FINANCING PUBLIC INVESTMENT BY DEFERRED SPECIAL ASSESSMENT**

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ABSTRACT

This paper proposes financing neighborhood public investment by special assessment, and allowing taxed owners to defer payment, with accumulated interest, until they sell the benefited property. The present discounted value of deferred payments equals the initial special assessment if the market interest rate is charged on assessment debt. Property sales records and census data show that deferred assessments would typically yield a quicker cash flow return than necessary to amortize assessment debt by 30-year level payments.

I. Introduction

LOCAL governments in the United States commonly used special assessments to finance public investment until the Great Depression led to widespread defaults and foreclosures on special assessment tax liens. In cities with a population of more than half a million, total special assessment revenue fell almost 90 percent between 1930 and 1940, and special assessments have been unpopular ever since. For all U.S. cities, special assessments provided seven percent of general revenue in 1930, and less than one percent in 1977.[1]

The Depression demonstrated that special assessments can cause severe problems for homeowners and governments when unemployment interrupts normal income. Even in prosperous times, however, special assessments on unrealized betterment can create a difficult cash flow problem that hinders their use. Consider, for example, a special assessment to underground the utility wires in an older, owner-occupied neighborhood that suffers the familiar overhead wire blight. Suppose that $10,000 per house would pay to bury the neighborhood's wires, and that this amenity would increase house values more than its cost. Nevertheless, some homeowners would understandably oppose the special assessment if they had no cash to pay it.

The government can borrow a special assessment project's cost and amortize the debt by annual assessments, but at 10 percent interest an owner would still have to pay $1,061 per year for 30 years to amortize a $10,000 debt. Therefore, some owners who don't have the cash to pay the tax may oppose a special assessment project that would both enhance their neighborhood and increase their wealth. Even those who could pay the special assessment out of current income or by liquidating assets might also vote against the project if they felt it would put too much of their wealth into home equity.

Section II addresses the special assessment cash flow problem and proposes to solve it by combining special assessment with tax deferment at interest, so that owners pay the assessment plus interest when they sell the benefited property, or die. Section III shows that deferred assessments would usually yield a quicker cash flow return than necessary to amortize the total assessment debt by level payments for 30 years. Section IV discusses the interest rate on deferred assessments, and Section V the risk on assessment debt. Section VI speculates on the distribution of benefits and costs among present and future owners, and between tenants and landlords. Section VII proposes that loans repaid at sale could also finance private investments that serve a public purpose.

II. Deferred Special Assessment

Conventional special assessment projects are typically initiated either by a city council or by a petition from property owners. When plans for the proposed pub-

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lic investment have been prepared, approval of the project rests with the city council or a vote among the taxed owners. The work is usually done by private contractors after competitive bids, and the cost is divided among the benefited owners according to front footage, betterment, or some other measure of each site's special benefit.[2] Local governments often sell special assessment bonds to finance the project cost and amortize the debt by annual assessments, but sometimes require owners to pay the entire cost in advance.

Deferred special assessment differs from a conventional special assessment only in the proposal to let owners defer payment, with accumulated interest, as long as they own their properties. An owner can pay the assessment immediately, pay it at sale, or pay at any intermediate schedule, but interest is charged on the assessment debt.

The usefulness of deferred assessment is clearest where public investment creates betterment greater than its cost. Suppose, for example, that underground utilities raise a house's value by $20,000, and that the $10,000 cost is financed by deferred assessment. If house value goes up by $20,000 and debt by $10,000, the owner's equity jumps $10,000. To see how long the betterment will exceed the deferred assessment growing at interest, let

P = initial market value of the property
B = initial increment in market value, or betterment
C = initial deferred special assessment
i = rate of change of property values
r = rate of interest charged on deferred assessments
t = number of years since the initial assessment
τ = number of years with a net gain at sale
e = base of the natural system of logarithms.

Assume that the public investment raises property value from P to P + B, and that property values appreciate at i percent per year whether or not the investment takes place.[3] The initial special assessment is C and grows at interest rate r percent per year.[4] The public investment yields a net gain at sale so long as the benefited property value less the accumulated debt remains above the property value without the investment. That is, the public investment yields a net capital gain so long as

$$(P + B)e^{it} - Ce^{rt} > Pe^{it} \quad (1)$$

or therefore so long as

$$Be^{it} > Ce^{rt}. \quad (2)$$

Equation 2 says there is a net gain at sale so long as the betterment exceeds the accumulated assessment debt. Earlier it was assumed that B = $20,000 and C = $10,000. Let us further assume that the interest rate is 10 percent, the house price inflation rate is 6 percent, and the initial house value is $75,000. In Figure 1 the solid line (1) shows the wire-blighted house value, initially at $75,000 and growing 6 percent per year. The top line (2) shows the enhanced value of the same house in a wire-free neighborhood, initially $95,000 and also growing 6 percent per year. The $10,000 special assessment accumulates at 10 percent per year along the dotted bottom line (3). Finally, the dashed line (4) is the enhanced house value minus the deferred assessment, obtained by subtracting the bottom line from the top line.

Figure 1 shows that it takes 17.3 years for the wire-blighted house value (1) to catch up to the enhanced house value minus the deferred assessment (4), so in the meantime owners enjoy a wireless view without taxes, and reap a net gain at sale. Those who let the deferred assessment accumulate for more than 17 years will then have a deferred assessment debt greater than the betterment, but the net cost pays for the benefits in all the preceding years, and is due only when owners realize their equity in cash.[5]

Homeowners would have two benefits and one cost to consider in voting on a proposed deferred assessment project for their neighborhood. The benefits are (1) the owners' direct benefits until they sell their property, and (2) the betterment realized at sale, which is the capitalized

