Price Effects of Road and Other Impact Fees on Urban Land

ARTHUR C. NELSON, JANE H. LILLYDAHL, JAMES E. FRANK, AND JAMES C. NICHOLAS

Urban land prices rise rather than fall in response to imposition of development impact fees due to one of two reasons. First, impact fees imply a contract for development that is worth more as a package than no fees and uncertain development. Impact fees are actually the final stage of a policy process that anticipates development pressures through a land use and facility planning scheme. In return for paying fees, developers are assured of adequate facilities. Impact fees thus enable the urban land market to internalize otherwise unpriced development externalities such as greater certainty in approval, extension of needed facilities, and reduced political opposition because developers are paying their own way. Second, if impact fee policy is part and parcel of an overall growth restriction effort, development production will fall in the near term because of higher construction costs represented by the fees. In the near term, developers either find ways to reduce development costs, perhaps through greater land use intensity or lower quality, or they take fewer profits. To avoid lower profits in the longer term, developers leave the market only to return when the post-fee profit margins equal pre-fee levels. Those levels are attained when prices rise just enough to offset the fees. Land owners in the urban land market respond to higher development prices by raising land prices if the land-to-development price ratios remain substantially unchanged. The central hypothesis—that urban land prices will rise in response to imposition of development impact fees—was applied to evaluations of the urban land markets in Loveland, Colorado, and Sarasota County, Florida. Evidence was found that supports the hypothesis, but the reasons are not yet clear. Although additional study is needed, the findings break new ground in an understanding of how urban land markets respond to development impact fees.

In recent years, local governments have created alternative revenue sources to finance facilities needed to accommodate new development. Among those inventions are development impact fees, defined as charges imposed by local governments on new development to generate new revenue for infrastructure necessitated by such new development.

The overall policy objective of development impact fees is to shift the burden of financing new infrastructure from the overall community to the owners of land, developers, or consumers of new development. Although the burden may be shifted away from the community, there are competing claims as to which groups in the development process will actually bear the cost of those fees in the form of higher prices, lower profits, or other outcomes. It is generally conceded that, in urban land markets in which the demand for new development is relatively inelastic (for example, when home buyers are relatively unaffected by increases in housing price because of few substitutes), it is the consumers of new development who pay the impact fees (*1*,*2*). Under this situation, impact fees are said to be shifted forward to consumers.

If the local urban market is relatively competitive, however, conventional wisdom and tax incidence theory suggest that urban land prices must fall by an amount sufficient to offset the additional costs of construction represented by the fees. Otherwise, new development will not be able to compete with available substitutes (*3*–*10*).

There is some speculation that urban land markets are not as competitive as one might think. Developable land is often in limited supply; for any given type of development the number of land owners is limited and they may know one another. The land owners may hold a reservation price below which they will not sell even if land sales slow down because of impact fees (*11*). Developers will thus be stuck with the need to raise prices or reduce profits. In the near term, they may have to reduce their profits. They will rid themselves of inventory and then wait until demand rises to a point at which post-fee profits return to pre-fee levels. In the end, it will be the consumer who pays the fees through higher prices (*6*). However, the practical effect of land owners holding out until they receive their reservation price is that the present value of their price in the future may in effect be equal to the price they could have received earlier. Higher land prices may thus be a function of time and not necessarily the change in the demand structure of the local urban land market.

Although the literature suggests that in relatively competitive urban land markets the imposition of development impact fees will result in either lower urban land prices or constant prices after accounting for demand and inflationary effects, the opposite is hypothesized, that is, that impact fees will result in higher urban land prices for two reasons.

First, development impact fees are a contract for development rights that are worth more as a package than no fees and uncertain development. This concept can be viewed in several ways. The fee may represent all the facilities and services promised to be delivered by local government in exchange for its payment. The fees thus reflect the value of facilities and services promised or contracted. The fee may also reflect more certainty in land use decisions because impact fee policy is required by law to be based on sound land use and facility planning. Impact fees also comport with demands of locally vocal slow- or antigrowth interests that new

A. C. Nelson, City Planning and Public Policy, Georgia Institute of Technology, Atlanta, Ga. 30332. J. H. Lillydahl, College of Arts and Sciences, University of Colorado, Boulder, Colo. 80302. J. E. Frank, Department of Urban and Regional Planning, Florida State University, Tallahassee, Fla. 32306. J. C. Nicholas, Department of Growth Management Studies, University of Florida, Gainesville, Fla. 32611.

development pay its own way. Expressed another way, the presence of an impact fee policy may result in the urban land market internalizing these or perhaps other otherwise unpriced development externalities.

