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THE INCIDENCE OF DEVELOPMENT FEES AND SPECIAL ASSESSMENTS

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Abstract - This paper investigates the incidence of development fees and special assessments, popular ways to finance new public infrastructure. Development fees are often seen as a way to shift the burden of new infrastructure onto the new residents that require it. This view is only partially right. Even with mobile households, competitive housing markets, and infrastructure investments that meet a cost-benefit test, one-quarter of the burden could fall on the owners of undeveloped land. Moreover, imposing fees for infrastructure that does not benefit new residents will only increase landowners' burden. In contrast, the above conditions ensure that the burden of special assessments falls entirely on new residents.

INTRODUCTION

Thanks to the tax revolt and the high costs of rapid residential development, many jurisdictions have been turning to development fees as a way to finance new infrastructure. In a few states, especially Minnesota, special assessments also are used for this purpose. In their review of recent developments, Altshuler and Gómez-Ibáñez (1993) document increases in the number of jurisdictions that use development fees, in the range of facility types financed by these fees, and in the magnitude of the fees, which now often exceed $10,000 per house. They also point out that some cities now use special assessments for nontraditional purposes, such as financing business improvement districts. This paper employs some well-known tools of urban public finance to investigate the incidence of such financing mechanisms.

Many papers have already explored the incidence of development fees, also called impact fees or exactions.[1] See, for example, Huffman et al. (1988) and Altshuler and Gómez-Ibáñez (1993), along with the references therein. For the most part, this literature employs supply and demand curves and intuitive arguments. This paper adds some formality to the treatment of the issue, and provides a framework in which the incidence of both development fees and

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special assessments can be analyzed. This formality confirms some points, adds precision to others, and reveals some new conclusions that the literature has missed. This approach also lacks the institutional detail in some previous work, as all possible scenarios cannot reasonably be included in a formal model.[2] The paper attempts, however, to deal with the main features of the topic.

THE HOUSEHOLD'S BIDDING PROBLEM

The central component of the analysis in this paper is a model of household bids for housing in alternative locations. This model draws on the large literature on housing bids, which is reviewed in Ross and Yinger (forthcoming). The specific bidding framework used here was pioneered by Wheaton (1993). The model determines how much households would pay for new housing in communities with different infrastructure and financing packages.

In the bidding framework, a household selects the highest bid per unit of housing services that is consistent with its budget constraint and with its level of utility. To facilitate comparisons across financing mechanisms, the household budget constraint is written with both property taxes and special assessments in it. Development fees do not appear in this problem because they are not paid by the household, but they obviously appear in the housing firm's problem, which is discussed below. Let Y be household income; Z be consumption of a composite good (with a price of unity); P be the price per unit of housing services, H; t be the effective property tax rate;[3] a be the special assessment rate (applied to house value);[4] and i be the real discount rate. Then, house value is $V = PH/i$, annual property taxes are tV, and the annual value of a special assessment is $iaV = aPH$.[5] Thus, the household budget constraint is

1

$$Y = Z + PH + t\frac{PH}{i} + aPH.$$

A household's utility, U, is a function of the composite good, Z; housing services, H; standard public services (such as police, fire, and education), S; and infrastructure (or public capital services), C. Moreover, households are assumed to have many communities in the metropolitan area from which they can choose so that their utility level is fixed at, say, U'.[6] Events in one community cannot alter this utility level, so it can be treated as a parameter in the bidding problem. (The consequences of weakening this assumption, and a few others, are considered in a later section.) This paper assumes that all households are alike, but the analysis can easily be extended to consider any number of income/taste classes—each with its own fixed utility level.[7]

The household's problem is to determine the maximum amount it would be willing to pay for housing in communities with different service-tax packages, subject to the constraint that household utility equals the level it can achieve in the metropolitan area. Now, let $t^* = t/i$. Then, solving the budget constraint, equation 1, for P, the household's problem is to pick Z and H so as to

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$$\text{maximize} \qquad P = \frac{Y - Z}{H(1 + t^* + a)}$$

$$\text{subject to} \qquad U(Z, H, S, C) = U'.$$

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The first-order conditions of this problem are

3

$$\frac{-1}{H(1 + t^* + a)} + \lambda U_z = 0$$

and

4

$$\frac{-P}{H} + \lambda U_H = 0$$

where λ is a Lagrangian multiplier and the subscripts indicate partial derivatives. These conditions imply that a household selects H so that

5

$$P(1 + t^* + a) = \frac{U_H}{U_Z} .$$

In words, $P^* = P(1 + t^* + a)$ is the effective price of H, and a household adjusts its spending until the marginal benefit from H equals this price. It will prove convenient to summarize this demand relationship using the compensated price elasticity of demand for H, μ. In particular, we can write

6

$$dH = \mu \frac{dP^*}{P^*} H .$$

Now, we can turn to the heart of the matter, namely, the impact of infrastructure and financing mechanisms on household bids and hence on housing prices. These impacts ultimately determine the extent to which any financing mechanism is shifted onto households. Because C, t, and a are parameters in equation 2, we can use the envelope theorem to derive their impact on P.[8] The results, which are well established in the literature (Ross and Yinger, forthcoming), are

7

$$\frac{dP}{dC} = \lambda U_C$$

8

$$\frac{dP}{dt} = \frac{-P}{i(1 + t^* + a)} .$$

and

9

$$\frac{dP}{da} = \frac{-P}{1 + t^* + a} .$$

Now using equation 3 and defining the marginal benefit from C as $MB = U_C/U_Z$, equation 7 becomes

10

$$\frac{dP}{dC} = \frac{MB}{H(1 + t^* + a)} .$$

These results imply that, when C, t, and a all change, the change in P is

11

$$dP = \left(\frac{1}{1 + t^* + a}\right)\left(\frac{MB}{H} dC - \frac{P}{i} dt - P da\right).$$

