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THE IMPACT OF URBAN LAND TAXATION: THE PITTSBURGH EXPERIENCE

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Abstract - *In 1979–80, the city of Pittsburgh restructured its property tax system by raising the rate on land to more than five times the rate on structures. This paper explores the impact of this tax reform on the economic development of the city. Following some background on the theory of land taxation and Pittsburgh's historical setting, the paper presents an empirical analysis of the impact of the tax reform. Pittsburgh experienced in the 1980s a dramatic increase in building activity, far in excess of other cities in the region. The analysis suggests that, while a shortage of commercial space was a primary driving force behind the expansion, the reliance on increased land taxation played an important supporting role by enabling the city to avoid rate increases in other taxes that could have impeded development.*

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INTRODUCTION

Land-value taxation occupies a curious place in the lexicon of public finance. It has a long and rich history among both tax theorists and reformers who have extolled its properties on grounds of economic efficiency and equity. And it still commands a certain respect and interest on the part of both scholars and practitioners. Yet it has not been widely used, and public-finance economists do not have a good sense of its real potential as an effective form of taxation. Even so, it is under serious consideration as a revenue instrument among both hard-pressed city mayors and, more surprisingly perhaps, emerging governments in transition from socialism to market-oriented economies.[1]

There is, in the United States, a single case of major reliance on land taxation in a large city: the city of Pittsburgh in 1979 and 1980 restructured its property tax system to one in which land is taxed at more than five times the rate on structures. With the passing of more than 15 years, we are now in a position to explore the effects that this tax reform has had on economic activity in the city and metropolitan area.

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To assess this experience, it is essential to have a clear understanding of the theory of land-value taxation. There has, in fact, been some recent theoretical work that raises the possibility that land-value taxation need not be neutral in its effects, as the standard theory maintains. In the next section of the paper, we will review the theory of land taxation to provide the conceptual context for our study of the Pittsburgh experience.

In the succeeding sections, we turn to a description and analysis of the Pittsburgh experiment with land-value taxation. The findings, taken at face value, are dramatic. Relative to 14 other cities in our sample, Pittsburgh is a striking outlier: it is the only city to have experienced a large and significant increase in levels of building activity during the 1980s. The interpretation of these basic findings is, however, complicated. There were other things, including a major urban renewal program, underway during this same period. And it is hard to separate the effects of tax reform from other economic events. But the alternative is simply to ignore this interesting episode in fiscal history—and this, it seems to us, would be a mistake.

To address the impact of land-value taxation in Pittsburgh, we have undertaken a careful study of the history of the Pittsburgh economy and the specific character of the tax reform. These, we will argue, are critical to a proper interpretation of the Pittsburgh experience. To carry out the quantitative analysis, we have assembled two independent bodies of data on levels of building activity in Pittsburgh and in a sample of other cities in the region. Each has its strengths and weaknesses. The first is a lengthy time series covering the period 1960–89, whose source is Dun and Bradstreet figures on the value of new building permits. The attraction of these data is their coverage over time; they are, however, limited to the city itself and provide no disaggregation among different types of building activity. The second set of data, which we have pulled together from U.S. Bureau of the Census sources, provides coverage for the entire metropolitan area, broken down by city and suburbs and also disaggregated by type of building activity. Its coverage over time is, however, more limited: 1974–89. Although the two data bases exhibit, in certain instances, some puzzling differences, they yield much the same picture of the Pittsburgh experience relative to the other cities in the region.

The analysis of these data, in the context of some other key economic variables, suggests to us that the Pittsburgh tax reform, *properly understood*, has played a significant supportive role in the economic resurgence of the city. We shall work through a number of pieces of evidence that lead us to this conclusion.

THE THEORY OF LAND TAXATION

Proponents of land-value taxation have cited a number of its appealing properties, one of which is its neutrality with respect to land use. As Netzer (1966) put it, "Location rents constitute a surplus, and taxing them will not reduce the supply of sites offered; instead, the site value tax will be entirely neutral with regard to landowners' decisions, since no possible response to the tax can improve the situation, assuming that landowners have been making maximum use of their sites prior to the imposition of the tax" (pp. 204–5).