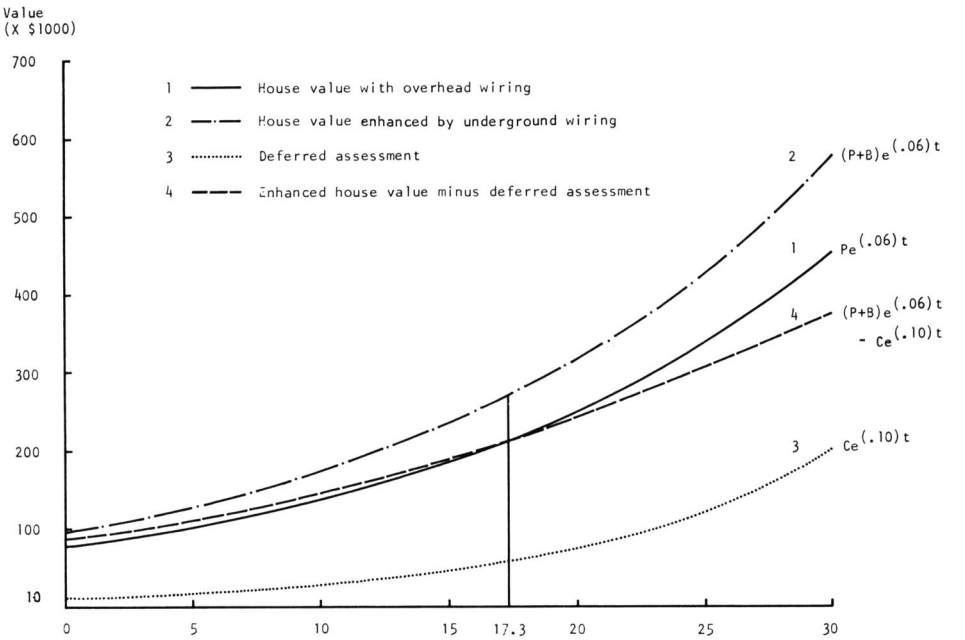

FIGURE 1. An example of public investment and deferred assessment

market value of subsequent public service benefits shifted from the next buyer to the current owner.[6] The cost is the deferred assessment due at sale.

Public investment with betterment greater than its cost creates an initial unrealized net capital gain of B − C. Owners can then use this windfall to pay for the public investment's direct benefits to themselves until

$$Be^{i\tau} = Ce^{r\tau} \tag{3}$$

where *tau* (τ) is the number of years it takes the assessment debt to grow to equal the betterment.

Equation 3 says that at *tau* the owner's appreciated betterment equals the accumulated assessment debt, and from it

$$Be^{-(r-i)\tau} = C \tag{4}$$

which says that at time zero the present discounted value of the betterment at *tau* equals the initial special assessment. That is, until *tau* the direct public service benefits are free to the original owners. Therefore, *tau* is another measure of the initial windfall, B − C, expressed in years of public service.

Equation 3 shows that the growth rate of betterment, rather than of total property value, determines *tau*. Betterment may grow slower than total property value, and can even decline because of physical depreciation, obsolescence, or an increase in the investment's supply. Solving Equation 3 for *tau* gives

$$\tau = \frac{1}{r - i} \log \left(\frac{B}{C} \right). \tag{5}$$

Equation 5 says two things determine *tau*:

1. B/C, the initial betterment to special assessment ratio, and
2. r − i, the difference between the deferred assessment interest rate and the betterment growth rate.

Table 1 shows *tau* as a function of B/C and r − i, and the entries represent the number of years a public investment and deferred assessment yield a net gain at

TABLE 1

PERIOD OF NET GAIN FROM PUBLIC INVESTMENT AND DEFERRED ASSESSMENT

Interest Rate minus Inflation Rate r-i	Ratio of Betterment to Special Assessment B/C				
	1.1	1.5	2.0	2.5	3.0
(percent)			(years)		
10	1.0	4.1	6.9	9.2	10.1
9	1.1	4.5	7.7	10.2	12.2
8	1.2	5.1	8.7	11.5	13.7
7	1.4	5.8	9.9	13.1	15.7
6	1.6	6.8	11.6	15.3	18.3
5	1.9	8.1	13.9	18.3	22.0
4	2.5	10.1	17.3	22.9	27.5
3	3.2	13.5	23.1	30.5	36.6
2	4.8	20.3	34.7	45.8	54.9
1	9.5	40.5	69.3	91.6	109.9
0 or less	∞	∞	∞	∞	∞

sale. For example, if the interest rate is 10 percent, and the betterment growth rate is 6 percent (that is, $r - i = 4$ percent), and B/C is 2, there is a net gain for 17.3 years, as was shown in Figure 1 with the same assumptions.

In principle, *tau* measures the present net benefit of any project in years of the project's own output. If the project's benefits and costs have been monetized and discounted to their present values, the benefits equal the costs plus the value of *tau* years of the project's services.

Even owners who do not value a proposed project's direct benefits highly should still vote for a deferred assessment if they expect to sell before *tau*; owners who expect to sell after *tau* should also vote for a deferred assessment if they value the public service highly enough. But some owners who don't value the service benefits highly and do expect to stay after *tau* may rationally vote against a project with $B > C$ even if the assessment is deferrable until sale. (See Appendix 1 for a discussion of how the general property tax interacts with deferred assessment and shortens *tau*.)

Equation 5 shows that *tau* does not depend on the initial property value. For example, at the previously assumed 10 percent interest rate and 6 percent betterment growth rate, a $100 per house special assessment project that raises house value from $3,000 to $3,200 would yield a net gain at sale for the same 17.3 year period found in Figure 1. Equation 5 shows it is the *ratio* of betterment to cost that matters, so deferred assessment should work best in rapidly growing Third World cities where public infrastructure investment often creates relatively large land value increases.

The period with a net gain at sale was calculated on the assumption that owners never pay early. To see how fast deferred assessment debt would accumulate if owners make payments before sale, let

δ = the property sale date
R_t = assessment payment at t
D_t = accumulated assessment debt at t

The assessment debt at t is

$$D_t = Ce^{rt} - \int_0^t R_y e^{r(t-y)}\,dy \qquad (6)$$

which says the debt is the accumulated value of the initial special assessment minus the accumulated value of any payments. Therefore, the debt would grow exponentially as in Figure 1 only if an owner paid nothing until sale.

Any remaining debt must be repaid at sale, so from Equation 6

$$\int_0^{\delta} R_t e^{r(\delta - t)}\, dt = Ce^{r\delta} \qquad (7)$$

which says the accumulated value of payments must equal the special assessment's accumulated value at sale. Simplifying Equation 7 gives

$$\int_0^{\delta} R_t e^{-rt}\, dt = C \qquad (8)$$

which says the present discounted value of payments equals the initial special assessment. If the market rate of interest is charged on assessment debt the opportunity to earn this rate on early payments would undoubtedly lead some debt-averse owners to pay the special assessment right away, and many others to pay when their cash flows permit.

