

Article

Williams, Colin

TN#: 2019182



D

User ID:



Article

Preferred Delivery: Library	
Dept.: Economics	
Address:	
Pick up Library: CLEM	

Status: **Graduate**

Email Address:

williams.colinandrew@gmail.com

Username: **chv7bg**

NOTES:

Copyright Information:

NOTICE: This material may be protected by copyright law (Title 17, United States Code)

Policy:

Date Needed: 01/17/2023

Email Address: williams.colinandrew@gmail.com

Colin Williams

Pick up Library: CLEM

Pick up Library: CLEM

Article

Call #: **HC101 .J55|zv.30 July-Nov. 1991**

Location: **IVY**

Book/Journal Title:

Journal of Urban Economics

Book Author:

Other Info:

Volume: **30**Issue: **2**Year: **1991-09-01**Pages: **242-256**Article Author: **Gyourko, Joseph**

Article Title: **Impact Fees, Exclusionary Zoning, and the Density of New Development.**

Univ. of Virginia Library
Interlibrary Services
PO Box 400109
2450 Old Ivy Road
Charlottesville, VA 22904-4108

Printed Date: 10/20/2022 1:18:25 PM

CONTENTS

JANET E. KOHLHASE. The Impact of Toxic Waste Sites on Housing Values	1
MASAHISA FUJITA AND JACQUES-FRANÇOIS THISSE. Spatial Duopoly and Residential Structure	27
STUART S. ROSENTHAL, JOHN V. DUCA, AND STUART A. GABRIEL. Credit Rationing and the Demand for Owner-Occupied Housing	48
J. VERNON HENDERSON. Optimal Regulation of Land Development through Price and Fiscal Controls	64
HELEN F. LADD. Property Tax Revaluation and Tax Levy Growth Revisited	83
PETER LINNEMAN AND RICHARD VOITH. Housing Price Functions and Ownership Capitalization Rates	100
THOMAS J. MICELI. Free Riders and Distortionary Zoning by Local Communities	112
WILLIAM H. HOYT. Property Taxation, Nash Equilibrium, and Market Power	123

JOURNAL OF Urban Economics

EDITOR: Jan K. Brueckner

EDITORIAL BOARD

Alex Anas	Peter Mieszkowski
Ralph M. Braid	David Pines
James R. Follain	John M. Quigley
Masahisa Fujita	Harvey S. Rosen
Ronald E. Grieson	Kenneth A. Small
Bruce W. Hamilton	Mahlon Straszheim
J. Vernon Henderson	William C. Wheaton
Yoshitsugu Kanemoto	Michelle J. White
James B. Kau	David E. Wildasin
John F. McDonald	John D. Wilson



ACADEMIC PRESS, INC.

Harcourt Brace Jovanovich, Publishers

San Diego New York Boston

Impact Fees, Exclusionary Zoning, and the Density of New Development

JOSEPH GYOURKO

The Wharton School, University of Pennsylvania, Philadelphia, Pennsylvania 19104

Received July 26, 1989; revised May 8, 1990

The increasing use of impact fees represents a new trend in local fiscal policy which can have important effects on real estate markets. The ramifications for economic efficiency as well as for the pattern of metropolitan area development are not well understood by real estate academics or practitioners. Current discussion focuses primarily on who bears the burden of the fees. This paper shows that impact fees have interesting implications for a broader set of important issues. The fees provide communities with added flexibility in pricing entry into their jurisdictions, allowing existing residents to transfer to themselves the surplus associated with new development. Using impact fees can reduce the incentive for communities to engage in fiscally inspired exclusionary zoning. The optimal density of new development can increase following the introduction of fees. Widespread use of impact fees ultimately may help alter the current centralization in core cities of relatively poorer people and other demanders of high density development.

© 1991 Academic Press, Inc.

I. INTRODUCTION

The last two decades have witnessed large changes in the structure of local public finance and the taxation of real estate in particular. As evidenced by numerous property tax limitations which have been enacted, residents appear increasingly unwilling to pay higher taxes to finance infrastructure maintenance and expansion. There has been a move to make entrants to the community pay for added infrastructure. One way in which this has been accomplished has been through reliance on impact fees, a new kind of development exaction. Bauman and Ethier [2] define the fees to be "... charges levied against a new development in order to generate revenue for funding capital improvements presumably necessitated by the development." Impact fees typically are levied at the time of building permit activity. They are more flexible than the standard exaction and have been easily adapted to fund the construction of off-site facilities in many cases.

The economic ramifications of impact fees have become increasingly visible in public policy debates. Impact fees have become intertwined with

the housing affordability issue in high fee and high house price areas such as California. This has led economists to focus on who bears the burden of the fees.¹ The focus in this paper is not on standard incidence problems, but on two other issues which have broad implications for the nature of new development. One involves the potentially exclusionary influence of impact fees, especially with respect to poorer households. The other is closely related and involves how the optimal density of new development can be affected by impact fees. We demonstrate that there is no reason a priori to believe that communities employing impact fees engage in greater exclusion of poor people (or of other demanders of higher density development²) than do communities which do not employ fees. The relative exclusionary strength of impact fees is an empirical question which must be addressed by future research.

