7. Average price for higher-quality new houses is $280,431.
8. Average price for lower-quality new houses is $163,990.
9. Average price for all existing houses is $199,786.
10. Average price for higher-quality existing houses is $280,494.
11. An impact fee–led increase in housing price may not always reduce housing affordability. For example, in cases where the impact fee–funded infrastructure helps a jurisdiction attract jobs, the income levels might rise, thereby mitigating, or even decreasing, housing affordability problem. The estimation of the effect of impact fee on housing affordability would require a general equilibrium framework. The empirical model used in this study is insufficient for such estimation. We thank an anonymous referee for pointing out this modeling limitation.

References

Altshuler, A., and J. Gómez-Ibáñez. 1993. *Regulation for Revenue: The Political Economy of Land Use Exactions*. Washington, DC: Brookings Institution and Lincoln Institute of Land Policy.

American Society of Civil Engineers (ASCE). 2009. *America's Infrastructure: 2009 Report Card*. Washington, DC: ASCE.

Anselin, L. 1988. *Spatial Econometrics: Methods and Models*. Dordrecht, the Netherlands: Kluwer Academic.

Been, V. 2005. "Impact Fees and Housing Affordability." *Cityscape* 8 (1): 135–86.

Bivand, R., and A., Bernat. n.d. *Lagrange Multiplier Diagnostics for Spatial Dependence in Linear Models*. http://rss.acs.unt.edu/Rdoc/library/spdep/html/lm.LMtests.html (accessed November 3, 2011).

Burge, G. S., and K. R. Ihlanfeldt. 2006. "Impact Fees and Single-Family Home Construction." *Journal of Urban Economics* 60 (2): 284–306.

CBO (Congressional Budget Office). 2002. *Future Investment in Drinking Water and Wastewater Infrastructure*. Washington, DC: CBO.

Chapin, T. 2007. "Comment on Shishir Mathur's 'Do Impact Fees Raise the Price of Existing Housing?'" *Housing Policy Debate* 18 (4): 661–67.

Delaney, C. J., and M. T. Smith. 1989a. "Impact Fees and the Price of New Housing: An Empirical Study." *Journal of the American Real Estate and Urban Economics Association* 17 (1): 41–54.

Delaney, C. J., and M. T. Smith. 1989b. "Pricing Implications of Development Exactions on Existing Housing Stock." *Growth and Change* 20 (4): 1–12.

DPFG (Development Planning and Financial Group). 2008. *Impact Fee Handbook*. Washington, DC: National Association of Home Builders.

Evans-Cowley, J. S., L. J. Lockwood, R. C. Rutherford, and T. M. Springer. 2009. "The Effect of Development Impact Fees on Housing Values." *Journal of Housing Research* 18 (2): 173–93.

Ihlanfeldt, K. R., and T. M. Shaughnessy. 2004. "An Empirical Investigation of the Effect of Impact Fees on Housing and Land Markets." *Regional Science and Urban Economics* 34 (6): 639–61.

Lawhon, L. L. 1996. "Equity Considerations of Development Impact Fees and the Effect of Such Fees on the Price of Housing for Low- and Moderate-Income Residents." UMI Dissertation Services, 1–115.

Mathur, S. 2007. "Do Impact Fees Raise the Price of Existing Housing?" *Housing Policy Debate* 18 (4): 635–59.

Mathur, S., P. Waddell, and H. Blanco. 2004. "The Effect of Impact Fees on the Price of New Single-Family Housing." *Urban Studies* 41 (7): 1303–12.

Nelson, A. C., and M. Moody. 2003. *Paying for Prosperity: Impact Fees and Job Growth*. Working paper. Washington, DC: Brookings Institution, Center on Urban and Metropolitan Policy.

Nicholas, J. 1987. Impact exactions: economic theory, practice and incidence. *Law and Contemporary Problems* 50(1): 85–100.

Porter, D. 1988. "Will Developer Pay to Play?" *Journal of the American Planning Association* 54 (1): 72–75.

Singell, L. D., and J. H. Lillydahl. 1990. "An Empirical Examination of the Effect of Impact Fees on the Housing Market." *Land Economics* 66 (1): 82–92.

Schrank, D., A. Lomax, and B. Eisele. 2011. *2011 Urban Mobility Report*. College Station: Texas Transportation Institute.

Sirmans, S., D., MacPherson, and E. Zietz. 2005. "The Composition of Hedonic Pricing Models." *Journal of Real Estate Literature* 13 (1): 3–46.

Snyder, T. P., and M. A. Stegman. 1987. *Paying for Growth: Using Impact Fees to Finance Infrastructure*. Washington, DC: Urban Land Institute.

Yinger, J. 1998. "The Incidence of Development Impact Fees and Special Assessments." *National Tax Journal* 51 (1): 23–41.

Zietz, J., E. Zietz, and S. Sirmans. 2007. *Determinants of Housing Prices: A Quantile Regression Approach*. Department of Economics and Finance Working Paper Series. Murfreesboro, TN: Middle Tennessee State University.

Author Biography

Shishir Mathur is an associate professor in the Department of Urban and Regional Planning at San Jose State University. His research interests include infrastructure and development finance, international development, urban and real estate economics, growth management, affordable housing policy, transportation planning, and spatial econometrics.