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Combining equations 6 and 11 and the definitions of P^* and V, we also can derive several other relationships that will prove useful later on:

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$$\frac{dP^*}{P^*} = \frac{dP}{P} + \left(\frac{1}{1 + t^* + a}\right)\left(\frac{dt}{i} + da\right)$$
$$= \frac{MB}{H(1 + t^* + a)}\ dC$$

13

$$dH = \left(\frac{\mu}{P}\right)\left(\frac{MB}{1 + t^* + a}\right) dC$$

and

14

$$dV = \frac{dPH}{i} + \frac{PdH}{i}$$
$$= \frac{MB\ (1 + \mu)\ dC - Vdt - iVda}{i + t + ia}.$$

THE CONSTRUCTION FIRM'S PROBLEM

A developer or construction firm builds houses so as to maximize its profits. In our terms, it uses capital, K, and land, L, to produce H.[9] The price of capital, which is set on a national market, is r, and the price of undeveloped land, which may differ from the price of developed land, is R. The firm also must pay an exaction or development fee, X. The price of housing is determined from the household bidding problem and is taken as given by the firm.[10] Thus, the firm's problem is to select K and L so as to

15

$$\text{maximize } \pi = \frac{PH(K,L)}{i} - rK - RL - X\ .$$

The familiar first-order conditions result:

16

$$\frac{PH_K}{i} = r \text{ and } \frac{PH_L}{i} = R\ .$$

Competition ensures that the firm's profits will be zero. Totally differentiating the expression for profits in equation 15, we find that:

17

$$\frac{dPH}{i} + \frac{P}{i}(H_K dK + H_L dL) - rdK - dRL$$
$$- RdL - dX = 0\ .$$

Plugging in the first-order conditions, equation 16, this simplifies to

18

$$dR = \frac{\frac{dPH}{i} - dX}{L}\ .$$

Thus, the change in land prices needed to ensure zero profits depends on the change in the market price of housing, P, and on the change in the development fee, X.

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BALANCED BUDGET INCIDENCE ANALYSIS

These results make it possible to examine balanced budget incidence for several different financing schemes. Three cases will be considered: development fees, special assessments, and property taxes.

Development Fees

The most obvious incidence question to address with this apparatus is what happens when infrastructure is added and financed with a development fee. To keep the analysis simple, let us assume that there is no development fee to begin with and there are no special assessments. Thus, this case is defined by $X = a = da = 0$ and $dX, dC > 0$. For the moment, let us also assume that property taxes do not change, that is, $dt = 0$. Finally, let us assume that the added infrastructure is an appropriate investment in the sense that it meets the following benefit-cost condition:

19

$$\frac{MB}{i}\, dC = dX\ .$$

Because a and t do not change (and X does not affect P), equation 10 gives the increase in P associated with the infrastructure investment—and hence the burden of the fee on homebuyers (not considering the benefits they receive).[11] Substituting equation 10 and 19 into equation 18, we find that

20

$$dR = \frac{\left(\frac{MB}{i+t} - \frac{MB}{i}\right)}{L}\, dC = \left(\frac{-tMB}{i(i+t)L}\right) dC < 0\ .$$

This is the key result in this paper: Even if it meets the benefit-cost test, a development fee leads to a drop in the price of land and therefore to a burden on landowners.[12] Housing firms bear no burden as (assumed) competition maintains zero profits. Moreover, new home purchasers bear a large share of the burden of the fee in the form of higher housing prices but also bear no burden net of the infrastructure benefits they receive, thanks to their (assumed) mobility.

The intuition of this result is straightforward. The added infrastructure raises the price of housing, but this increase is subject to the property tax, so housing prices do not increase by the full value to consumers of the infrastructure alone. Since the development fee is set equal to this full value, the housing price increase is not sufficient to compensate developers for the development fee and the price of land must drop to preserve zero profits.

The literature recognizes that landowners may bear some of the burden of development fees under some conditions. However, most previous studies ignore the capitalization of infrastructure benefits into house values, and no previous study recognizes the impact of property tax capitalization on the incidence of development fees.[13] Thus, this paper differs from previous work in concluding that some burden on landowners is a common outcome with development fees.

We must now return to the preliminary assumption that there is no change in t. In fact, the increase in house values due to the infrastructure improvement raises the property tax base in the jurisdiction and increases the revenue that can be raised at the old rate, t. To keep revenue constant (this is a balanced budget

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exercise), t must drop. This drop in t raises the price of new houses and therefore further compensates developers for the fee they must pay. If this additional price boost is high enough, land prices will not have to drop to maintain zero profits.

To keep the analysis manageable, let us assume that the share of original households, ρ^o, and the share of new households, ρ^n, are fixed; price changes may alter housing consumption, but not the number of households.[14] Moreover, let V^o stand for the value of houses owned by original households, V^n [=V] stand for the value of new houses, and $\bar{V}$ be average house value in the jurisdiction. Then, to keep revenue constant, it must be true that

21

$$dt\,\bar{V} + t\,\rho^o\,dV^o + t\rho^n dV^n = 0\ .$$

Substituting in equation 14 with $a = da = 0$ and with $dC = 0$ for the original residents (who already have infrastructure), we find that

22

$$dt = -\frac{t\rho^n MB(1+\mu)}{i\bar{V}}\,dC\ .$$

Thus, as long as $|\mu| < 1$, the housing price increase associated with infrastructure makes it possible to lower the property tax rate. The empirical literature on housing demand (Goodman, 1988) indicates that this condition is met.[15] If it were not, however, the housing quantity response would more than offset the price increase, and the property tax base provided by new housing would be lower with infrastructure than without it, necessitating a property tax increase to hold revenue constant.