When viewed in isolation, impact fees certainly are exclusionary to the extent they raise the price of entry into some community. However, a sensible judgement about the exclusionary nature of the fees cannot be formed by viewing the fees in isolation. In the absence of impact fees, communities typically control entry through a combination of a flat rate property tax and zoning regulations on lot size. Adding impact fees to these standard devices can result in lessened reliance on minimum lot size restrictions and lessened exclusion of lower income groups.

This is possible because impact fees provide a community with added flexibility in pricing entry into its jurisdiction. The integration of impact fees with the standard property tax afford the potential to price discriminate against entrants. The fiscal externalities which can arise when a community with only a flat rate property tax allows entrants to buy less than average value (and presumably smaller) lots are now well known (see [12] for example). Impact fees can help internalize the externality so that a rich suburb may no longer have an incentive to engage in fiscally inspired exclusionary zoning which bars higher density, smaller lot size development. It may appear paradoxical, but the use of impact fees to price discriminate can be utility-enhancing for high density demanders of space.

The next section briefly outlines the nature of impact fee usage as well as some of the important legal questions surrounding their imposition. Section III reviews the community's incentive to engage in exclusionary zoning. Section IV discusses the implications of allowing impact fees for the desired density of new development in an existing low density suburb. Section V concludes the paper.

¹See Synder and Stegman [16, Chap. 8] for an overview of the issues involved. Delaney and Smith [5] provide estimates for a small sample of Florida communities.

²Throughout this paper, higher density refers to more intensive subdivision of a given amount of land into smaller plots.

II. THE DEVELOPMENT OF IMPACT FEES

Impact fees are now imposed to fund activities involving roads, schools, and even daycare development. The upsurge in fee imposition began in the late 1970's in California and has spread across the nation. A 1989 national survey of over 900 communities conducted for the Wharton Urban Decentralization Project found that 37% of the jurisdictions levied impact fees.³ The Wharton survey also documents significant differences in fee usage across the nation. For example, 84% of the 85 California cities in the sample levy impact fees versus only 32% of jurisdictions surveyed in the Philadelphia metropolitan area. The fee amounts are nontrivial. The mean fee per 2000-square-foot single-family home across all cities which impose them is \$2902. For California cities alone, the mean fee is \$6496, with 10% of those cities imposing fees in excess of \$10,000. Even in the most expensive areas of California, fees of this size amount to 4-8% of unit value.⁴ Impact fees of this magnitude exceed the effective annual local property tax, which is capped by law in California. Other survey data on southern California indicate that fees continue to rise far faster than the regional cost of living.⁵

The Wharton Urban Decentralization Project data also provide evidence that impact fees are among a wide array of exclusionary devices. Moreover, fees and exactions are not considered the most effective devices to control growth. The survey respondents indicated they felt that the use of zoning and other ordinances as well as the absence of adequate public facilities generally were more effective than impact fees in this respect. However, among the cities which impose fees, there is a statistically significant positive correlation between the amount of the fee and the rating of its exclusionary strength. The amount of the fee is significantly negatively correlated with the respondents' ratings of the exclusionary strength of other growth control devices including ordinances and building permit restrictions. Thus, it appears that some cities may have turned to fees after other restrictive policies did not work as well as desired.

Given the size of impact fees, it is not surprising that their legality has been challenged in the courts. However, if certain procedures are followed, it appears the fees are legal. There must be enabling legislation

³The survey data collected for the Wharton Urban Decentralization Project are not yet in published form. I thank the project organizers, Peter Linneman and Anita Summers, for allowing me access to their data prior to its general circulation.

⁴California recently allowed school districts to impose an impact fee of \$1.50 per square foot of housing structure which has helped drive the fees to such high levels. The average school-related fee in the California communities in the Wharton Urban Decentralization Project sample is \$3500 per single family unit.

⁵See Bay Area Council [3], Building Industry Association of Southern California [4], and Synder and Stegman [16] among others.

from the state. Fees unilaterally imposed by a local agency and not authorized by statute have been struck down. A key issue in the constitutionality question has been whether the fees are considered taxes. While economists view the difference as irrelevant, the legal distinction is important. The locality's authority to impose impact fees derives from the community's police power to regulate development for the public health, safety, and welfare. The police power has been broadly interpreted by the courts. Pure taxing power for the express purpose of raising general revenue is more restricted. If viewed as a tax, the fees become subject to charges of being discriminatory because all residents are not subject to the fee/tax. The most common constitutional challenge has focused on the reasonableness of the fees under the 5th Amendment "takings" or 14th Amendment due process clauses. State courts generally use a "rational nexus" argument to decide the issue.⁶ That is, they ask if there is a reasonable connection between the charges required of and the benefits conferred upon a new development. If such connection is found, the fees appear to be legal and are not considered either a taking or a discriminatory tax. Finally, fees can be imposed on new development to maintain a given service level in the community. The new development can be forced to pay to mitigate adverse consequences arising from the development.