The essence of deferred assessment is that owners individually decide when to pay their special assessments, but they pay interest on their debt. Tax deferment already works successfully in California where homeowners who have at least a 20 percent equity and are 62 or older may postpone their local property taxes (including special assessments), and the state recovers the debt plus 7 percent annual simple interest when the owner moves, sells the property, or dies. Many other states and Australia have similar senior citizen property tax postponement programs.

Deferred assessment differs from senior citizen property tax postponement in two ways. First, senior citizen property tax postponement finances individuals' retirement consumption, while deferred assessment finances public investment. Second, senior citizen property tax postponement reduces the owner's equity, while deferred assessment increases it for *tau* years.

Just as lump-sum special assessments are used to finance the capital cost of public investments, annual special assessments are sometimes used to finance the operating cost of public services such as street lighting. These operating cost assessments can, however, create the same cash flow problem that capital cost assessments do, and the same reasoning suggests that annual special assessments might also be deferred at interest until sale.

III. Financing Deferred Assessments

A property owner can in theory borrow privately to defer paying a conventional special assessment, but capital market imperfections make it expensive to defer all payment until sale. To reduce the transaction cost of deferring payment, a government could either (1) finance its own deferred assessments, or (2) guarantee its property owners' private market borrowing to pay conventional special assessments. Under the second option, banks or savings and loan associations could lend to individual owners on deferred assessment terms, and the government would not have to finance the debt. Under either option an owner's deferred assessment account would resemble an inverted savings account, with the accumulating debt secured by a real property lien.

To see how a typical deferred assessment might be repaid in practice, all property sales since 1950 were examined for a Los Angeles neighborhood chosen randomly from among Census tracts with house values and family incomes near the 1950 citywide average. If this neighborhood had voted for a deferred assessment on January 1, 1950, these subsequent sales would have determined the debt repayment schedule, on the pessimistic assumption that owners never pay before sale. In practice, owners would surely repay the debt much faster if a floating market interest rate were charged on the assessment debt.

Figure 2 shows the annual and Figure 3 the cumulated repayment cash flow per $100 of deferred assessment at 5 percent interest, which was the conventional mortgage interest rate in 1950. For comparison, the solid lines show the annual and cumulated values of the $6.51 per year necessary to amortize the same $100 assessment by 30-year level pay-

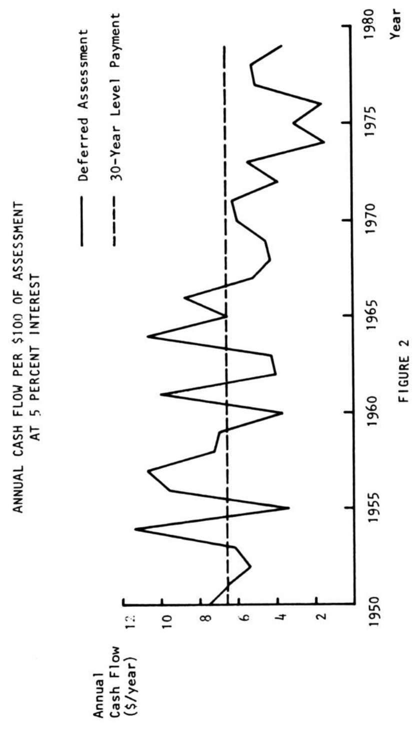

FIGURE 2

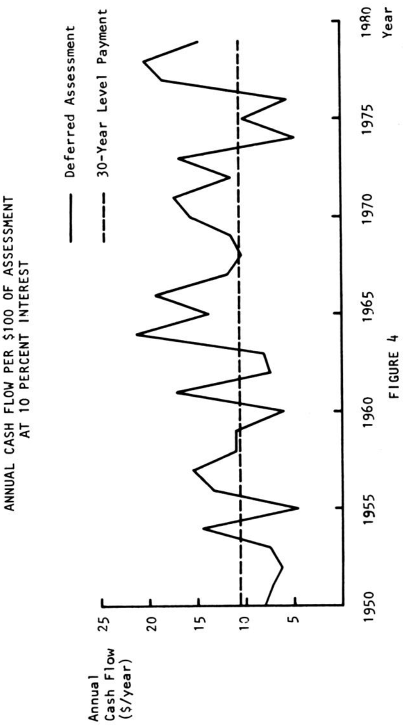

FIGURE 4

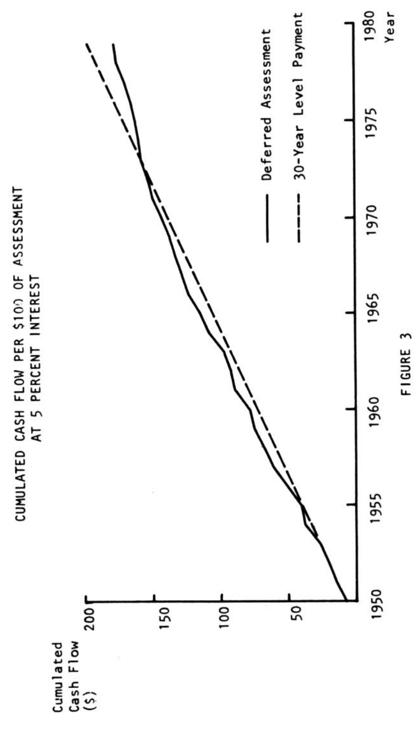

FIGURE 3

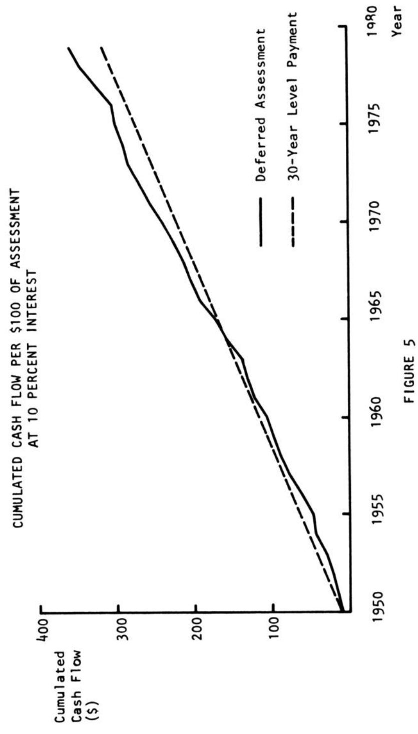

FIGURE 5

ments at the same interest rate. The data are shown in Appendix 2.