Using equations 11 and 22 to bring in the impact of the change in t on P, we now find that $dR < 0$ as long as

23

$$(1+\mu)\,\rho^n < \frac{\bar{V}}{V}\ .$$

Because μ is negative and new residents are likely to be a small fraction of the total population, the left side of this equation is far below one. Thus, unless the value of a new house is many times greater than the average house value in the jurisdiction, the extra price boost from the property tax cut will not be sufficient to fully compensate developers for the fee they must pay, and land prices will still fall—although not by as much as indicated by equation 20.[16] The intuition here is clear: Because the property tax break is spread out over all houses in the jurisdiction, not just over new houses, the impact on the sales price of new houses is likely to be small.

The magnitude of the final burden imposed on landowners is quite high. In fact, the ratio of the burden on the owner of land for a given house, $(-dR)(L)$, to the gross burden on the home purchaser, $(dP)(H)/i$, equals

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$$\frac{-dRL}{\frac{dPH}{i}} = \frac{i+t}{i + t\left(\frac{V}{\bar{V}}(1+\mu)\rho^n\right)} - 1\ .$$

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The first two columns of Table 1 illustrate the burden ratio implied by equation 24 for various values of the parameters in the model, assuming that the benefit-cost condition is met. In this table, all the calculations assume that $i = 0.04$ and $\mu = -0.4$.[17] For example, the burden ratio is 0.241 when the effective property tax rate is one percent, old and new houses have the same value, and new houses make up five percent of the housing stock. Note that a burden ratio equal to b implies that homeowners bear $1/(1 + b)$ percent of the burden and landowners bear $b/(1 + b)$ percent, ignoring the negative burden on the original homeowners. By this formula, the lowest burden ratio in the first two columns of Table 1 implies that landowners bear $0.196/(1 + 0.196) = 16.4$ percent of the burden and the highest ratio implies that they bear $0.719/(1 + 0.719) = 41.8$ percent of the burden. The main factor increasing the burden ratio is the property tax rate, which, after all, causes the divergence between the housing price increase and the development fee.

This analysis also implies that existing residents get a capital gain from the fee.[18] Because infrastructure boosts the price of new houses and expands the tax base, the jurisdiction-wide cut in property taxes that is needed to keep revenue constant raises the value of existing houses by the formula in equation 8.[19] Development fees not only insulate existing residents from the costs of infrastructure for new development but also give them a capital gain.[20]

Special Assessments

With special assessments, $a = X = dX = dt = 0$ and $da, dC > 0$. To meet the benefit-cost condition, it must be true that

25

$$\frac{MB}{i}\, dC = da\, V\,.$$

Solving equation 25 for da and substituting the result into equation 11, we find that $dP = 0$. It follows from equation 18 that $dR = 0$.

In this case, both the benefit side and the cost side have an impact on the

TABLE 1
BURDEN OF A DEVELOPMENT FEE ON LANDOWNERS RELATIVE TO THE GROSS BURDEN ON HOMEBUYERS[a]

	B-C Ratio = 1.0		B-C Ratio = 2.0		B-C Ratio = 2/3	
	$t = 0.01$	$t = 0.03$	$t = 0.01$	$t = 0.03$	$t = 0.01$	$t = 0.03$
Value of New Houses = Value of Existing Houses						
$\rho^n = 0.05$	0.241	0.711	–0.380	–0.144	0.861	1.567
$\rho^n = 0.15$	0.222	0.639	–0.389	–0.180	0.834	1.459
Value of New Houses = 2 x Value of Existing Houses						
$\rho^n = 0.05$	0.232	0.675	–0.384	–0.163	0.847	1.512
$\rho^n = 0.15$	0.196	0.542	–0.402	–0.229	0.794	1.313
Value of New Houses = 0.8 x Value of Existing Houses						
$\rho^n = 0.05$	0.243	0.719	–0.379	–0.140	0.864	1.579
$\rho^n = 0.15$	0.228	0.660	–0.386	–0.170	0.842	1.491

[a]These calculations assume that $i = 0.04$ and that $\mu = -0.4$. Note that B-C stands for "benefit-cost" and that all symbols are defined in the text.

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price of housing. Both of these impacts affect property tax liability, so the asymmetry present in the case of development fees does not appear. The increased housing price associated with better infrastructure exactly offsets the decreased housing price associated with a special assessment, and housing price does not change. Hence, there is no need for land rents to fall and none of the burden falls on landowners.[21] In fact, the entire burden of the tax falls on new residents, who receive the full benefit from the infrastructure.[22]

Property Tax Finance

It is also possible to finance new infrastructure by raising the property tax rate. In this case, $a = X = da = dX = 0$ and $dt, dC > 0$. The benefit-cost condition is now difficult to state because some of the costs fall on the original residents of the jurisdiction, whereas the benefits still only flow to new residents. One way to state this condition is to say that the marginal benefit per new household must equal the total cost of the infrastructure divided by the number of new residents. The infrastructure is paid for by an increase in t that applies to all property, existing and new, so the cost side of the condition must include the property taxes paid by new residents plus the property taxes "exported" to existing residents. In symbols,

26

$$\frac{MB}{i}\,dC = \left(\frac{\rho^n NV + \rho^o N\bar{V}}{\rho^n N}\right) dt$$

$$= \left(V + \frac{\rho^o}{\rho^n} V^o\right) dt$$

where N is the number of households in the community.

From this formulation and equation 11, it follows that

27

$$dP = \frac{iMB}{H(i + t)} \left(1 - \frac{\rho^n V}{\bar{V}}\right) dC\,.$$

Because $\bar{V} > \rho^n V$, it follows from equation 27 that $dP > 0$ and hence, from equation 18 that $dR > 0$. With a property tax, therefore, owners of undeveloped land experience a capital gain. Not surprisingly, existing homeowners experience a tax increase and, hence, a capital loss; after all, they are paying higher taxes without receiving any benefits. New residents also bear a small share of the increased property tax burden.