The second explanation involves the possibility that fees not only result in higher house prices but higher land values as well. This possibility has been theorized in terms of the optimal timing of development in a competitive housing market. For example, expanding on theories by Shoup (*12*), it might be argued that the optimal time for housing development occurs when the ratio of house construction cost to the market price of the housing, including land, equals the ratio of the interest rate on capital less the rate at which rents increase over time to the interest rate on capital, as follows:

$$P(K)/P(T) = (i - r)/i \quad (1)$$

where

P = price of capital,
K = amount of capital needed to build the house on a single lot,
$P(T)$ = value of the house with land when built at time T,
i = interest rate on capital, and
r = rate at which rents or house values are increasing.

The developer should wait until the interest saved by postponing development one period, $iP(K)$, equals the rent foregone, $(i - r)[P(T)]$. The price of the finished house is determined by the demand for housing, which in turn is assumed to increase continuously, causing values to rise at a constant rate (r).

Using this foundation, the effect of impact fees on the timing of development can be considered. Impact fees (IF) are added to the cost of house construction. The time of development may change to T^* with the resulting price of housing $[P(T^*)]$. $P(T^*)$ can be directly compared with the price of housing without the fee $[P(T)]$, which is analogous to Shoup's (*12*) analysis of the effect of taxes on the optimal time of development. In particular, when

$$[P(K) + \text{IF}]/P(T^*) = (i - r)/i \quad (2)$$

then

$$P(T^*) = [iP(K) + i\text{IF}]/(i - r) \quad \text{or}$$

$$P(T^*) = P(T) + [i\text{IF}/(i - r)] \quad (3)$$

where

$$i/(i - r) > 1$$

The impact fee will therefore delay the time of home construction until the house price rises to $P(T^*)$, which is analogous to Wicksell's (*13*) optimal time of timber harvesting. In effect, the impact fee will delay construction until prices rise by an amount that offsets the interest charge on the impact fee. When applied to a growing urban area, the increase in housing prices will result in higher land prices. The effect of the impact fee is therefore to delay home construction to the point at which the fee is offset by higher house construction and land purchase price. It is possible that the impact fee policy is used in part as a growth-restricting device. As such, the practical outcome will be the same: land prices will rise when housing production is delayed to a later time when greater prices can be realized.

Unfortunately, there is virtually no empirical research concerning the price effects of impact fees in the urban land market. The principal aim here is to help overcome this void.

LOVELAND AND SARASOTA IMPACT FEE PROGRAMS

The city of Loveland, Colorado, and Sarasota County, Florida, provide reasonably good case studies for evaluating the price effects of development impact fees.

Loveland has a nationally recognized development impact fee program that has been in place since 1983. The city does not impose artificial limits on the supply of buildable urban land. Rather, supply is expanded as warranted by demand provided there are revenues available to extend necessary facilities. Those revenues are provided in part by development impact fees. Furthermore, considering the sluggish economy and housing market for the Front Range cities of Colorado since the early 1980s, there is little concern for the effects of unusual demands placed on existing supplies of buildable land.

Impact fees on new single-family houses in Loveland during the time of this evaluation (1981 through 1986) totaled $1,537 ($736 for parks, $98 for fire facilities, $24 for police facilities, $121 for libraries, $58 for museums, $271 for general government facilities, and $229 for streets). Loveland's cost recovery system won the American Planning Association's innovative planning program award for 1986. Many communities across the nation have recently copied and implemented Loveland's approach.

Sarasota County also has a nationally recognized development impact fee program, which was instituted in 1983. The county imposes limits on the supply of buildable urban land west of US-41, which demarcates the area of high-value homes found along the Gulf of Mexico. East of that highway, however, supply is expanded as warranted by demand (*14*).