III. PRICING ENTRY TO THE COMMUNITY AND EXCLUSIONARY ZONING

Prior to the imposition of economically meaningful impact fees, a locality typically used general property tax revenues to pay for the publicly provided goods available both to existing and new residents.⁷ However,

⁶Recent U.S. Supreme Court decisions (Nollan in particular) have raised questions about heightened federal review of impact fees. See Note (1988) for an overview of the Nollan decision and its potential implications.

⁷Technically, bonds were often issued to pay for the needed infrastructure. The municipal bonds ultimately had to be paid off with general tax revenues. For the purposes of this paper, we ignore bond finance. However, the financing mechanism may be quite relevant to the issue of why impact fees arose in the first place. In a private communication, Peter Linneman suggested that the use of bonds is life cycle compatible, but not incentive compatible due to increased mobility. Service demand typically is high for the young who also tend to be relatively cash constrained. The use of bonds helps solve the life cycle problem. However, the more mobile the society becomes, the more severe the incentive compatibility problem may become. The younger, high service demanders often move before the bonds are retired. There is an incentive compatibility problem only if the burden of the higher future taxation can be avoided by moving. One might think that an efficient land market would capitalize this. However, Inman makes a similar argument with respect to public employee pension underfunding and concludes that underfunding differentials are not fully capitalized into land prices. With imperfections in land markets, a possibly exogenous increase in mobility may have helped precipitate the switch from bond finance to user-like fees. While beyond the scope of this paper, this is a potentially important avenue for future research.

both price and nonprice means have been used to control entry because the property tax alone often has not been sufficient to control free-rider problems associated with some entrants. Inman and Rubinfeld [12] review why exclusionary zoning regulations may have been adopted by many suburban communities to deal with these problems. They demonstrate that with a property tax alone, a homogeneous collection of citizens will not want to admit families who desire to purchase sites with values below the community average. To allow such entry lowers the community's tax base per family and, for a given spending level, implies higher taxes. The higher tax rate makes the community less attractive, resulting in capital losses for existing residents. The end result is an incentive to enact so-called exclusionary zoning.⁸ Its practice in suburban areas is thought to be a major contributor to the concentration of the poor in central cities.⁹

To illustrate the issues involved, assume that community s levies a tax of rate t_s on the standard lot size of existing residents, l^R . This results in tax revenues of $\$M = t_s l^R$. Assume further that the cost of providing a unit of the publicly provided good (g_s) costs $\$M$ and that all residents are provided with one constant quality unit of g_s . It is assumed throughout that there is one resident per lot regardless of lot size. Currently, there are only wealthy residents with income level I^R who have bought sites of size l^R . In this situation, each resident pays for the unit of the publicly provided good consumed and the community's budget is balanced.

If entrants who were (say) poorer were allowed to purchase smaller lots of size l^P , where $l^P = \alpha l^R$ with $0 < \alpha < 1$, fiscal externalities result. Assuming assessed valuation is directly proportional to lot size, the tax revenues from each new entrant amount to $\alpha \$M$ which do not fully cover the cost of the unit of g_s provided to each site. The property tax rate must be raised to balance the budget which makes the community less attractive, thereby lowering land values. The desire to avoid capital losses underlies the situation outlined by Inman and Rubinfeld [12] in which the local government (assumed to act on behalf of existing residents) has an incentive to zone out the high-density demanders. As those authors note, existing residents could in theory band together and outbid potential

⁸It should be noted that Epplé *et al.* [7] have employed the term exclusionary zoning in a different way. They define exclusion to have occurred if, in their intertemporal setting, "... land in some community remains unoccupied while higher-cost land elsewhere is developed" (p. 135). Zoning-induced sorting by income into separate communities does not necessarily imply exclusion in their world. Exclusion results only if entrants are denied access to unoccupied land. Throughout this paper, we are concerned solely with exclusionary zoning as defined by Inman and Rubinfeld [12].

⁹This supposition is a guiding force behind recent court decisions in New Jersey regarding land use controls and mandatory implementation of low-income housing programs. See Windsor [18] and Hill [11] for the details surrounding the New Jersey situation.