This analysis also makes it possible to examine hybrid financing schemes, such as a property tax applied only to the infrastructure-induced increase in property value combined with a development fee, if needed. Like other tax-increment financing schemes, this approach faces the difficult practical obstacle of determining the impact of an infrastructure increase on property values.[23] If this impact can be determined, then the incidence of this hybrid scheme is likely to fall between that of a development fee and that of a special assessment. In particular, the change in land rent can be shown to equal the expression in equation 20 multiplied by the absolute value of μ, the price elasticity of demand for housing.[24] If $\mu = -1$, therefore, this scheme has the same incidence as a development fee, and, if $\mu = 0$, it has the same incidence as a special assessment.

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Alternative Assumptions

Three of the assumptions in this analysis are particularly important: mobile households, competition in the construction business, and infrastructure investments that meet a benefit-cost test. This section briefly considers the consequences of relaxing these assumptions.

The assumption of household mobility leads to predictions about property tax and public service capitalization, which have been extensively tested. Yinger et al. (1988) review the tax capitalization literature, which consistently finds a statistically significant negative impact of property taxes on house values, and present some evidence that a $1 increase in the present value of property taxes, holding services constant, results in a full $1 decrease in house values, as the theory presented here predicts. Many studies, which are reviewed in Yinger et al. (1988) and Ross and Yinger (forthcoming), also support the view that public service quality is capitalized into house values, holding the property tax rate constant.

Service and tax capitalization are, of course, central to the results in this paper. Service capitalization is the mechanism by which revenues for infrastructure are shifted onto new owners. Incomplete service capitalization therefore implies a burden on new residents that is smaller than the one derived here. With full service capitalization but incomplete capitalization of taxes, the incidence of development fees and special assessments is more similar than the analysis presented here implies. According to equation 27, incomplete tax capitalization also lowers the price impact of property tax finance and the associated bonus for landowners.

The assumption of mobile households implies that the housing demand curve facing construction firms in a single jurisdiction is horizontal. Many authors consider the case of downward-sloping demand, which is said to increase the burden on new households. Indeed, the only way to shift some of the burden onto new households in traditional analysis is by tilting the demand curve because the capitalization of infrastructure benefits is not considered.

However, the motivation for downward-sloping demand in the literature is not clear. In particular, most of the articles in the literature argue that demand will slope downward in a community that has nonreproducible characteristics or no close substitutes.[25] With mobile households, however, the value of nonreproducible characteristics will simply be capitalized into the price of housing—with no impact on the slope of the demand curve. What is needed is an analysis of imperfectly mobile households, of a mix of mobile and immobile households, or of a metropolitan area that contains only a few communities, none of which is in the literature. The intuition that downward-sloping demand curves shift more of the burden onto new households is reasonable, but the circumstances that lead to such demand curves have not been identified.

Competition in housing construction appears to be a reasonable assumption. This industry is dominated by small firms and entry and exit are relatively easy. Moreover, estimated supply curves are infinitely elastic (see Stover, 1986). However, some evidence suggests that there may be modest economies of scale in construction and that large firms are increasing their market share in some metropolitan areas (again, see Stover). Without the assumption of

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perfect competition, construction firms may pick up some of the burden that would otherwise fall on landowners, although with immobile households perhaps they can, in turn, pass this burden along.[26] The literature does not contain any formal analysis of these possibilities.

Finally, the analysis in this paper must be amended if the benefits and costs of the infrastructure investment are not equal. The benefit-cost condition is quite restrictive; in most cases, one hopes the benefits of an infrastructure investment exceed its costs. In fact, a more general way to formulate the problem would be to solve for the optimal level of infrastructure investment and then to determine the benefits from this investment by integrating under the demand curve up to this level. Unfortunately, the calculus approximations used here treat the infrastructure investment as a marginal change, so it is not possible to distinguish between the marginal condition for the optimal level of infrastructure and the total benefits that infrastructure provides.[27]

Nevertheless, it is possible to gain insight into this issue by considering the case in which the "total" benefit from an infrastructure investment, which equals *MB/i* in the formulation used here, exceeds the cost. In this case, the price of housing will rise more than the above analysis indicates and landowners can charge more for their land. With infrastructure projects that have large net benefits, therefore, the losses imposed on landowners by development fees may disappear or even turn into capital gains. This case is illustrated in the second two columns of Table 1, which assume a benefit-cost ratio of 2.0.[28] In these columns, the burden ratios are negative, indicating that landowners receive capital gains because the benefits from infrastructure lead to such a large boost in the price people are willing to pay for housing. Again, ignoring the capital gains for existing homeowners, the entry in the first row of the fourth column, 0.144, implies that the gain to landowners is 16.8 percent of the gross burden on new home buyers.

The opposite case, namely, benefits falling below costs, also is possible if development fees are used to finance something other than infrastructure for new housing.[29] In this case, development fees are not covered by increases in the price of housing and landowners suffer additional capital losses; that is, the burden of the fees falls largely on landowners. Moreover, the excess fee revenue can be used to boost other public services, *S*, which are held constant throughout this paper, or to cut property taxes; in either case, existing homeowners receive additional capital gains. The magnitude of the losses on landowners is illustrated in the last two columns of Table 1, which are based on a benefit-cost ratio of 2/3. According to the formula given earlier, the largest burden ratio in these columns, 1.579, implies that landowners bear 61.2 percent of the burden.

A jurisdiction's ability to shift the burden of infrastructure for existing residents onto landowners through development fees is now restricted, if not eliminated, by the "rational nexus" test, which requires development fees to be related to the infrastructure needs of new development (Stegman, 1986). However, the rational nexus test does not cover agreements negotiated between individual developers and local governments.[30] In return for expedited processing of the necessary permits, zoning changes, or other considerations, developers may be willing to provide

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payments to the local government or to build infrastructure not covered by development fees. If developers anticipate that such agreements are required in a particular community, they may be able to shift some of their resulting costs onto landowners in the form of lower bids for land there. Similarly, if developers hold land that has appreciated in value (for reasons unrelated to infrastructure), they may be willing to share some of the resulting profits from development with the local government.