In 1983 the county commissioners adopted an impact fee ordinance that divided the county into three subareas: (a) north municipal service taxing units (MSTUs), (b) south MSTUs, and (c) areas east of the MSTUs. Within the MSTUs, new development would be assessed differential levels of impact fees; the other areas were exempt from the impact fees during the study period. In both the north and south MSTUs, impact fees are assessed separately for parks and roads. In the north MSTU, the park impact fee is $80 per equivalent dwelling unit (EDU), which is defined as the average dwelling unit. The road impact fee is $826 per equivalent trip generation unit (ETGU), defined as 10 trips per day from an average single-family home. For the average dwelling unit, the total north MSTU impact fee is $906. In the south MSTU, the park impact fee is $124 per EDU and $575 per ETGU for roads, or a total of $699 per average dwelling unit.

EMPIRICAL RESULTS

Through support from the Urban Land Institute and with the cooperation of the Georgia Institute of Technology, Florida

State University, University of Florida, and University of Colorado, price effects of development impact fees on urban land in Loveland and Sarasota County were evaluated. In this section the model and methodology are reviewed. In the next section the findings are summarized.

The following model was used to test the central hypothesis that impact fees result in higher land prices in a relatively competitive urban land market:

$$P_i = b_0 + b_i\text{FEE}_i + \text{Eb}_j\text{C}_{ij} + \text{u}_i \quad (4)$$

where

P_i = market price per acre or foot of transacted Parcel i;
FEE_i = estimated fee that would be paid by a developer of Parcel i assuming that development would take place simultaneously with the land purchase;
EB_jC_{ij} = a vector of j variables characterizing each Parcel i, including those variables reviewed in the following section; and
u_i = stochastic disturbance.

It is thus hypothesized that $d\text{FEE}/dP > 0$.

Loveland

The land sales data for Loveland come from records collected by the Larimer County assessor's office. Sales records are updated continuously and coded by land class (residential, industrial, commercial, etc.), land use (vacant, built, etc.), and whether the transaction was arms length. Those files are typically used to calculate ratios or indexes for the purpose of adjusting property tax rolls by market trends. Specifically, the land data used for estimating the model consist of arms-length sales of vacant, buildable land within the city of Loveland, at least 1 acre in size, zoned for residential development, and transacted between July 1, 1981, and June 30, 1987. Buildable land includes those parcels that had full urban services (i.e., water, sewer, and roads) available to within 300 ft of the property at the time of sale.

Data on 33 arms-length transactions were collected for the study period and constituted the universe of qualifying transactions. The final independent variable selection was thus limited by degrees-of-freedom restrictions. The sample size is not unreasonable, although more cases would have been preferred.

The dependent variable was specified as the price per acre of land at the time of sale. The independent variables included (a) parcel size in acres to account for plattage value effects, (b) desirable view opportunities from the site (according to a windshield survey of all tracts), (c) a dummy variable for low-density neighborhoods, (d) the distance to the nearest freeway interchange (a proxy for centrality effects—Loveland has no single central core for retail and commercial activity, but it is within commuting range of shopping and employment centers in and around Fort Collins and Denver), (e) a continuous time variable representing the month and year of transaction, and (f) the amount of the impact fee per average-sized lot that would have been paid upon development if development occurred at the time of sale.

Table 1 summarizes the empirical results for the Loveland case study. In general, the regression results are consistent with traditional demand studies of land prices. Approximately 71 percent of the variation in price per acre is explained by the model. In addition, number of acres, view, and density are all statistically significant variables and have the expected signs. The demand variable, population, has the expected positive sign but is statistically insignificant. The negative, but insignificant, coefficient on the time variable suggests that, holding other factors constant, the price of land fell over this sample period. Given that there was a regional protracted slowdown in the construction industry during the study period, this finding is not surprising.

The independent variable of primary interest is the impact fee variable. Although impact fees have a statistically insignificant, positive effect on the price of land, the results are consistent with expectations. They are also consistent with findings offered by Singell and Lillydahl (*15*); that is, the entire impact fee was shifted forward onto home buyers in Loveland. Singell and Lillydahl found that prices not only of new homes but also of existing homes were affected significantly by the fee. In addition, they concluded that the quantity of housing, lot size, and other housing characteristics may also be affected by the fees.