The cash flow fluctuates, but in most early years the deferred assessment payments retire the debt faster than do conventional 30-year payments. Most owners pay nothing in any one year, but the few who sell pay the full assessment plus interest, and these payments exceed the level payment alternative in the early years. Although any single deferred assessment has a highly uncertain repayment date, a portfolio of deferred assessments might yield a predictable overall result. Despite the deferred assessment's early cash surplus, both payment streams have the same $100 present discounted value in 1950.

Figures 4 and 5 show the same annual and cumulated cash flows at 10 percent interest. Here the deferred assessment produces a slight early shortfall and a later surplus compared to the level payment schedule, but this interest rate in 1950 would have induced enough prepayments to change the early cash flow deficit to a surplus.

Figures 2–5 refer to only one neighborhood for the years 1950 to 1980, but its sales rate was almost identical to the national average for single family houses over the same period (see Appendix 2 for a comparison of this neighborhood's and the nation's sales rate). For other properties that are sold less frequently, minimum payments could be required after a specified date or when debt reaches a specified share of total property value.

That the slowest-case deferred assessment payments approximate conventional 30-year payments is a remarkable coincidence, though not a crucial part of the argument for deferred assessment. Rather, the fundamental point is that the present value of the payments discounted at the market interest rate equals the initial special assessment. Therefore, the real advantage of deferred special assessment compared to conventional special assessment is that it can better accommodate the inevitably diverse cash flows of many property owners, who all must pay the special assessment if their neighborhood is to have the public investment.

IV. The Deferred Assessment Interest Rate

Some special assessment projects provide benefits outside the assessed neighborhood. These external benefits or various income redistribution arguments might justify using general revenue to pay part of a neighborhood project's cost, but the appropriate subsidy to give owners is a separate issue from the appropriate price (that is, interest rate) to charge them for deferring their payments.[7] Any subsidy can be given by assessing property owners less than the full project cost rather than by charging a deferred assessment interest rate lower than the competitive market interest rate.[8]

A below-market interest rate would subsidize owners in proportion to the lateness of their payments rather than in proportion to external benefits or need, would deter sales, and would delay the cash flow return. For example, why would a wealth maximizer prepay a deferred assessment if its interest rate were lower than the rate earned on savings accounts?

A below-market interest rate on deferred assessments would require the government to borrow more to let more owners stay in debt longer and more cheaply. By contrast, a floating market interest rate on deferred assessments would make the present discounted value of payments independent of their timing, and would not deter prepayments. Discounts at the same rate could be given for paying a special assessment before the public investment is made; those who prepay would reduce the government's interim financing needs.

A government could enable its property owners to defer special assessments at interest without itself publicly financing the debt if it simply levied conventional special assessments and guaranteed repayment at sale of each owner's assessment borrowing from private lenders. Although this private market solution may sound unorthodox, the private capital market already actively accommodates the very similar practice of margin borrowing against the market value of stocks and bonds.

When customers borrow from their stockbrokers the margin debt can accumulate indefinitely so long as the equity remains above a specified percentage of the pledged securities' current market value, and borrowers pay a floating daily interest rate pegged to the call money rate on broker's loans in New York. Free entry, government guarantees, and sensible regulation could produce a similarly competitive deferred assessment borrowing and lending market that would relieve the government of the responsibility for setting the interest rate on its citizens' debts.[9]

Money interest rates include an allowance for expected inflation in addition to the real interest rate, so assessment debt accumulating at a floating free market money interest rate would automatically be corrected for expected inflation. Linking the debt to a cost of living index and charging an inflation-free real interest rate would also correct for price level changes. Owners would have to pay indexed assessments only when they realize their inflated equity, so they would suffer no hardship if property values keep up with or outpace the general price level, and expected inflation would not deter them from prepaying their debts.[10]

Indexed special assessment bonds secured by real estate should suit prudent long term lenders concerned about inflation, and might command a very low real interest rate.[11] Because indexed deferred assessments would over time recover from landowners the full real cost of public expenditures, even cities in countries with rapid inflation, low incomes, high land values, and soft currency could repay hard currency loans for public infrastructure investment.

To illustrate how a deferred assessment growing at a floating market interest rate might work out, Table 2 shows the results for a hypothetical $1,000 deferred assessment undertaken in 1950 to pay for public investment causing $2,000 betterment.

Column 2 shows for each year the average inflation rate for a sample of single family houses that the Real Estate Research Council of Southern California has since 1943 appraised twice a year to measure property price trends in Los Angeles.[12]

Column 3 shows for each year the average new conventional mortgage interest rate, which is for illustration used as the floating rate charged on deferred assessments.

Column 4 shows the value of a house starting at $11,000 (the median Los Angeles house value in 1950) and growing at the inflation rate in Column 2.

Column 5 shows the house value enhanced by public investment, starting at $13,000 and growing at the inflation rate in Column 2.

Column 6 is Column 5 minus Column 4 and represents the betterment, which grows at the inflation rate in Column 2.

Column 7 shows a $1,000 deferred assessment increasing at the interest rate in Column 3.

Column 8 is Column 6 minus Column 7, and shows the net gain at sale from the public investment and deferred assessment.

Column 8 shows a net gain in all years, which is unlikely in practice because the inevitable increase in supply would reduce the betterment it creates. Therefore, the betterment shown in Column 6 would not grow as fast as the house price inflation rate in Column 2. Even if betterment shrinks over time, however, assessment debt remains small in relation to the property value, so owners should have no difficulty in paying at sale (compare Column 7 to Column 4 in Table 2, or Line 3 to Line 1 in Figure 1).