DIFFERENTIAL INCIDENCE ANALYSIS

The three cases in the previous section represent different ways of financing the same capital spending, with no change in other public services. Hence, a comparison of the three cases yields differential incidence—holding the infrastructure change constant. Because differential-incidence analysis explores different ways of financing the same infrastructure investment, it does not depend on the benefit-cost condition. In other words, a comparison of the three financing schemes yields the same results regardless of whether the benefits from an infrastructure investment exceed, equal, or fall short of its costs. To simplify the following discussion, I assume that the benefit-cost condition used earlier is met; any deviation from this condition would affect all three financing schemes in the same way.

Special assessments are the most neutral policy: The burden falls entirely on new owners, who receive all the benefit from the infrastructure. By comparison, development fees shift some of the burden onto the owners of undeveloped land and confer a capital gain on existing homeowners. Property tax financing does the opposite: It places some of the burden on existing homeowners and gives a capital gain to the owners of undeveloped land.

This analysis has clear implications for the political economy of development fees. Existing owners prefer development fees to special assessments and special assessments to property taxes as a way to finance new infrastructure. The owners of undeveloped land rank these financing mechanisms in the opposite order. New residents and developers (in their role as developers, that is, before they buy land) do not care which mechanism is selected. Thus, one would expect development fees to be used primarily in circumstances in which land use policy reflects the interests of current homeowners.[31] When the owners of undeveloped land (who may also be developers) have extensive political power, however, one would expect to see property tax financing of new development.[32]

IMPLICATIONS FOR EMPIRICAL WORK

The principal testable implications of this analysis are in equations 8 through 10. Controlling for the characteristics of housing and for other determinants of house value, the sales price of new housing should increase with the anticipated quality of public infrastructure, decrease with special assessments and property taxes, and be unaffected by development fees. Property tax rate changes, including those that arise because public infrastructure boosts the value of housing and thereby alters the property tax base, affect both new and existing housing. Indeed, according to equation 14, any given change in t has the same percentage impact on the value of every house. Additional implications refer to land: All else equal, the price of undeveloped land should fall as one moves from a jurisdiction that

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finances infrastructure with property taxes to one that uses special assessments to one that uses development fees. Moreover, the larger the development fee, again, all else equal including the quality of infrastructure, the lower the price of undeveloped land.[33]

Although they appear straightforward, these implications are difficult to test in practice, largely because the effects of fees, property tax rate changes, and infrastructure changes are difficult to untangle. Consider first a time-series analysis of house values or land prices in a community that changes its infrastructure financing mechanism. The impact of such a change depends on the expectations that existed prior to the announcement of the change. According to our model and to earlier studies (Singell and Lillydahl, 1990), for example, if a community is planning to finance new infrastructure with a property tax but then shifts to development fees, the value of both new and existing housing should go up (by the same percentage) and the price of undeveloped land should fall.[34] A time-series analysis of this type also must account for changes in infrastructure quality that accompany a change in the financing mechanism. To continue the above example, the sales price of new housing could fall if the switch to development fees were packaged with a decision to downgrade the required infrastructure package. In a more extreme case, which is discussed by Nelson et al. (1992), fees may raise the price of land if they replace uncertainty about what infrastructure will be provided or about the possibility that development will occur with a known package of infrastructure and fees—and with development.

A cross-sectional analysis to compare housing or land prices in communities with different infrastructure financing mechanisms also is possible. Controlling for housing characteristics and for infrastructure quality and other factors that influence the house values, the sales prices of new houses should be higher (and the price of undeveloped land lower) in communities that finance infrastructure with development fees than in communities that finance infrastructure with property taxes or special assessments.

Review of Existing Studies

Perhaps the two best-known studies of development fees involve Loveland, Colorado (Singell and Lillydahl 1990), and Dunedin, Florida (Delaney and Smith 1989a, b).[35] Singell and Lillydahl conduct a time-series analysis of house values in Loveland during a period in which new development fees were implemented. In particular, they regress the log of house value on the log of the interest rate; the log of five variables that influence *H* (square footage, number of bedrooms, number of baths, lot size, and house age); a time trend; and a dummy variable that equals one for months in which the new fees were in effect (with a three-month lead). No neighborhood variables are included. They run separate regressions for old and new houses. The coefficient of their "impact fee" variable is positive and significant (one-tailed, five percent) in both regressions, with a value about twice as large for old as for new homes. In terms of magnitude, they find that the sales price of a new house increased about $3,800, on average, at the time the fee increase was implemented. This increase was far greater than the actual fee increase of $1,182.

Singell and Lillydahl conclude that "the results imply that the buyers of new homes in Loveland, rather than land

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owners or developers, bear the burden of the impact fees" (p. 89). This interpretation is consistent with the analysis presented here; if values increase $3,800 for a fee increase of only $1,182, then developers are more than recovering the increased fee. Indeed, there appears to be "overshifting" here, with developers or landowners receiving a bonus, and homeowners receiving capital gains due to the expanded property tax base.

Singell and Lillydahl also find that the sales price of old housing increased $7,000 when the fees increased. They argue that this makes sense as fees can free owners of existing housing from more burdensome payment methods, such as the property tax. In fact, the voters of Loveland had turned down a property tax increase for infrastructure three years before the fee increase. This argument is consistent with the differential incidence analysis presented above, but the magnitude of the estimated price impact seems too large. It suggests that each existing homeowner was expecting to pay the infrastructure costs for 7,000/1,182 = 5.9 new households (or else expected an infrastructure cost per new house far above $1,182). Moreover, it is not clear why the sales price of old houses increased so much more than that of new houses.[36] As shown earlier, the switch away from property taxes should have the same impact on the value of both new and old housing. For the two impacts estimated by Singell and Lillydahl to be equal in percentage terms, the sales price of existing houses would have to be 3,000/1,182 = 1.84 times as high as the sales prices of new homes.