Sarasota County

The data for Sarasota County come from land sales records collected by county tax assessment offices as reported to the Florida Department of Revenue, supplemented by data collected in the field. According to officials of the Department of Revenue, Sarasota County's recorded data are of high quality. Sales records are kept by fiscal year and coded by land class (residential, industrial, commercial, etc.), land use (vacant, built, etc.), instrument used in sale (cash, contract, trust deed, etc.), and relationship of seller to buyer (relative, closely held corporation, arms length, etc.). The files are typically used to calculate an index for the purpose of automatically adjusting property tax rolls by market trends. Cases

TABLE 1 REGRESSION RESULTS FOR LOVELAND, COLORADO

Independent Variables	B Coefficient	Beta	T-Value
Impact Fee	12.3	.31	.81
Acres per Parcel	-2983.1	-.56	-4.60
Good View	28,183.0	.46	3.30
Density	-28,367.0	-.46	-3.30
Distance	201.6	.04	.30
Population	10,743.0	.74	1.00
Time	-537.0	-.45	-.60

$R^2 = 0.71$

Adjusted $R^2 = 0.63$

$n = 33$

identified for the study were arms-length transactions of vacant, buildable land sold between July 1, 1981, and June 30, 1987, zoned for single-family residential development, located outside city limits, capable of being subdivided into four or more residential home sites, and that had full urban services available to within 300 ft at the time of sale according to city engineering and planning records and officials.

The total data set included more than 80,000 records of sales during the study period. After screening cases for only arms-length transactions of buildable parcels, a subset of approximately 850 cases was created that also met the general definition of buildable land. These cases were reduced to about 275 after removing large acreage subdivision lots that cannot be further divided. The pool was reduced further to 155 and then to 68 after eliminating parcels that could not be subdivided into four or more lots (the proxy for candidate parcel sales to builders). Thus, out of more than 80,000 total records, only 68 cases met the criteria of arms-length transactions of vacant, buildable land sufficiently attractive to developers.

However, 24 of those cases were zoned for agricultural densities—one unit per 5 acres minimum lot size. Those cases were eliminated because county plans indicated that zone changes to a range of urban densities were likely in the agricultural areas where these parcels were found. Another 4 cases were outliers, believed to be caused by honest errors either in assessor records or in the interpretation of them. The final universe of qualifying transactions was 40.

Sixteen independent variables or their log values were used in the final regression equations. The dependent variable was sales price per potential home site of a transacted parcel (LGPUNIT). This definition was selected because it was known that developers buy urban land not because of size but because of the potential number of developable home sites. (Unlike Loveland, where zoning restricted all parcels to similar density, zoning density throughout Sarasota County is variable.)

The independent variables included area of potential home sites in acres (LGUNITSZ); property tax rate (LGTAX); census tract income in 1980 (LGINCOME); number of residential units in a half section (LGDENS); distance to downtown Sarasota, Venice, the nearest Interstate exchange, the nearest regional shopping center, and the beach in 1,000-ft units (LGDSARA, LGDVEN, LGDXCH, LGDSHOP, and LGDBEACH, respectively); presence of a road in front of the parcel (ROAD); presence of sewer within 300 ft (SEWER); the month in which the parcel was transacted during the period, from 1 for July 1981 to 84 for June 1987 (LGTIME); change in county population in the year previous to sale as an indicator of demand (LGPOPCH); location inside an incorporated city (CITY); the impact fee per potential home site (LGUNITFE); and location inside the north or south MSTU (NMSTU and SMSTU, respectively).

There is little evidence of multicollinearity as there are no collinearities involving important variables above 0.70. Similarly, the plot of estimated values compared with residual values indicated no systematic bias in the residuals, suggesting that heteroscedasticity is not a problem.

Table 2 presents the regression results for the Sarasota County case study. Table 3 presents the same regression except substituting location in north and south MSTU for the

TABLE 2 REGRESSION RESULTS FOR SARASOTA COUNTY, FLORIDA

Independent Variables	B Coefficient	Beta	T-Value
Constant	0.716	0.000	0.081
LGUNITSZ	1.112	0.800	8.424
LGTAX	0.587	0.066	0.684
LGINCOME	1.203	0.151	1.278
LGDENS	-0.047	-0.129	-0.833
LGDSARA	-0.581	-0.409	-2.515
LGDVEN	0.038	0.037	0.145
LGDXCH	-0.227	-0.150	-0.970
LGDSHOP	-0.094	-0.039	-0.553
LGDBEACH	-0.483	-0.399	-1.572
ROAD	-0.093	-0.036	-0.507
SEWER	0.354	0.171	1.808
LGTIME	-0.111	-0.095	-1.106
LGPOPCH	-0.002	-0.001	-0.011
CITY	-0.270	-0.117	-1.009
LGUNITFEE	0.023	0.215	2.196