Income tax deductibility of assessment interest payments would reduce owner occupiers' after-tax cost of paying deferred assessments, and owners would benefit from this deduction in proportion to their marginal tax rate. Because homeowners pay no income tax on the imputed rental value of neighborhood public investments, an argument can be made against allowing homewoners an income tax deduction for deferred assessment interest payments.[13]

V. Deferred Assessment Risk

Special assessment tax liens are normally senior to private mortgage debt, but deferred assessments could be made junior to existing mortgages and senior only to

TABLE 2

A HYPOTHETICAL PUBLIC INVESTMENT AND DEFERRED ASSESSMENT IN LOS ANGELES

Year	House Price Inflation Rate	Mortgage Interest Rate	House Value	Enhanced House Value	Betterment	Deferred Assessment	Net Gain
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(%)	(%)	($)	($)	($)	($)	($)
Base			11,000	13,000	2,000	1,000	1,000
1950	4	5	11,440	13,520	2,080	1,050	1,030
1951	9	5	12,470	14,737	2,267	1,103	1,164
1952	1	5	12,594	14,884	2,290	1,158	1,132
1953	0	5	12,594	14,884	2,290	1,216	1,074
1954	1	5	12,720	15,033	2,313	1,276	1,037
1955	6	5	13,483	15,935	2,452	1,340	1,112
1956	5	5	14,157	16,732	2,575	1,407	1,168
1957	6	6	15,007	17,736	2,729	1,492	1,237
1958	2	6	15,307	18,090	2,783	1,581	1,202
1959	4	6	15,920	18,814	2,894	1,676	1,218
1960	4	6	16,556	19,567	3,011	1,776	1,235
1961	5	6	17,384	20,545	3,161	1,883	1,278
1962	7	7	18,601	21,983	3,382	2,014	1,368
1963	6	6	19,717	23,302	3,585	2,136	1,449
1964	2	6	20,111	23,768	3,657	2,264	1,393
1965	3	6	20,715	24,481	3,766	2,400	1,366
1966	2	6	21,129	24,971	3,842	2,544	1,298
1967	1	6	21,340	25,220	3,880	2,696	1,184
1968	2	7	21,767	25,725	3,958	2,885	1,073
1969	3	8	22,420	26,497	4,077	3,116	961
1970	3	8	23,093	27,291	4,198	3,365	833
1971	3	8	23,786	28,110	4,324	3,634	690
1972	3	7	24,499	28,953	4,454	3,889	565
1973	6	8	25,969	30,691	4,722	4,200	522
1974	12	9	29,085	34,374	5,289	4,578	711
1975	17	9	34,029	40,217	6,188	4,990	1,198
1976	25	9	42,537	50,271	7,734	5,439	2,295
1977	32	9	56,149	66,358	10,209	5,928	4,281
1978	21	10	67,940	80,293	12,353	6,521	5,832
1979	23	11	83,567	98,761	15,194	7,238	7,956

Sources: Grebler and Mittelbach (1979) and Real Estate Research Council (1980) for Column 2; Homer (1977) and Federal Home Loan Bank Board for Column 3.

subsequent debt. Even if deferred assessments were junior to prior debt, they would typically carry little risk of default because lenders can lose only if owners walk away from their property with nothing. The owner's entire equity is security for the debt, and in this sense property owners would take almost all the risk of public investment financed by deferred assessment.

To prevent owners from either accidentally or deliberately "milking" their property into a negative equity position, the government could require those with sufficient income to begin paying if their equity falls below an adequate reserve.

Most neighborhoods offer good security for deferred assessment. In the 1970 Census, 39 percent of single family homeowners reported no mortgage debt, so the entire market value of their properties would back a deferred assessment. The remaining 61 percent estimated their equity at almost half their home value. Using Federal Reserve data, Grebler and Mittelbach (1979) estimated that 60 percent of total owner occupied single family home value was equity in both 1970 and 1977.

Perhaps because so many older neighborhoods were formerly redlined, they now have lower than average mortgage burdens; 36 percent of owner-occupied central city housing units were debt free in 1976, compared to 30 percent outside central cities but inside an SMSA (U.S. Bureau of the Census, 1976).

Spiraling land prices in rapidly growing Third World cities imply that many low income owners already have or quickly acquire enough equity to secure deferred assessment for public investment in their neighborhoods. This opportunity would provide an incentive for owners to register their land titles, which would in turn make the land market more efficient and annual property taxes more collectible.

Despite a deferred assessment's security for the lender, borrowers run no risk of losing their homes by foreclosure for nonpayment because a deferred assessment is by definition due only at sale. For example, if deferred rather than conventional special assessments had been used to finance local public investment in the 1920s many fewer owners would have lost their properties to tax liens in the 1930s.

VI. Distribution of Benefits and Costs

To the extent that expected service benefits are capitalized, property values will rise where deferred assessments finance public investment. This betterment implies that the original owners retain some of the public investment's subsequent benefits when they sell their properties. Original owners also bear the burden of the deferred assessment, however, because houses with deferred assessment debt would sell for no more than otherwise similar houses without assessment debt. Sale prices rise because the capitalized benefits of public investment shift to the seller, not because a deferred assessment shifts to the buyer.

To illustrate the incidence of benefits and burdens, compare a federal grant to a deferred special assessment as the way to finance neighborhood public investment. In the first case federal taxpayers (including renters) pay now, and in the second case benefited landowners pay when they sell their property. Which is fairer?

If many neighborhoods financed public investment by deferred assessment, the increase in total infrastructure supply could decrease rather than increase the general level of land prices. For example, 40 percent of Latin America's urban population live in neighborhoods without piped water even though water service can create betterment much greater than its cost (Beier et al., 1976). If deferred assessment were to finance public water investment in many of these neighborhoods (and on raw land at the urban fringe), the increase in supply could lower serviced land prices enough to benefit renters as a class.[14]

Often a two thirds or even greater majority is required for approval in special assessment elections, and votes are some-

times weighted in proportion to the voter's share of the proposed tax base to prevent many small property owners from exploiting a few big taxpayers. Special assessments are often exempt from constitutional tax ceilings, but tax exempt institutions such as schools, churches, and public enterprises are often not exempt from special assessments.