The excessive magnitude of the impact-fee effect and its higher value for existing houses suggest that something may have been left out of the analysis. The authors speculate that developers may have shifted to higher quality new houses, "with the idea that impact fees could be passed on more easily at the higher end of the market" (p. 89). But omitted variable explanations must cover both old and new houses, and this suggestion is contradicted by the higher value impact for old houses than for new ones. It seems more likely that quality was declining for new houses, which explains the smaller effect for them, and that some time-related factor increasing house values for both old and new houses, such as a new, large employer in Loveland, led to an overstatement of the impact for both old and new housing. Another possibility is that the expectations of existing residents, who lived through the debate about property tax financing, were different from those of new residents.

Delaney and Smith (1989a, b) use two somewhat different samples to compare housing prices in Dunedin, which imposed development fees of $1,150 in 1974, with housing prices in other cities in the same county, all of which imposed smaller or no fees, over the 1971–82 period. One of their articles (1989a) focuses on new housing. Their methodology is to regress, for each city and each year, housing price on square footage, lot size, and land cost per square foot. On the basis of these regressions, they calculate a constant "quality" price of housing in each city in each year by holding the value of the three above explanatory variables at their full-sample mean. Finally, for three other cities (and the sample of years), they regress the ratio of Dunedin's price index to that city's price index on a constant plus a dummy variable for years in which Dunedin had fees divided by that city's constant quality price for that year. In two of the three cities, the

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coefficient of this variable is positive and significant, suggesting higher prices in Dunedin when the fees went into effect. In every case, the coefficient is at least three times as large as the value they expect, namely, $1,150.

In fact, their method may lead to an estimate of the impact of fees on house values that is greater than the value of the fees. According to the analysis presented here, housing price increases do not fully cover development fees, but developers are in equilibrium because land prices drop. In defining a constant quality house, however, Delaney and Smith hold constant the land cost variable; as a result, the price index picks up the impact of a fee under the assumption that land prices do not drop. This assumption removes the housing price decline associated with the land price decline and, therefore, leads to an overstatement of the final housing price increase. Moreover, the Delaney–Smith data set does not allow them to control for infrastructure quality or for housing and neighborhood characteristics, so that their results may be subject to omitted variable bias.[37]

Delaney and Smith's other article (1989b) uses a similar methodology to compare the sales prices of existing houses in Dunedin and one of the other cities and to compare new and existing houses in Dunedin.[38] First, they find that, after the fee, the price in Dunedin exceeded the price in the other city by $1,643. This result is comparable to those discussed earlier and can be interpreted in the same way. Second, they find that the price difference between new and existing houses in Dunedin increased by $2,600 after fees were imposed. The most straightforward interpretation of this result is that it, like those discussed earlier, is the product of a procedure that holds constant the price of land. As shown earlier, the imposition of fees should have the same percentage impact on the price of new and old housing (controlling for differences in infrastructure quality), but the price increase for new housing is accompanied by a decrease in the price of undeveloped land. When this land price increase is removed, the housing price increase may be overstated. This result also might reflect some of the other issues identified earlier, such as the lack of infrastructure or neighborhood control variables.

Another study, Nelson et al. (1992), explores the impact of development fees on the price of developable land in Loveland, Colorado, and in Sarasota County, Florida. Their strategy is to regress land prices on a development fee variable and other factors, such as access to shopping or the surrounding population density.[39] In Loveland, they find no statistically significant impact of fees on land prices, a result that is consistent with the framework presented here under the assumption that the benefits from fee-financed infrastructure (which, in Loveland, included parks, fire, police, libraries, museums, general government, and streets) exceeded the costs.[40]

In Sarasota, however, Nelson et al. find that land prices are significantly higher in two municipal service taxing units (MSTUs), which use fees to finance some infrastructure, namely, parks and roads, than in other parts of the county where fees are not imposed. The authors do not indicate whether the county provides comparable infrastructure in these other areas, but the results are consistent with the assumption that they do not. This appears to be the author's assumption; as they put it (p. 41), "The developer may give greater

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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." In other words, this result may simply reflect the value of infrastructure differences between the MSTUs and other areas.[41] Another possibility mentioned by the authors (p. 41) is that "properties on which impact fees would be paid could receive development permits faster than properties without such fees;" hence, their result might reflect the value developers place on the time savings associated with fee payments. However, they were unable to determine whether development actually occurred faster when fees were paid.

Overall, therefore, the existing empirical work is broadly consistent with the framework presented here, but it leaves several questions unanswered. Future work of this type should look for additional control variables, particularly for infrastructure differences, and for more evidence about prefee expectations. Longitudinal studies must carefully control for time-related events that affect property values other than the implementation of development fees, and studies based on variation in development fees across properties must carefully control for determinants of property value with which the fees might be correlated.

Conclusions

Development fees are seen as a way to shift the burden of new public infrastructure onto the new residents that require it. This paper shows that this view is only partially right. The buyers of new homes will indeed bear some of the burden of these fees as the benefits of infrastructure show up in the prices they pay for housing. Even with mobile households, competitive housing markets, and infrastructure investments that meet a benefit-cost test, however, one-quarter or more of the burden of these fees could fall on the owners of undeveloped land. Moreover, any attempt to impose fees for infrastructure that do not benefit new residents will only increase the burden landowners bear. Finally, development fees generally confer a small capital gain on existing homeowners and, to the extent housing construction is competitive, do not place any burden on developers. No wonder development fees are so popular!