Conventional property taxation, in contrast, involves the taxation of both

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land and improvements to the land; such taxes, as has long been recognized, are clearly not neutral as they place a levy on any structures on the land. A shift from property to land taxation (or the movement to a "graded" tax system under which land is taxed at a higher rate than the structures on the land) will reduce the "penalty" on improvements and encourage more intensive land use. Brueckner (1986) has demonstrated this proposition in a rigorous *static* analysis: the replacement of taxes on structures by levies on land-value will result in a higher level of improvements to the land (i.e., a higher capital-land ratio). We will refer to this as the *capital-intensity effect*.[2]

In an intertemporal setting, land-value taxation *can* have a different sort of effect (apart from any tax on structures). In two interesting papers, Bentick (1979) and Mills (1981) have shown that land-value taxation need not be neutral with respect to the timing and nature of land development. In particular, the taxing of land-values *may* distort the choice between earlier and later development of unused land parcels in favor of those projects that promise an earlier stream of net receipts. The implication of their models is that a movement in the direction of land taxation may hasten economic development, perhaps to an extent that is excessive on purely efficiency grounds. This effect, however, depends upon an important and controversial assumption concerning the way in which land is valued for tax purposes. Where this assumption is satisfied, land-value taxation can have what we will call a *timing effect*.

For purposes of exposition here, we will simply work through an illustrative case of land taxation. Since the capital-intensity effect is well understood, we shall focus our attention on the timing effect.[3]

We present in Table 1 a simple numerical example. The initial conditions describe an equilibrium in land-use decisions in the absence of any taxation. Each landowner is indifferent between (1) development at the current time (use A) with a stream of rental income in perpetuity of $1,000 per period, or (2) waiting one period and employing use B to receive a rent per period of $1,100. The present value of each of these alternatives is $10,000 at the assumed rate of interest of ten percent, i.e., $V_A = V_v$.

Suppose we introduce a tax on land *rents* of 20 percent. The effect of this tax is simply to reduce the net rents on each use, and hence the present value of land in each use, by 20 percent. The tax clearly has no allocative effects on land-use decisions. A tax on land rents is thus a neutral tax: its sole effect is to reduce the value of land holdings.[4] Thus, once again we find $V_A = V_V$.

Now suppose we introduce a tax on land *values* of two percent. The impact of this tax depends crucially on the way land is assessed. In the third panel of Table 1, we assume that land is taxed according to its current use. Thus, for example, land once developed for use A is always taxed based on its value in use A. Here, we find that the tax depresses the present value of use B relative to that of use A, and hence will encourage a flow of land out of future use B and into current use A. The rationale for this result is clear from the arithmetic. Under land-value taxation, future rental income manifests itself in current land-values with the result that future rents are effectively taxed in advance of their receipt. As Bentick (1979) and Mills (1981) showed, this is equivalent to raising the rate of discount by the amount of the tax rate on land. It imposes, in a sense, a tax on waiting so

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TABLE 1
LAND-VALUE TAXATION: A NUMERICAL EXAMPLE

1. Notation and assumptions:

R_A	Annual rent in perpetuity on project A beginning at time zero ($1,000)
R_B	Annual rent in perpetuity on project B beginning at time one ($1,100)
r	Rate of interest (0.10)
V_A	Value of land if used for project A
V_B	Value of land if used for project B
V_V	Value of vacant land at time zero
t	Property tax rate (0.02)

2. No taxation:

$V_A = R_A/r = 1{,}000/0.1 = \$10{,}000$
$V_B = R_B/r = 1{,}100/0.1 = \$11{,}000$
$V_V = V_B/(1 + r) = \$11{,}000/1.1 = \$10{,}000$

3. Assessments based on actual use:

$V_A = (R_A - tV_A)/r = \$8{,}333$
$V_B = (R_B - tV_B)/r = \$9{,}167$
$V_V = -tV_V + V_B/(1 + r) = \$8{,}170$

4. Assessments based on highest and best use:

$V_A = (R_A - tV_A) + ((R_A - tV_B)/r)/(1 + r) = \$8{,}170$
$V_B = (R_B - tV_B)/r = \$9{,}167$
$V_V = -tV_V + V_B/(1 + r) = \$8{,}170$

that the return from delaying development must be higher in the presence of land-value taxation than in its absence if such delay is to be profitable. The return from waiting must compensate landowners *both* for the opportunity cost of the funds tied up in the land and the taxes paid on the vacant parcel. Moreover, as Bentick and Mills show with some illustrative calculations, this timing effect could be sizable in magnitude.[5]

There is an important and compelling line of objection to the non-neutrality result that we have presented above. As Wildasin (1982) and Tideman (1982) have pointed out, this result depends on a particular form of assessment practice. Returning to our illustration in Table 1, the non-neutrality of land-value taxation results from the practice of taxing land on the value associated with its chosen use. If land were always assessed at each point in time for tax purposes on the basis of its "highest and best" possible use, irrespective of any commitments to a particular use, then land-value taxation would indeed be neutral. Taxation at such a *standard value* (Vickrey, 1970) would be use-independent and, hence, neutral. In terms of our example, we see in the fourth panel of Table 1, *all* parcels (irrespective of their use) would be taxed as if they produced a rental income of $1,000 in period one and $1,100 in all subsequent periods. In this case, once again the tax is neutral, i.e., $V_A = V_V$.