$R^2 = 0.934$

Adjusted $R^2 = 0.892$

$n = 40$

TABLE 3 REGRESSION RESULTS FOR SARASOTA COUNTY, FLORIDA: SUBSTITUTING LOCATION IN NMSTU AND SMSTU FOR IMPACT FEE

Independent Variables	B Coefficient	Beta	T-Value
Constant	-0.815	0.000	-0.087
LGUNITSZ	1.103	0.794	8.118
LGTAX	0.560	0.063	0.639
LGINCOME	1.318	0.165	1.327
LGDENS	-0.035	-0.097	-0.555
LGDSARA	-0.541	-0.381	-2.147
LGDVEN	-0.004	-0.004	-0.014
LGDXCH	-0.222	-0.147	-0.932
LGDSHOP	0.175	-0.042	-0.594
LGDBEACH	-0.462	-0.382	-1.461
ROAD	-0.071	-0.028	-0.368
SEWER	0.350	0.169	1.752
LGTIME	-0.113	-0.096	-1.102
LGPOPCH	0.004	0.001	0.016
CITY	-0.193	-0.083	-0.594
NMSTU	0.587	0.206	2.060
SMSTU	0.432	0.206	2.060

$R^2 = 0.934$

Adjusted $R^2 = 0.888$

$n = 40$

impact fee. Table 4 presents the results for only those 29 cases in which impact fees would be assessed when developed, that is, on parcels sold since 1983. (The impact fee was effected in October 1983. However, the imminence of impact fees and their approximate magnitude were well known throughout 1983. It was thus assumed that buyers of buildable land knew about the impact fee throughout the entirety of 1983 and purchased land accordingly. The unreported results for cases only occurring after 1983 were consistent with the reported findings.) Table 5 presents the same regression on the 29 cases except substituting location in NMSTU and SMSTU for the impact fee. Results are consistent with each other. The evidence is reasonably compelling of the positive price effect of impact fees on urban land values.

In Table 2, four variables are significant at the 0.10 level of the two-tailed *t*-test. They are unit size, distance from Sarasota, presence of sewer lines within ¼ mi, and the impact fee. Distance to beach is significant for a one-tailed test. All explanatory variables possess expected signs and reasonable magnitudes of coefficients.

The impact fee coefficient suggests that a 1 percent increase (or decrease) in the fee is associated with a 0.023 percent increase (or decrease) in value per home site. Because the mean home-site value is $14,396 and the mean impact fee per home site is $410, a 1 percent change in the fee of $4.10 is statistically associated with a $3.31 change in value per home site. This finding would imply that 81 percent of the fee is being internalized in land value.

TABLE 5 REGRESSION RESULTS FOR SARASOTA COUNTY, FLORIDA: FOR SAME 29 CASES, SUBSTITUTING LOCATION IN NMSTU AND SMSTU FOR IMPACT FEE

Independent Variables	B Coefficient	Beta	T-Value
Constant	-5.181	0.000	-0.429
LGUNITSZ	1.288	0.900	9.931
LGTAX	-0.112	-0.010	-0.126
LGINCOME	1.853	0.269	1.539
LGDENS	-0.241	-0.297	-2.221
LGDSARA	-1.023	-0.716	-1.311
LGDVEN	-0.036	-0.024	-0.031
LGDXCH	0.394	0.297	0.743
LGDSHOP	-0.175	-0.053	-0.649
LGDBEACH	0.127	0.097	0.347
ROAD	-0.245	-0.113	-1.058
SEWER	0.310	0.155	1.325
LGTIME	0.106	0.085	0.809
LGPOPCH	0.105	0.035	0.492
NMSTU	-0.711	-0.290	-0.259
SMSTU	0.375	0.199	1.906
R^2 = 0.956			
Adjusted R^2 = 0.906			
n = 29			

TABLE 4 REGRESSION RESULTS FOR SARASOTA COUNTY, FLORIDA: FOR ONLY 29 CASES IN WHICH IMPACT FEES WOULD BE ASSESSED WHEN DEVELOPED