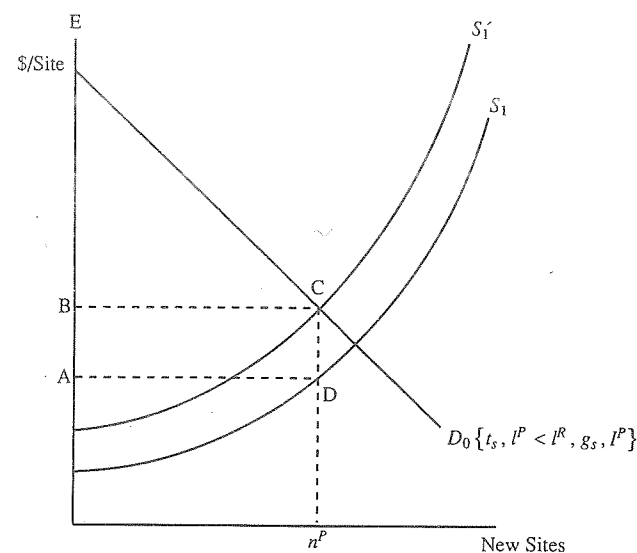


FIG. 1. Demand for sites of size l^R with subdivision allowed.

residents who might want to subdivide into less expensive, smaller lot size developments. Nevertheless, the evidence appears consistent with the hypothesis that the cheapest way to prevent entry is to zone out the demanders of high density development.

Figures 1 and 2 graphically illustrate the problem. In Fig. 1, poorer entrants are allowed to band together to buy a lot of size l^R and then subdivide into smaller lots of (say) size $l^P = (0.33)l^R$. Their aggregated demand schedule for lots of size l^R with subdivision allowed is denoted by D_0 . The real resource cost of developable sites is assumed to be upward sloping and is given by the S_1 schedule. The S'_1 schedule is the tax inclusive supply curve. The entrants would like to buy n^P sites of size l^R and then subdivide to allow $3n^P$ people into community s . However, the property tax revenues of $ABCD$ (equal to $\$n^P M$) are less than the costs of providing a unit of the public good to all entrants ($\$3n^P M$). This shortfall provides the fiscal incentive to enact minimum lot size restrictions.

Eliminating subdivision by establishing a minimum lot size of l^R might zone out the high-density demanders as shown in Fig. 2. If these demanders are relatively poor and income constrained, their demand for sites of size l^R is given by D'_0 .¹⁰ Their willingness to pay is everywhere less than

¹⁰There could be other underlying causes besides income for the low demand. For example, old people who are not poor may have a preference for smaller lots requiring less upkeep. We focus on the income dimension for simplicity and because of the potentially important policy implications associated with exclusion along income lines.

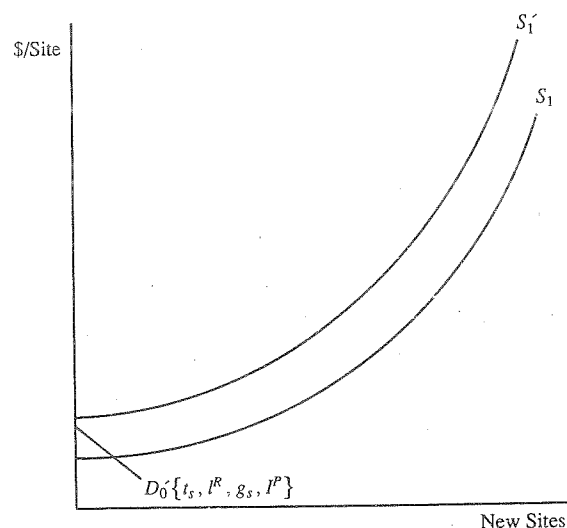


FIG. 2. Demand for sites of size l without subdivision allowed.

the sum of the real resource costs of new development plus taxes of $\$M$ for each site and there is no entry by this class of demanders.

IV. THE COMMUNITY'S CHOICE OF OPTIMAL LOT SIZE WITH IMPACT FEES

There is no entry by the poor even though Fig. 1 indicates that some potential entrants may be willing to pay more than the cost of the public service consumed for the right to enter. For all but the marginal entrant there is some consumer surplus associated with receiving a site in community s . If the willingness to pay exceeds the costs of the publicly provided service and the surplus can be captured by the city via an impact fee, the potential to internalize the fiscal externality exists. The legal requirement to levy a single nondiscriminatory property tax can prevent gains from trade.

Consider the zoning decision for new development in suburban community s . Assume that this suburb already has largely been developed and is composed of a homogeneous collection of rich residents who each have endowment income of y^R and live on lots of size l^R . This lot size was optimally determined at the time of past development when the only means of raising revenue was a flat rate property tax, t_s .¹¹ Community s

¹¹See White [17] for an early and detailed analysis of suburban zoning decisions. More recently, Epplé *et al.* [7] consider how a metropolitan area would develop over time

can now levy impact fees of amount f_i on each new site where i indexes the new sites developed. For simplicity, we assume that any impact fees collected by the local government are transferred via grants on a per capita basis to existing residents. The community must also set zoning standards for new lots with the lot size established for new entrants being denoted by l^E .