Special assessments appear to be a fairer financing mechanism, at least according to the benefit principle.[42] Under the same assumptions listed above, the burden of special assessments falls entirely on the people who benefit, namely, the people who buy new housing. Thus, with well functioning markets and sensible decisions about infrastructure investment, special assessments avoid the problems of unfair burdens on landowners and unfair gains to existing homeowners.

Empirical work on this topic is consistent with this framework, but leaves many questions unanswered. Given the growing popularity of these financing mechanisms, more empirical work clearly is needed.

[redacted]

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[1] Some authors use the term "exactions" as a general term that includes in-kind requirements as

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well as specific fee payments to local governments (Altshuler and Gómez-Ibáñez, 1993).

[2] For example, this paper does not explore the impact of fees on the timing of development. For an analysis of this issue, see Downing and McCaleb (1987) and Nelson et al. (1992). The link between infrastructure financing and urban growth is explored by Brueckner (1995).

[3] If the household itemizes deductions on its federal income tax, t is the effective rate net of the property tax deduction. For some evidence that itemization affects the link between t and house values, see Eisenberg (1996).

[4] In practice, special assessments usually are based on frontage instead of house value. It is my understanding, however, that Princess Ann, Maryland, and perhaps some other jurisdictions use house value as the base. A special assessment based on value is the same as a property tax levied only on new residents except that it is all collected in one year.

[5] A special assessment is a one-time payment. To make it consistent with the rest of the budget constraint, it must be "annualized." Moreover, we need not worry about assessment practices because new homes' assessments typically are reasonably close to their market values.

[6] Households also can select existing housing, and they must achieve the same level of utility in either type of housing. This possibility further supports the assumption of household mobility.

[7] Some people have argued that development fees alter the type of households that live in a community (Huffman et al., 1988), but no formal analysis of this possibility exists. Using the method in Wheaton (1993), the bidding framework could be applied to this issue.

[8] Strictly speaking, these results apply to changes in households' expectations about C, t, and a. After all, the benefits from purchasing a house are all received in the future.

[9] Labor could be added to the housing production function with no impact on the results.

[10] Formally, H also should be taken as given by the firm. This adds a constraint to the firm's problem, but does not change the results.

[11] Several studies examine burden sharing over time. See Levine (1994) and the studies cited therein. The framework used here suggests that this issue is not of great interest. A large share of the burden falls on new buyers, who also receive the rights to benefits from the infrastructure. These people sell these rights if they sell their houses in the future; that is, they receive the infrastructure benefits either by consuming them or by capitalizing them into the sale prices of their houses. In effect, therefore, future residents end up paying for the infrastructure benefits that they receive and there is no intergenerational inequity.

[12] In this context, the landowner is the person who owns the (undeveloped) land when the development fee is announced. This person could be the same person who later builds the house. The analysis distinguishes burdens by role, not by individual. Altshuler and Gómez-Ibáñez (1993) recognize that landowners may be hit with the burden of exactions: "A developer who owns options on undeveloped land at the time exactions are imposed, for example, may have little choice but to develop and absorb the exactions or to write off the options as a loss" (p. 100). However, they then confuse the issue by saying that landowners cannot bear the burden in the long run, because competition ensures that "owners of undeveloped property on the periphery (or elsewhere) would earn, on average, the same return on investment as others do. In such a situation, the exaction could not be absorbed in the long run by reducing the return to land speculation but would have to be passed on to buyers" (pp. 99–100). The second part of their argument misses the point. The owners of land at the time development fees are announced are the ones who bear the burden. In the long run, the return to land must equal the return elsewhere, so people who purchase land from these owners (including people who own housing construction firms) will pay less for it. Hence, the loss imposed on these owners is precisely the mechanism by which the return on the land is brought back up to average; passing the burden on to buyers has nothing to do with it.

[13] Downing (1973) and Levine (1994) recognize that the impact of infrastructure changes on house values is tempered by property tax capitalization (with an equation equivalent to 10 above), but they do not recognize the implications of this result for development fee incidence.

[14] This is a conceptual, not a chronological, analysis. The "without" case is new housing with no infrastructure, not no new housing at all. Note also that, for simplicity, these calculations ignore the deductibility of property taxes.

[15] Goodman estimates that the uncompensated price elasticity of demand for housing is about –0.5. According to the Slutsky equation, the compensated price elasticity, μ, is closer to zero as long as the income elasticity is positive, which, not surprisingly, Goodman also finds to be true.

[16] If $|\mu| > 1$, the inequality in equation 23 always holds, and the drop in land rent exceeds the amount specified by equation 20.

[17] The burden ratio declines somewhat at higher values of i and increases significantly at lower values. The value of μ has little impact on the results.

[18] Huffman et al. (1988) say that development fees lead to a higher property tax base due to higher housing prices. However, the cause of higher

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housing prices in their analysis is a shift to higher-quality houses, not the capitalization of infrastructure benefits. At another point, Huffman et al. say that, "If housing prices in a community rise because of impact fees, the price of existing homes that are close substitutes for new homes will also rise. That results in a windfall profit to owners of existing homes" (p. 52). This effect cannot arise in my analysis because the higher price for new houses simply reflects infrastructure benefits, which do not apply to existing houses. Benefits to new houses flow only through increases in the property tax base.

[19] Using the benefit-cost condition, equation 19, it can be seen that the capital gain will be a small fraction of the development fee for all reasonable values of the parameters. Consider the following, relatively extreme case: if $i = 0.05$, $t = 0.03$, $\mu = -0.7$, $\rho^n = 0.5$, and $V^o/\bar{V} = 1.0$, then dV^o is 7.5 percent of dX.

[20] If existing residents also receive direct benefits from the new infrastructure, at no extra cost, the formulas presented here understate their capital gains.

[21] This result may seem at first to contradict the well-known theorem that switching a tax from the supply side (developers) to the demand side (households) does not change its incidence. In this case, however, the switch from development fees to special assessments also changes the form of the tax from one that is fixed to one that depends on housing consumption; this change in form explains the change in incidence.