Only property owners are consulted in the conventional special assessment procedure, and renters have no say in the matter. To include the whole neighborhood in public decisions, perhaps both occupiers and owners should vote in separate elections, with approval required from both groups. Voting rules and methods of assessing costs among owners will unquestionably become important issues if special assessments become a common way to finance public services.

Because homeowners tend to move to higher income neighborhoods as their own incomes increase, delaying tax payments would tend to increase spendable income in lower income neighborhoods and later decrease wealth in richer ones. This voluntary income redistribution through time and across space (but not among individuals) seems Pareto optimal if owners pay the market interest rate and never default at sale.

Senior citizens' property tax postponement programs already show how practical it is to rearrange lifetime tax payments with little or no cost to other taxpayers. Therefore, with regulations to protect lenders from default and borrowers from impoverishment, why not let all owners defer their property taxes until sale? Although deferred assessments and postponed property taxes would still require benefited property owners to pay for their public services, paying later would give a community more cash to spend now and less to take away at sale.

Just as senior citizen property tax postponement solves the individual problem of living poor and dying rich, deferred special assessment and general property tax postponement can solve the community problem of living poor and leaving rich. In this sense they resemble Monty Python's proposal to "tax foreigners living abroad."

VII. Private Investment with a Public Purpose

Private investments often also serve public purposes and for this reason many are subsidized. But investors are often given capital subsidies where deferred payment loans would be more appropriate. For example, California income tax allows a solar energy tax credit for 55 percent of the cost of new solar energy systems, with a maximum credit of $3,000 per year; any unused credit can be carried forward against future tax liabilities.

Solar energy use requires a large capital investment that yields its benefits over a long time, and California's solar tax credit does not wholly solve the resulting cash flow problem. In 1979 a couple earning $9,200 a year paid only $100 in state income tax, so it would take them 30 years to exhaust a $3,000 solar tax credit; at 10 percent interest the present discounted value of this tax credit is only $943. The income tax for a similar couple earning $45,165 a year was $3,000, so they could claim the entire tax credit in the first year after making the solar investment. Thus, the solar tax credit perversely helps low income taxpayers least in solving the cash flow problem, wholly solves it for no one, and gives the greatest subsidy to high income taxpayers.

The arguments made earlier for deferred assessment suggest that loans with repayment deferrable at interest could, without any subsidy, entirely solve the cash flow problem for any solar or insulation retrofitting investment that has a present net benefit. Borrowers could pay the debt with their yearly energy cost savings, or could pay at sale when the capitalized value of continuing energy savings might raise house value enough to offset the debt. The government could guarantee repayment of these loans at sale, and could also provide an initial cash subsidy if justified. Deferred payment loans to developers could also eliminate the large cash flow burden of energy conservation investment in new housing,

with the loans repaid as soon as the new houses are marketed. A relatively small revolving fund might therefore finance energy conservation investment in all new construction.

Housing rehabilitation and historic preservation are other examples of private investment where external benefits justify deferred payment loans. The government could more legitimately require rehabilitation or restoration of neighborhoods if deferred payment loans were guaranteed or provided to eliminate the cash flow burden imposed on property owners. These loans would also stimulate investment by assuring investors that their neighbors will similarly invest.[15]

VIII. Conclusion

A dominant theme in local public finance research since 1956 has been Charles Tiebout's hypothesis that households express their demand for public services by moving to jurisdictions with preferred taxing and spending patterns. This paper has concentrated on how households can improve their local public services without moving.

As the incomes and tastes of a city's population change over time, neighborhoods can become obsolete without continued public investment. Families are free to move elsewhere in search of improvement, but older neighborhoods themselves decline. Unfortunately, individual search for neighborhood amenity has collectively left sidewalks, streets, and water mains literally falling apart beneath many "senior cities" in the United States, and the problems are far more serious in rapidly growing Third World cities.

Although some public investments greatly increase property values (or prevent their decline), a barrier to financing them by special assessments is the cash flow problem for benefited property owners. I have argued here that tax deferment would solve the special assessment cash flow problem, and that property owners would be more able and willing to pay deferred assessments than conventional special assessments. The surprising result is that a local government can offer its property owners this flexible way to pay for public investment without creating a cash flow problem for itself.

Most owners already have more than sufficient equity to pay for desired public investment, so deferred assessment would enable incumbent owners, regardless of their income, to upgrade their public services without moving out. Deferred assessment would also improve the market for local public goods, as Tiebout conceived it, but families choosing neighborhoods would compare public services to rents and house values rather than to taxes, because original owners would pay the deferred assessments.

The option to defer property taxes as well as special assessments would strengthen such general tax reform proposals as assessing all property at true market value or shifting the property tax base from total property value (land and improvement value) to site value (land value alone). Because it would solve the cash flow problem these changes can cause for low income owners of high valued or rapidly appreciating land, tax deferment at interest would eliminate objections based on owners' seeming inability to pay.

Shifting finance of local public investment from general government revenue to deferred assessment would make taxpayers more cost conscious, neighborhoods more self reliant, public decisions more democratic, and the public sector more efficient. Neighborhoods could begin to play a stronger role in the federal system by contracting with other units of government or with private enterprise to supply their local public services on deferred assessment terms. City, state, and federal governments would continue to influence neighborhood outcomes by the projects they make eligible for deferred assessment finance and by the share of each neighborhood project's total cost they subsidize from general revenue. Planners, politicians, community associations, and potential suppliers of local public services could also play important entrepreneurial roles in persuading neighborhoods to "buy" projects financed by deferred assessment.

Neighborhood citizen participation

brings costs of its own because residents have to agree both that something should be done and what it should be. But special assessment and tax deferment are the existing halves of a deferred special assessment, so putting the two together may be as simple in practice as in theory.

Appendix 1: Interaction between Deferred Assessments and General Property Taxes

If a deferred assessment project increases market values and properties are reassessed, the resulting increase in annual property taxes creates its own cash flow problem. Property taxes on betterment can also be deferred, but the additional taxes deferred at interest shorten the period with a net gain. To show how general property taxes reduce τ, let p = the annual property tax rate on market value. The net gain is zero when the betterment equals the deferred assessment plus the deferred property tax on betterment, or when

$$Be^{i\tau} = Ce^{r\tau} + \int_0^{\tau} pBe^{it}e^{r(\tau - t)}\,dt. \tag{9}$$

Solution for τ gives

$$\tau = \frac{1}{r - i} \log \left(\frac{1 + \dfrac{p}{r - i}}{\dfrac{C}{B} + \dfrac{p}{r - i}} \right). \tag{10}$$

Equation 10 reduces to Equation 5 if p = 0, so the values for τ shown earlier in Table 1 refer to the special case where there is no property tax or where, as in California, property tax assessments are frozen for continuing owners.