Independent Variables	B Coefficient	Beta	T-Value
Constant	-8.279	0.000	-0.996
LGUNITSZ	1.289	0.901	10.252
LGTAX	-0.136	-0.013	-0.158
LGINCOME	2.136	0.310	2.294
LGDENS	-0.229	-0.283	-2.268
LGDSARA	-0.735	-0.514	-2.979
LGDVEN	-0.470	-0.320	-1.456
LGDXCH	0.550	0.414	1.610
LGDSHOP	-0.137	-0.041	-0.563
LGDBEACH	0.181	0.138	0.549
ROAD	-0.207	-0.096	-1.016
SEWER	0.249	0.124	1.469
LGTIME	0.129	0.103	1.127
LGPOPCH	0.096	0.032	0.468
LGUNITFEE	0.018	0.163	1.936
R^2 = 0.956			
Adjusted R^2 = 0.912			
n = 29			

In Table 3, distinction is made only in location of parcels and not in impact fees paid. Variables that are statistically significant at the 0.10 level include unit size, distance to Sarasota, presence of sewer, and location within the SMSTU. Variables that are significant using the one-tailed test are income of the census tract and location within the NMSTU. All statistically significant variables possess expected signs. Positive coefficients on MSTUs suggest that parcels in urbanizing, unincorporated Sarasota County command higher prices. Reasons include the availability of easily developable parcels relative to cities, where in-fill can be costly, and in rural areas, where urban services are not available. No direct impact fee interpretations should be inferred.

Table 4 presents the results for those 29 cases for which impact fees have been assessed since 1983. Variables that are statistically significant include unit size, income of census tract, neighborhood density, distance to Sarasota, and impact fee. Distance to nearest Interstate highway interchange is significant using the one-tailed test. All significant variables possess the expected signs. Interestingly, the coefficient on impact fee is not much different in Table 4 than in Table 2.

For Table 5, significant coefficients include home-site size, income of the census tract, neighborhood density, distance to Sarasota, distance to Venice, distance to the nearest Interstate interchange, distance to nearest shopping center, and presence of sewer systems within ¼ mi. The SMSTU coefficient is also significant and positive. All possess expected signs and have reasonable magnitudes.

POLICY IMPLICATIONS

In review, there are two reasons for positive price effects. These reasons are discussed in more detail in this section, focusing on some interesting policy implications and on the need for further research.

The payment of impact fees essentially establishes a contract between the fee payer and the local government (*16*). In return for the fee, the county promises to deliver public facilities and services more or less on demand, even if they are not present at the time the fee is paid. This exchange is a fundamental tenet of the impact fee law. (This connection between impact fee collection and service provision may have to be modified as Florida implements its statutorily required concurrency management.) The developer may give greater value to land on which impact fees will ultimately be paid because there is the expectation that facilities will be made available in exchange for the fee. Positive price effects thus reflect expectations of developability.

But it is the seller who reaps the windfall. In effect, the seller may believe that, because the property will have access to facilities upon payment of a fee (by someone else), the expectation of those facilities is worth an increment.

The possibility that properties on which impact fees would be paid could receive development permits faster than properties without such fees was investigated. If this could be demonstrated with reliability, it is possible that the impact fee serves as a proxy in part for time savings in seeking development approval. The owner of the land perceives that impact fee payments expedite the development-permitting process, which results in time savings and windfall profits to developers, which are then capitalized value in land (*17*). Informal analysis with local officials in Sarasota was inconclusive, however. No reliable figures exist on the extent to which development approvals were processed any faster than before after fees were imposed in the north and south MSTUs or whether permits are processed faster inside MSTUs than outside.