The objective of city officials is to maximize the utility of existing residents, U^R . This is done by jointly choosing the optimal lot size for entrants (l^E), the associated amount of entry (n^E), and the impact fee (f_i) and tax rate (t_s) which maximize the surplus transferred to current residents.¹² Existing resident utility is assumed to be a function of land services l^R , a single publicly provided good g_s , and a bundle of all other goods A which is the numeraire commodity. The opportunity cost of a unit of land in community s is r_s so that the implicit rent paid by each existing resident owner is $r_s l^R$. If n^R is the number of existing residents and n_i represents a single entrant to the community, then the impact fee revenue received by any one of the existing residents is given by $F = \sum(f_i n_i)/n^R$. Consumption of the numeraire bundle A is $y^R - \{(r_s(l + t_s)l^R)\} + F$.

We assume further for simplicity that the alternative to living in community s is living in community c . Community c has no exclusionary zoning laws and one can buy any size site desired here. Lots in community c are denoted by l_c . The community levies an effective property tax rate t_c but has no impact fee. Community c also has its own publicly provided good, g_c .

Community s faces a downward sloping demand for entry into its jurisdiction but that is not intended to be a consequence of the assumption of only a single alternative community. That assumption is intended solely to simplify notation. In an empirical investigation of the effects of growth

depending upon whether existing residents could set zoning policies. They find that sorting into homogeneous communities is likely under various conditions, although there are situations (analogous to those enumerated by Hamilton [9]) in which heterogeneous communities are viable.

¹²To abstract from income effects, we assume all vacant land is owned by absentee landlords. Further, we do not explicitly analyze the developer's decision on subdivision which has already been solved by Adelstein and Edelson [1]. We also abstract from complications involving congestion externalities arising from entry. Adelstein and Edelson [1] illustrate how development exactions, including impact fees, could function to internalize congestion costs. By ignoring congestion costs and their potential feedback effects on local land markets, we obviously are employing a partial equilibrium framework rather than a general equilibrium framework. A partial equilibrium analysis is much simpler and can clearly present the main points of the paper. Later in the text, we explicitly note the implicit assumptions being made by our use of a partial equilibrium model.

controls on housing prices, Katz and Rosen [13] present evidence strongly implying that small suburban communities are not perfect competitors and do not face horizontal demands for entry. Small communities appear to have special features making them unique even in a large metropolitan area. In the example below, the key unique feature of community s will be its package of publicly provided goods and services.

The solution to the community's maximization problem even in this stylized environment is complex and is subject to various constraints. First, the property tax/impact fee structure cannot be such that the utility of entrants into community s (U_s^E) is lower than that achievable in community c (U_c^E). Existing residents would like to impose very large fees and reduce their property taxes as much as possible. The equal utility constraint helps bound the size of the impact fee in that the fee charged cannot be so large that the part of the burden borne by the entrant exceeds the willingness to pay for a particular site.

The fee also is constrained by the community's need to balance its budget. Because new entrants facing impact fees are likely to be a small percentage of the total population, general property tax revenues probably will be needed to help finance public goods provision. We assume that each locality must provide one constant quality of the public service to each resident. There is one resident per site regardless of lot size. The tax rate which balances the budget is a function of the impact fee because the fee helps determine the number of units of g_s which must be provided. Assuming property value is directly proportional to lot size, the base for the property tax is $(n^R l^R + n^E l^E)$, where n^E is the number of new entrants. Local public expenditures are $g_s(n^R + n^E)$.

There are also direct legal constraints on the size of impact fees. Recall that the courts' rational nexus argument implies that fees must bear some resemblance to the benefits provided by the new development. The legal upper bound is denoted as \bar{f} and the unconstrained fee by f^* . This leads to a third constraint which mandates that the actual fee imposed be the minimum of \bar{f} and f^* . One would expect this constraint to bind. The unconstrained fee should be that which captures all available willingness-to-pay to enter the community (net of that taken by property taxation). This fee drives the price of newly developable land to zero as all quasi-rents associated with inframarginal entrants are transferred to existing residents via the impact fee. We do not see new site prices of zero in impact fee areas and the legal limitations on permissible fee amounts certainly are at least partially responsible for this.

A fourth constraint on the maximization problem is that the fee structure cannot be such that developer profits in community s (Π_s) are lower than the normal industry rate of return that can be earned elsewhere (Π^*). In terms of Fig. 1, this constraint implies that, for inframarginal

developers, the impact fee cannot be such that it would transfer any more than the available producer surplus associated with developing any given site.