This issue is a tricky one. Suppose that land-use decisions involve if not

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permanent at least very lengthy commitments to a specific form of usage. As Bentick (1982) argued, if we treat uses of land as (effectively) mutually exclusive, then the value of land at a particular time will depend upon the use to which it has been committed (see also Bentick and Pogue, 1988). Much clearly depends here on existing assessment practices: to the extent that the assessed value of parcels reflects decisions as to their use, the timing effect becomes potentially important. This suggests that any study of the actual effects of land taxation must pay careful attention to existing assessment procedures.[6]

To conclude our discussion of timing effects, we note that the literature has suggested two additional ways in which land-value taxation hastens the development of unused parcels, one of which we think is probably of minor importance and the other of which involves an outright error. The first is the "liquidity effect." Since land-value taxation requires the paying of taxes in advance of any income from land to be developed in the future, there can exist, in circumstances of constrained access to credit markets, a cash-flow incentive for premature development of unused land parcels. But so long as land owners either have their own financial reserves or access to credit, such an effect should not be of much importance. In this regard, Bourassa (1990), in a recent empirical study of land-value taxation and housing development in three Pennsylvania cities (including Pittsburgh), was unable to find any evidence of such a liquidity effect.

Second, one finds in the more popular literature the claim that land-value taxation encourages earlier development of vacant land parcels by placing a penalty on undeveloped property. This is simply incorrect. Land-value taxes place the same penalty on land regardless of whether it is developed; indeed, it is for this reason that the tax is neutral.[7] In sum, if land assessments are not based on actual use and if liquidity effects are unimportant, then land-value taxation is neutral: it will *in itself* have no direct effects on either the form or timing of development of unused land parcels.

Finally, we raise a conceptual issue that is critical for the interpretation of the role of land-value taxation in Pittsburgh. The analysis of a new tax (or an increase in an existing tax) can proceed in either of two ways (see Musgrave, 1959, ch. 10). The increased revenues can be coupled with an expansion in the size of the public budget in which case we are dealing with a *balanced-budget* fiscal change. In this case, the overall fiscal effect depends both on the change in public expenditure and the effects of the change in taxes. Alternatively, we can view an increase in one tax as providing revenues that substitute for revenues from an alternative source with the size of the budget held constant. For such a case of *differential* tax analysis, we compare the effects of the actual tax change *relative* to those of the revenue alternatives. It is important, as we shall see later, to realize that the Pittsburgh case involves mainly an exercise in differential tax analysis, for the increase in the rate of land-value taxation was adopted as an alternative to other proposed taxes.[8]

PITTSBURGH: THE SETTING AND FISCAL REFORM[9]

In order to understand the effects of land-value taxation in Pittsburgh, it is important to place this tax reform in the context of the ongoing economic evolution of the city and metropolitan area. Pittsburgh has been undergoing a

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very basic and far-reaching process of economic transition. The economic core of the city in the late nineteenth and early twentieth centuries was its manufacturing base with a heavy concentration of steel mills. In recent decades, however, the Pittsburgh economy has shifted away from this heavy reliance on manufacturing toward a more white-collar oriented economic structure based on light manufacturing and services. In 1940, manufacturing employment in the four-county Pittsburgh Metropolitan Statistical Area (MSA) accounted for almost half of the total work force; in 1981, manufacturing employment constituted less than one-quarter of total employment. And by 1985, manufacturing employment was down to only 16 percent of total employment.

As in many other major U.S. cities, the Pittsburgh population has declined sharply: the city's population fell from a high of over 700,000 in 1950 to about 400,000 in 1980. This reflected largely a process of suburbanization, with the total population of the metropolitan area remaining roughly the same. Pittsburgh grew in its early years by a process of annexation and consolidation. However, there has been virtually no further annexation or consolidation since World War II; suburban townships have retained their independence.