Table 3 shows τ as a function of B/C and r − i at p = 2 percent. A project with B/C = 2 and r − i = 4 percent, for example, yields a net gain at sale for 10.1 years compared to the 17.3 years found earlier with p = 0. Therefore, property taxes discourage not only private but also public investment!

Appendix 2: Deferred Assessment Repayment

To see how quickly a deferred assessment would have been repaid if an actual neighborhood had voted for one on January 1, 1950, a 10-block neighborhood of 236 single family homes was chosen more or less randomly from among Census tracts with family incomes and

TABLE 3

PERIOD OF NET GAIN FROM PUBLIC INVESTMENT AND DEFERRED ASSESSMENT WITH A TWO PERCENT PROPERTY TAX

Interest Rate minus Inflation Rate r-i	Ratio of Betterment to Special Assessment B/C				
	1.1	1.5	2.0	2.5	3.0
(percent)			(years)		
10	0.8	3.1	5.4	6.9	8.1
9	0.9	3.5	5.8	7.5	8.8
8	0.9	3.9	6.4	8.2	9.5
7	1.0	4.3	7.0	9.0	10.4
6	1.2	4.8	7.9	10.0	11.7
5	1.3	5.4	8.8	11.2	13.0
4	1.6	6.2	10.1	12.7	14.8
3	1.9	7.3	11.9	14.8	17.1
2	2.3	9.0	14.4	17.8	20.4
1	3.1	11.7	18.2	22.3	25.3
0	4.5	16.7	25.0	30.0	33.3

TABLE 4

COMPARISON OF AMORTIZATION BY DEFERRED ASSESSMENTS AND BY 30-YEAR LEVEL PAYMENTS

			5 Percent Interest		10 Percent Interest		
Year	Annual Sales Rate	Cumulated Sales Rate	Annual Cash Flow per $100 of Deferred Assessment	Cumulated Cash Flow per $100 of Deferred Assessment	Annual Cash Flow per $100 of Deferred Assessment	Cumulated Cash Flow per $100 of Deferred Assessment	Annual Sales as Percent of Unsold Stock
(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
	(%)	(%)	($/year)	($)	($/year)	($)	(%)
1950	7.2	7.2	7.56	7.56	7.92	7.92	7.2
1951	5.9	13.1	6.54	14.10	7.18	15.10	6.4
1952	4.7	17.8	5.40	19.50	6.20	21.30	5.4
1953	5.1	22.9	6.18	25.68	7.45	28.75	6.2
1954	8.9	31.8	11.36	37.04	14.33	43.08	11.5
1955	2.5	34.3	3.40	40.44	4.50	47.58	3.7
1956	6.8	41.1	9.54	49.98	13.21	60.79	10.3
1957	7.2	48.3	10.64	60.62	15.44	76.23	12.2
1958	4.7	53.0	7.23	67.85	10.99	87.22	9.0
1959	4.2	57.2	6.90	74.75	10.99	98.21	9.0
1960	2.1	59.3	3.62	78.37	6.05	104.26	5.0
1961	5.5	64.8	9.89	88.26	17.29	121.55	13.5
1962	2.1	66.9	4.00	92.26	7.31	128.86	6.0
1963	2.1	69.0	4.20	96.46	8.05	136.91	6.4
1964	5.1	74.1	10.57	107.03	21.24	158.15	16.4
1965	3.0	77.1	6.48	113.51	13.63	171.78	11.5
1966	3.8	80.9	8.74	122.35	19.28	191.06	16.7
1967	2.1	83.0	5.10	127.35	11.78	202.84	11.1
1968	1.7	84.7	4.28	131.63	10.37	213.21	10.0
1969	1.7	86.4	4.50	136.13	11.40	224.61	11.1
1970	2.1	88.5	5.90	142.03	15.68	240.29	15.6
1971	2.1	90.6	6.20	148.23	17.25	257.54	18.5
1972	1.3	91.9	3.90	152.13	11.38	268.92	13.6
1973	1.7	93.6	5.47	157.60	16.70	285.62	21.1
1974	0.4	93.6	1.44	159.04	4.59	290.21	6.7
1975	0.9	94.5	3.01	162.05	10.10	300.31	14.3
1976	0.4	94.9	1.58	163.63	5.56	305.87	8.3
1977	1.3	96.2	4.98	168.61	18.33	324.20	27.3
1978	1.3	97.5	5.23	173.84	20.17	344.37	37.5
1979	0.9	98.4	3.66	177.50	14.79	359.16	40.0

TABLE 5

COMPARISON OF OBSERVED AND ESTIMATED CUMULATED SALES RATES

Year	Cumulated Sales Rate Observed in Los Angeles	Cumulated Sales Rate Estimated from 1970 Census of Housing
	(%)	(%)
2	13.1	15.6
4	22.9	28.4
6	34.3	39.5
11	59.3	58.8
16	77.1	73.4
20	86.4	83.8

Source: United States Bureau of the Census, 1970 Census of Housing, Vol. 5, Residential Finance.

house prices close to the 1950 Los Angeles averages. All first sales since 1950 in the area bounded by Crenshaw Boulevard, Hillcrest Drive, 52nd Street, and 57th Street were recorded and the results are shown in Table 4. Only 3 properties had not been sold by 1980.

Column 2 shows the number of first sales as a percent of the total number of properties. Column 3 sums Column 2 and represents the percentage of the housing stock sold since 1950, Column 4 converts the annual sales rate of Column 2 into the annual cash flow per $100 of deferred assessment at 5 percent interest compounded annually. The number of properties sold in year t is n and

$$\text{Annual Cash Flow} = 100\frac{n}{236}(1.05)^t.$$

Column 5 sums the cash flow in Column 4, and Columns 6 and 7 show the annual and accumulated cash flows at 10 percent interest. Column 8 shows the number of first sales as a percent of the stock remaining unsold since 1950.