The maximization problem is formally stated as

$$\max_{(U^P, n^P, f, t_s)} U^R \{l^R, y^R - (r_s(1 + t_s))l^R + F; g_s\}$$

subject to

- (1) $U_s^P \{l^P, y^P - (r_s(1 + t_s))l^P - f_i; g_s\} > U_c^P \{l_c, y^P - (r_c + t_c)l_c; g_c\}$;
- (2) $t_s \{n^R l^R + n^P l^P\} > g_s(n^R + n^P)$;¹³
- (3) $f_i = \min[\bar{f}; f^*]$;
- (4) $\Pi_s(f_i, t_s) > \Pi^*$.

We are particularly interested in whether there are cases in which the city would allow higher density development than would result in the absence of impact fees. The city might allow such development if the high density demanders can outbid the low density developers for a potential site. If this happens, the area of potentially extractable surplus is greater without minimum lot size restrictions against smaller lots. This possibility is most clearly illustrated in Figs. 3 and 4.

First, note that exclusionary zoning is optimal if high density demanders' willingness to pay is not sufficient to cover the costs of the required publicly provided goods.¹⁴ The city also has no incentive to remove minimum lot size restrictions if the high density demanders do not outbid the low density demanders for sites. Tastes certainly play an important role in determining whether the high density demanders' aggregated demand for a site of size l^R is greater than that of another party who does not desire to subdivide the site. Willingness to pay to enter community s partially is a function of the quality of land services which itself is assumed to be an increasing function of lot size ($\partial U^P / \partial l^P > 0$). The disutility associated with living in a higher density development could result in the sum of multiple entrants' demands being less than that of a single low density demander.

One way in which the high density demanders' bid for a site could be higher is if they have a particularly strong taste for the publicly provided

¹³Recall that the impact fee revenue does not show up here because we assume that it is rebated directly to existing residents.

¹⁴All payments and costs are meant to be in net present value terms. While the graphs below capture a snapshot in time, they should be interpreted as representing fully discounted sums.

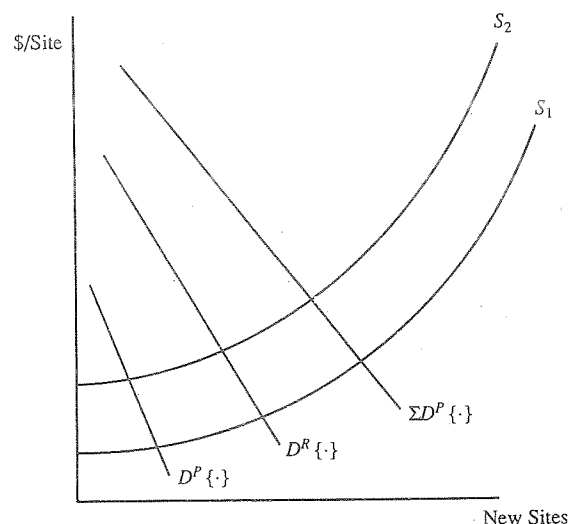


FIG. 3. Rich and poor demands with subdivision allowed.

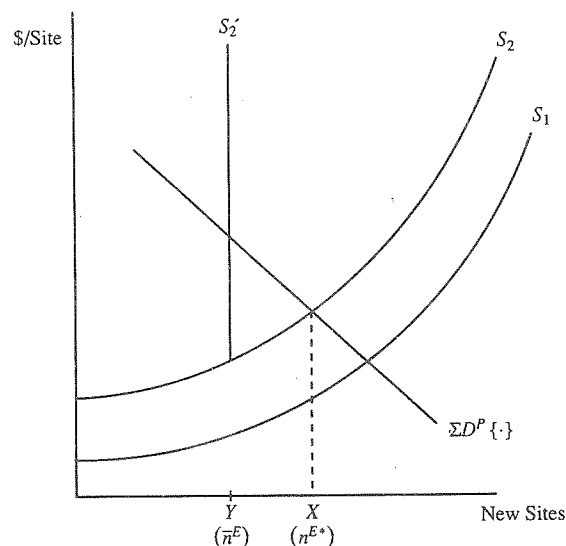


FIG. 4. Exogenous political constraint limiting entry.

good g_s . This is not an unlikely scenario for the case of poorer young families whose alternative is living in some center city (community c) where the education service is markedly inferior. Wealth constraints may prevent them from purchasing a large lot, but they may be able and willing to sacrifice space for the right to consume the higher quality education service in suburban community s . If one believes there is validity to the exclusionary zoning story, then the rise of impact fees makes this trade-off potentially viable.

Figure 3 depicts the situation in which some (say) poorer people are willing to outbid the rich person for a site which they will then subdivide so that $l^E < l^R$. A poor person's individual demand for land of amount l^R is given by D^P and is everywhere below that of a rich person (denoted by D^R). However, the sum of the relevant poor peoples' demands for sites of size l^R (ΣD^P) is higher than that of the rich person even though they will occupy only a fraction of l^R . In this case, the surplus extractable via impact fees is greater if zoning regulations are relaxed to allow the poorer high density demanders to enter the community. The city obviously would search across all feasible lot sizes for the maximum surplus given the various constraints on extractability. Figure 3 is assumed to represent the outcome of that maximization.¹⁵

The law does not allow for perfect price discrimination. The same fee generally must be imposed on a class of people entering a development. At best, the community can engage in a multi-part pricing scheme. This reduces but does not eliminate the incentives to alter the desired density of new development and exclusionary zoning regulations.