Another explanation for positive price effects is related to how impact fees may affect the shifting of the housing market. One effect of impact fees on markets in which buyers are relatively insensitive to price changes is to shift the fee forward to those buyers. Even when markets are relatively competitive, imperfections in the land market can result in impact fees being passed forward. Moreover, in Sarasota County the payment of the impact fee could be delayed until issuance of the certificate of occupancy, thereby sheltering all participants in the development process from payment of the fee until the sale of the home. (This option was changed in 1989 to require payment of impact fees no later than the issuance of the building permit. The fee is paid at the building permit stage in Loveland.) If the effect of impact fees is to cause an increase in house price or a reduction in house quality, then the fee would not be incurred by the seller of land but instead by the final consumer. If the fee results in a higher house price, then naturally builder markup is affected in proportion to the increase. Because land-to-house-price ratios remain relatively constant in any given housing market, a markup of housing price would be associated with a markup in land value. Unless sellers of land capitalize this benefit, developers and builders receive a windfall. Thus, positive price effects of the impact fee in the land market is the consequence of forward-shifted impact fees. The explanation is also related to theory on the optimal timing of house construction. Because the fee is a one-time payment made at the time of construction, a possible effect of the fee is a reduction in the rate of return realized by a developer or builder. The rate of return is restored only when construction is delayed to a time when values are higher and post-fee ratios are restored to their pre-fee levels.

Of course, positive price effects of the fee can be—and probably are—a combination of all these factors. More research is needed to properly attribute price effects and to assess the manner in which the actors in the development process shift or share the fee. Research should be undertaken in relatively competitive urban land markets so that the interactions between land owner and land developer, between land developer and builder, and between builder and consumer can be evaluated. Consideration might also be given to the timing of fee payment and the resulting interactions among the actors in shifting and sharing the fee. The present study is but a small step, but it lays the foundation for future work.

REFERENCES

1. J. D. Landis. Land Regulation, Market Structure, and Housing Price Inflation: Lessons from Three California Cities. *Journal of the American Planning Association*, Vol. 52, No. 1, 1986, pp. 9–21.
2. S. Weitz. Who Pays Infrastructure Benefit Charges? In *The Changing Structure of Infrastructure Finance* (J. C. Nicholas, ed.), Lincoln Institute of Land Policy, Cambridge, Mass., 1985.
3. R. C. Ellickson. Suburban Growth Controls: An Economic and Legal Analysis. *Yale Law Journal*, Vol. 86, Jan. 1977, pp. 385–512.
4. R. A. Musgrave and P. B. Musgrave. *Public Finance in Theory and Practice*, 4th ed. McGraw-Hill, New York, 1984.
5. R. D. Sandler and E. T. Denham. Transportation Impact Fees: The Florida Experience. Presented at 65th Annual Meeting of the Transportation Research Board, Washington, D.C., 1986.
6. T. P. Snyder and M. A. Stegman. *Financing the Public Costs of Growth*. Urban Land Institute, Washington, D.C., 1986.
7. S. Weitz. Funding Infrastructure for Growth. In *Impact Fees: A Developer's Manual*, National Association of Home Builders, Washington, D.C., 1984.
8. J. B. Duncan, T. D. Morgan, and N. R. Standerfer. *Simplifying and Understanding the Art and Science of Impact Fees*. City of Austin Planning Department, Austin, Tex., 1986.
9. P. Mieszkowski. The Property Tax: An Excise Tax or a Profit Tax? *Journal of Public Economics*, Vol. 1, No. 2, 1972, pp. 73–96.
10. H. Aaron. *Who Pays the Property Tax?* The Brookings Institute, Washington, D.C., 1975.
11. D. E. Dowall. *The Suburban Squeeze*. University of California Press, Berkeley, 1984.
12. D. C. Shoup. The Optimal Timing of Urban Land Development. *Papers of the Regional Science Association*, Vol. 25, 1970, pp. 33–41.
13. C. G. Uhr, ed. *Economic Doctrines of Knut Wicksell*. University of California Press, Berkeley, 1960.
14. A. C. Nelson, J. E. Frank, and J. C. Nicholas. Development Impact Fees and Housing Production. *Journal of Urban Planning and Development*, 1991 (in press).
15. L. Singell and J. Lillydahl. An Empirical Examination of the Effect of Impact Fees on the Housing Market. *Land Economics*, 1990.
16. J. C. Nicholas, A. C. Nelson, and J. Juergensmeyer. *A Practitioner's Guide to Development Impact Fees*. American Planning Association, Chicago, Ill., 1991.
17. A. C. Nelson and G. J. Knapp. A Theoretical and Empirical Argument for Centralized Regional Sewer Planning. *Journal of the American Planning Association*, Vol. 53, No. 4, 1987.

Publication of this paper sponsored by Committee on Local Transportation Finance.