[22] As noted earlier, new infrastructure also might provide incidental benefits, and associated capital gains, for existing residents, but these effects are not germane to our discussion.

[23] As is well known, tax-increment financing schemes inevitably are based on the observed total increase in value after a project is implemented instead of the change in value due to the project, which cannot be determined without controlling for other factors that affect property value. As a result, an actual tax-increment plus fee financing scheme might have a very different incidence than the one in the text.

[24] To derive this result, simply replace equation 19 with $(MB/i)dC = dX + t(dV/dC)/i$ and follow the steps that led to equation 20.

[25] See, for example, Altshuler and Gómez-Ibáñez (1993), Delaney and Smith (1989a), Downing and McCaleb (1987), Huffman et al. (1988), and Stegman (1986).

[26] Several authors also argue that timing issues and uncertainty about the final fee may affect the sharing of the burden between developers and landowners. See, for example, Downing and McCaleb (1987), Huffman et al. (1988), and Stegman (1986).

[27] The calculus approximations used here also make it impossible to consider how the answer might change if the cost of infrastructure depended on the quantity of land consumed.

[28] The calculations in the last four columns of Table 1 introduce a benefit-cost ratio into equation 19 and hence into the derivation of the burden ratio, equation 24. This parameter does not appear in any of these equations as presented.

[29] Another complication not considered here is that the marginal cost may vary by house. This complication typically is ignored with development fees, but special assessments often account for it, at least in part, by basing payments on frontage instead of value. This practice undoubtedly leads to deviations between actual special assessments and the benefit-cost condition in the text, but these deviations are beyond the scope of this paper.

[30] I am grateful to Bob Einsweiler for pointing this out to me.

[31] By extension, one also would expect to see negotiated agreements in which developers agree to pay for or build infrastructure (for new or existing residents) only under some circumstances. These circumstances were described in a previous section.

[32] One example was suggested to me by Jeff Chapman. In California, small jurisdictions with little undeveloped land tend to finance new infrastructure with development fees. In contrast, jurisdictions with extensive undeveloped land tend to pay for new infrastructure by setting up a Mello-Roos Community Facilities District, which can issue bonds that are backed by property taxes on the property growth in the district. This is called tax increment financing. Although these property taxes do not apply to the entire jurisdiction, the Mello-Roos District can be drawn in such a way that some of these taxes fall on existing residents; Mello-Roos bonds require voter approval, but landowners receive votes based on the acreage they hold.

[33] Predictions also could be developed for the quantity of housing, H, which moves in the opposite direction from P. Empirical work usually holds H constant by including housing characteristics in the analysis, but Singell and Lillydahl (1990), whose work is discussed below, find that lot size decreased (and price increased) after development fees increased.

[34] These changes in housing prices and rents also would accompany a shift from special assessments to fees, although the price change would be larger in magnitude and the rent change would be smaller.

[35] For an alternative review of the literature, see Altshuler and Gómez-Ibáñez (1993).

[36] One possibility, suggested to me by a reviewer, is that "the use of fees for new developments may also signal that the community is serious about controlling growth (which imposes negative

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externalities on existing residents)" and may therefore boost the price of existing houses.

[37] Two other methodological problems in Delaney and Smith should be mentioned. First, the land price variable clearly is endogenous in the housing price equation. This endogeneity is both behavioral (land and housing prices are jointly determined) and definitional (the land value variable is calculated using sales price and assessed value, as well as land value, so that their method involves regressing sales price on itself). In fact, most analysts would argue that it does not even belong there because housing prices determine land prices, not vice versa. (A piece of land is valuable to the extent people will pay to buy housing there.) Second, the multistage calculations are far less powerful and compelling that a single pooled regression with time, city, and fee-implementation variables.

[38] The only difference I can see in the methodology of the two papers is that the second one (1989b) adds the age of housing as an explanatory variable in the first-stage regression.

[39] One problem with their regression strategy is that one key explanatory variable, acres per housing site, is jointly determined, by definition, with the dependent variable, land price per housing site in Sarasota or land price per acre in Loveland. In Sarasota, the number of sites is in the denominator of both the dependent and one explanatory variable (both of which are in log form), and in Loveland the number of acres is the denominator of the dependent variable and the numerator of an explanatory variable. As a result, random factors that affect the number of sites (or acres per parcel) lead to a correlation between the error term and an explanatory variable—a potential source of endogeneity bias in all the estimated coefficients. Alternative formulations without this problem include regressing the log of rent per acre on the log of number of parcels or regressing the log of total land price on the log of total acres and the log of number of parcels (plus the squares of these two variables to account for possible nonlinear effects).

[40] One puzzle is that the authors do not indicate the source of variation in the fee variable in Loveland. In fact, Nelson et al. (1992) seem to say (on p. 37) that the fee was the same ($1,537) for every house during the sample period.

[41] Nelson et al. (1992) confuse the issue somewhat, in my view, by presenting another regression in which the MSTU dummies are replaced by the log of the actual development fee. This variable reflects both interarea variation in the fee (and the associated variation in infrastructure) and intra-area variation in the fee. Because these two components of variation are not separated, this regression provides no information on whether intra-area variation in the fee plays any role. According to the framework presented here, higher fees within a MSTU (where, presumably, the infrastructure is constant) should lead to lower land prices. A regression that includes both the MSTU dummies and the fee variable is necessary to separate this effect from the effect of infrastructure differences between areas.

[42] Carol Heim pointed out to me that a vertical equity standard might lead to a preference for development fees over other financing mechanisms—even for infrastructure that benefits existing residents. The owners of undeveloped land may be rich relative to new or existing homeowners, so shifting the burden to landowners could improve the progressivity of the financing mechanism. I focus on the benefit principle in the text because it seems to me to be a more appropriate standard for evaluating the fairness of alternative financing schemes for new infrastructure.

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