Figure 3 assumes the flat rate property tax plus impact fee covers the cost of the publicly provided service. However, it is important to remember the partial equilibrium nature of our model and its potential influence

¹⁵Unfortunately, the algebra behind the formal solution to the city's maximization problem is complex and unintuitive, largely due to the presence of the multiple constraints. It can be shown that the optimal lot size (l^{P*}) is a function of a host of factors which interact with each other in complex ways. These factors include: existing and new residents' relative tastes for land, for non-land goods consumption, and for the publicly provided good; and, the fiscal environment and how changes in it affect builder profitability, and residents' abilities to consume. Note also that our analysis has focused on moving from a zero impact fee situation to one with positive fees. This discrete change cannot really be captured with a standard comparative static calculation. In our problem, both l^P and f are choice variables so that there is not a convenient comparative static result for a change in lot size given some change in the impact fee. Such a result can be obtained only if one simplifies the problem by assuming that both f and t_s are fixed with the community maximizing over lot size (l^P) and the amount of entry (n^E). This makes the third and fourth constraints above irrelevant. With certain other assumptions, we can show that all the implications of the paper also hold for communities which already have fees and are considering enlarging them. The details of those calculations are available upon request.

on this assumption. Specifically, we have neglected other possible costs to residents. The most obvious added costs are congestion-related. If consumption of the public good is congested, the value of new entrants falls. Higher fees might be required for more dense development or property taxes might have to be raised to help restore service quality. Clearly, our model assumes such feedback effects are not so large as to overwhelm the direct benefits following entry by high density demanders. While the conceptual issue is clear, the relevance of the congestion effects is a potentially important empirical question beyond the scope of this paper.

Finally, one might think that the relatively poor high density demanders would take over community s . They could just as easily bid up the value of already developed sites of size l^R and subdivide. This probably does not occur because of an exogenous political constraint which we have ignored. There is a maximum number of entrants demanding high density development (denoted below by \bar{n}^E) which the existing residents are willing to admit. The upper bound is set to prevent the new type of people from becoming the dominant coalition in community s . The number of high density demanders is the minimum of this politically determined upper bound and the number (n^{E*}) who would like to enter given the optimal lot size, impact fee structure, public goods provision, and personal traits such as income (I^E) which affect the demand for sites. Essentially, this means that a fifth constraint, $n^E = \min[n^{E*}, \bar{n}^E]$, should be added to the above maximization problem. The effect of this constraint is illustrated in Fig. 4. There are a total of n^{E*} entrants who would occupy the X new sites of size l^R developed without political constraint. However, the effective supply of sites is given by S_2 so that only \bar{n}^E can enter with only Y sites developed.

V. CONCLUSIONS

This paper has outlined how the rise of impact fees can influence the incentive for communities to engage in fiscally inspired exclusionary zoning. With only a flat rate property tax, communities often could not effectively exploit any monopoly power they may have had. It certainly will not surprise some that with respect to an equilibrium with exclusionary zoning, some potential entrants can be made better off even if the community can engage in perfect price discrimination against them. Hamilton [9] has argued that fiscal zoning can act to internalize fiscal externalities and look like a head tax. We have argued that impact fees can have similar effects under certain conditions. However, we caution that impact fees themselves typically are not head taxes as often they are positively related to the density of development.

Moreover, when viewing impact fees from an economic perspective, we do not think it will be helpful to analyze them in optimal tax terms. A

more fruitful perspective may be to view them as part of tax reform. Stated differently, a more relevant question to ask is whether impact fees represent an improvement as part of piecemeal reform. The analysis can take place within the framework advocated by Diewert [6], Feldstein [8], and Rosen [15] for other tax changes. Hattat [10] has shown that movement toward a uniform commodity tax structure is welfare improving under fairly general conditions, including in the absence of a lump sum tax. The results here imply that differential fees may be welfare improving for all parties. Future work needs to ascertain whether the results about the appropriateness of differential impact fees hold true in a formal piecemeal reform analysis. The apparently conflicting results may be due to different underlying constraints in the urban context. For example, there is zoning plus the property tax in the urban environment.

Finally, serious empirical analysis of these issues requires a systematic data collection effort both on new development and impact fee structures. Some planning and private developer groups have conducted surveys on impact fees, but these data tend not to be in a form easily usable by researchers. Private collection efforts will be required given budget cutbacks experienced by the standard government sources.

ACKNOWLEDGMENTS

Funding from a Pew Trust grant to the Wharton Decentralization Project is gratefully acknowledged. Joe Haubrich, Bob Inman, Pete Linneman, Joe Tracy, and the referee provided helpful comments on previous drafts.