To see whether this sales rate was typical, it can be compared to Census of Housing data on when owner occupiers of single family homes acquired their properties. In 1970, for example, 16 percent of owner occupiers reported that they had acquired their homes before 1950, and from this it might be inferred that 84 percent of owner occupiers sell within 20 years of buying. The relationship is less simple when the housing stock is growing, but Table 5 shows the distribution estimated by this method and compares it to the Los Angeles distribution from Table 4. The two distributions are similar, with houses in the Los Angeles neighborhood selling slightly slower than the national average in the early years, and slightly faster later.

FOOTNOTES

**I would like to thank Jan Kleczewski and Jun Onaka for their superb research assistance. For valuable comments and other help I would also like to thank William Baer, William Barger, Hugh Bartlett, Leland Burns, Robert Cervero, John Clapp, William Clark, Edgardo Contini, William Doebele, William Fellner, John Friedmann, Leo Grebler, Orville Grimes, Donald Hagman, Jack Hirshleifer, Daniel Holland, Richard Kirwan, Robin Liggett, Ruth Mack, Peter Marris, David Mason, Frank Mittelbach, Dean Misczynski, Max Neutze, Ets Otomo, Harvey Perloff, Bertrand Renaud, Larry Schumake, Carl Shoup, Patricia Shoup, Harold Somers, Phillip Vincent, Sarah Welch, John Wells, Fred Weston, and Michael Whitbread. Earlier versions of this paper were presented at the Southern California Regional Science Research Seminar in Los Angeles and at the World Congress on Land Policy in Cambridge, Massachusetts.

[1]The Tax Foundation (1970) summarizes the history of special assessments, which provided 0.9 percent of total general revenue for U.S. cities in 1977 (*Census of Governments,* 1977, Vol. 4, No. 4). Bird (1976) calculated that special assessments raised less than 2 percent of total municipal revenue in Ontario. Grimes' (1974) survey of betterment taxation in both developed and developing countries also found that land value increment taxes were low compared to general property taxes or other revenue sources. Bogota is an important exception where special assessments

(called "valorization" taxes) are used extensively; valorization revenues have in some years been more than half of general property tax revenues and have financed much of Bogota's urban infrastructure investment (Doebele, Grimes, and Linn, 1979).

[2]Doebele, Grimes, and Linn (1979) discuss the technical problems of equitably apportioning a public investment's cost among property owners in the benefited neighborhood. In the sense used here, a neighborhood is the benefit shed of a local public investment, and need be neither urban nor residential. For example, special assessment can finance rural irrigation investment.

[3]Because neither B nor i can be known beforehand, these variables are expected values of subjective probability distributions rather than known quantities.

[4]The interest and inflation rates are compounded continuously rather than annually. Thus Ce^{rt} instead of $C(1 + r)^t$ represents the value in year t of an initial special assessment C growing at r percent per year.

[5]The dashed line (4) representing house value net of the deferred assessment reaches its peak of $517,123 in the 43rd year, and declines to zero in the 57th year when the deferred assessment and house value are both $2,781,692. The obvious flaw in this extrapolation is the assumption that betterment remains a constant fraction of house value. This assumption was made to simplify the illustration, and is subsequently dropped.

[6]Betterment can be interpreted as the implicit price of a neighborhood public good not explicitly traded in the market, and can be predicted from a hedonic price function that includes the public good as a property value determinant (Freeman, 1979). Hagman and Misczynski (1978) explore whether public investment benefits are capitalized into site value or total property value.

[7]Buchanan's (1965) theory of clubs and Olson's (1969) theory of fiscal equivalence suggest criteria for matching special assessment districts to local public goods. Doebele, Grimes, and Linn (1979) explain how special assessment district boundaries are drawn in practice.

[8]A local government would make a profit if it borrows at a low tax-exempt municipal bond rate and relends to property owners at a higher private market interest rate. If necessary, this profit could be used to reduce property owners' initial special assessments. But tax-exempt municipal borrowing is an inefficient and inequitable way for the federal government to subsidize special assessments projects.

[9]Mayer (1980) reports that banks may soon offer accounts that will permit homeowners to draw checks against the value of a second mortgage on their property. These accounts would resemble and compete with brokerage accounts that permit margin customers to write checks against the loan value of their portfolios.

[10]A deferred assessment accumulating at a floating interest rate would cause owners no cash flow distress, but would make them more responsive to monetary policy by giving an incentive to repay quicker when money is cyclically tight, and to defer paying when interest rates decline.

[11]The popular British "Granny Bonds" have their capital value linked to the United Kingdom Retail Price Index, and if one of these savings certificates is held five years the holder gets back, tax free, the buying power equivalent of the initial purchase price, plus four percent of the initial purchase price (that is, a real interest rate less than one percent per year).

[12]The Real Estate Research Council has semi-annually appraised essentially the same sample of single-family detached houses in Los Angeles County since 1943. Substitutions have been made in the sample only because of such factors as demolition or major additions to the property. The purpose is to show changes in the market value of the same houses over time.

[13]Homeowners are not allowed an income tax deduction for capital improvement special assessments, but are allowed to add special assessments to their property's basis price for calculating capital gains at sale. Corporations depreciate capital improvement special assessments as they would their own capital investments.

[14]A neighborhood would have to consider other neighborhoods' public investments in estimating the likely betterment from any public investment of its own, but would not consider the effects of its own investments on other neighborhoods' land prices. One would therefore expect neighborhoods to increase the supply of infrastructure until $B = C$ at the margin. Neighborhoods might also invest in some projects with $B < C$ for the same reasons that many homeowners invest in improvements that raise house value less than their cost.

[15]My focus is on local public spending and taxation, but the logic suggests that banks could also lend to property owners on deferred payment terms. These loans would make it easier to liquidate equity for home improvements, other private investment, or consumption. Quite aside from financing public or private investment, deferred assessments could also be used to recoup some of the betterment caused by public land planning decisions, without depleting developers' venture capital. For example, if rezoning applicants were taxed on the resulting windfall increase in land value, the tax could be paid by a deferred assessment due when the windfall gain is realized.

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