REFERENCES

1. R. Adelstein and N. Edelson, Subdivision exactions and congestion externalities, *Journal of Legal Studies*, 1, 147-163 (1976).
2. G. Bauman and W. Ethier, Development exactions and impact fees: A survey of american practices, *Law and Contemporary Problems*, 51, No. 1 (1987).
3. Bay Area Council, "Taxing the American Dream: Development Fees and Housing Affordability in the Bay Area," May (1988).
4. Building Industry Association of Southern California, "1988 Land Development Fee Survey," (1988).
5. C. Delaney and M. Smith, The price effect of impact fees on new single family housing: An empirical study, *American Real Estate Urban Economics Journal*, 17(1), 41-54 (1989).
6. W. E. Diewert, Optimal tax perturbations, *Journal of Public Economics*, 10 139-177 (1978).
7. D. Epple, T. Romer, and R. Filimon, Community development with endogenous land use controls, *Journal of Public Economics*, 35, 133-162 (1988).
8. M. Feldstein, On the theory of tax reform, *Journal of Public Economics*, 6, 77-104 (1976).
9. B. Hamilton, Capitalization of intrajurisdictional differences in local tax prices, *American Economic Review*, 66, 743-753 (1976).
10. T. Hattat, Welfare effects of changing commodity tax rates toward uniformity, *Journal of Public Economics*, 29, 99-112 (1986).

11. D. A. Hill, Government manipulation of land values to build affordable housing: The issue compensating benefits, *Real Estate Law Journal*, 13, 3-27 (1984).
12. R. Inman and D. Rubinfeld, The judicial pursuit of local fiscal equity, *Harvard Law Review*, 92(8), 1662-1750 (1979).
13. L. Katz and K. Rosen, The interjurisdictional effects of growth controls on housing prices, *Journal of Law and Economics*, 30(1), 149-160 (1987).
14. P. Mieszkowski and G. Zodrow, Taxation and the Tiebout model, *Journal of Economic Literature*, 27(3), 1098-1146 (1989).
15. H. Rosen, A methodology for evaluating tax reform proposals, *Journal of Public Economics*, 6 105-121 (1976).
16. T. Synder and M. Stegman, "Paying for Growth: Using Development Fees to Finance Infrastructure," Urban Land Institute, Washington, DC (1986).
17. M. White, Fiscal zoning in fragmented metropolitan areas in "Fiscal Zoning and Land Use Controls" (E. Mills and W. Oates, Eds.), Lexington Books, Lexington, MA (1975).
18. D. Windsor, "Fiscal Zoning in Suburban Communities," Heath, Lexington, MA 1979.
19. R. Inman, Public employee pensions and the local labor budget, *Journal of Public Economics*, 19(1), 49-72, (1982).
20. Note, Taking a step back: a reconsideration of the takings test of *Nollan v. California Coastal Commission*, *Harvard Law Review*, 102(2), 448-468 (1988).

A Markov Chain Model of Zoning Change

DANIEL P. McMILLEN

Department of Economics, University of Oregon, Eugene, Oregon 97403

AND

JOHN F. McDONALD

*Department of Economics, University of Illinois at Chicago, Box 4348,
Chicago, Illinois 60680*

Received August 15, 1989; revised April 18, 1990

A Markov Chain model of land use zoning is estimated with data from suburban Chicago for 1961-1981. The land use categories are residential, non-residential, and a mix of the two. Predictions are made of the equilibrium zoning of representative tracts. The Markov Chain model is used to correct for selectivity bias in a residential land value function; significant bias is indicated. © 1991 Academic Press, Inc.

1. INTRODUCTION

Empirical studies of zoning have tended to focus on the effects of zoning on land values. Until recently, zoning was treated as exogenous in land value equations.¹ However, Wallace [10] and McMillen and McDonald [8] have shown that selectivity bias sometimes exists in land value equations because zoning is determined in part by land values. An empirical model of zoning is required to correct for selectivity bias. Very little attention has been paid to the determinants of zoning, only Rolleston [9], Wallace [10], and McMillen and McDonald [8] having addressed the problem. No study has explicitly considered the dynamics of the zoning process.² This neglect partly reflects data limitations, but it also reflects a tendency to regard zoning as unlikely to change and the changes themselves as unpredictable. In this study, we show that zoning changes are common in our sample area and offer an empirical model that predicts zoning change.

The Markov Chain model that we employ allows us to predict the equilibrium amount of land zoned as residential, non-residential, or a combination of both. Significant change is predicted, particularly for land that originally has both uses. Much land is predicted to be converted to

¹For example, see [2-5, 7].

²Mark and Goldberg [7] consider the effects of changes in zoning on land values, but they treat both zoning and zoning changes as exogenous variables.