Pittsburgh has undergone a striking process of urban renewal. This began in the 1940s with Renaissance I, a major effort to clean up the environment of the city and to revitalize the central business district. Based on a series of projects involving a public-private partnership, Pittsburgh made major advances in cleaning up air quality, in flood control (which had been a real problem with periodic heavy flooding of the central business district (CBD), and in the construction of new office buildings in the Golden Triangle. It is interesting that these efforts received a major impetus from a severe shortage of office space; from 1945 through 1952, Pittsburgh's office occupancy rate was 99 percent. Under the rubric of an Urban Redevelopment Authority (URA), the city's political and business leaders launched a series of major construction projects that resulted in new office buildings, parks, and some luxury apartments. One-fourth of Pittsburgh's downtown was rebuilt within ten years.

Following an "interlude" characterized by economic travails associated with the continuing collapse of the steel industry and mounting fiscal pressures, Pittsburgh launched a new renewal effort in the late 1970s: Renaissance II. As before, the renewal effort involved an extensive partnership between public and private agents, with a major focus on continued development of the central business district. Interestingly, this effort also seems to have been encouraged by a severe shortage of office space: occupancy rates of city office space were again at the 99 percent level in 1980. Several major corporations decided to expand their headquarters in Pittsburgh and, with public assistance, constructed a series of major office complexes. The result was a striking surge in levels of commercial construction activity: there were commercial contract awards in 1980 for 9.5 million square feet of new space with (as we shall see) continued high levels of building activity through most of the decade.[10]

Pittsburgh, along with a handful of smaller cities in Pennsylvania, has had a graded property tax system in place for many decades, a system under which land was taxed at a rate twice that of the structures on the land until 1979. As Table 2 indicates, Pittsburgh introduced

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TABLE 2
PROPERTY TAX RATES, CITY OF PITTSBURGH 1972–91

Fiscal Year	(a) Land Tax Rate (Mills)	(b) Structure Tax Rate (Mills)	(c) County Tax Rate (Mills)	(d) School District Tax Rate (Mills)	(e) Total Land Tax Rate (Mills)	(f) Total Structure Tax Rate (Mills)	(g) (e) as a Percent of (f)
1972	53.0	26.5	15.5	23	91.5	65.0	141
1973	51.0	25.5	15.5	23	89.5	64.0	140
1974	51.0	25.5	15.5	23	89.5	64.0	140
1975	49.5	24.75	15.5	23	88.0	63.25	139
1976	49.5	24.75	15.5	29	94.0	69.25	136
1977	49.5	24.75	21.375	29	99.875	75.125	133
1978	49.5	24.75	21.375	29	99.875	75.125	133
1979	97.5	24.75	19.365	29	145.865	73.115	200
1980	125.5	24.75	23.0	29	177.5	76.75	231
1981	125.5	24.75	28.0	41	194.5	93.75	207
1982	133.0	32.0	29.0	36	198.0	97.0	204
1983	151.5	27.0	29.0	36	216.5	92.0	235
1984	151.5	27.0	29.0	40	220.5	96.0	230
1985	151.5	27.0	29.0	40	220.5	96.0	230
1986	151.5	27.0	31.25	40	222.75	98.25	227
1987	151.5	27.0	31.25	46	228.75	104.25	219
1988	151.5	27.0	31.25	46	228.75	104.25	219
1989	151.5	27.0	35.0	46	232.5	108.0	215
1990	184.5	32.0	36.5	46	267.0	114.5	233
1991	184.5	32.0	36.5	46	267.0	114.5	233

Source: Office of the City Controller, City of Pittsburgh.
Note: The tax rates in this table are nominal rates. The assessment-sales ratio in Pittsburgh is 0.25; thus, effective tax rates are one-quarter of the nominal rates.

a striking restructuring of the city's property tax in 1979 and 1980, raising the tax rate on land to about five times the rate on structures. This increased "tilt" of rates has been maintained and even increased slightly during the decade following the restructuring. We note that the assessment-sales ratio in Pittsburgh is 0.25 so that the nominal tax rates appearing in Table 2 must be divided by four to obtain measures of effective tax rates.

Two aspects of this tax reform are particularly important. First, we see in Table 2 that properties in the city of Pittsburgh are subject to taxation not only by the city government, but also by the county and the overlying school district. These latter two jurisdictions do not participate in the graded tax system: they employ a conventional property tax that applies the same tax rate to land and structures. As the last column of the table indicates, this results in *total* tax rates on land in the city of Pittsburgh that are something more than twice the rates on structures. Properties outside the city are, in contrast, subject to conventional property taxation.

Second, Table 2 suggests that the tax reform in 1979–80 involved raising the rate on land while *holding constant* the rate on structures. This is, however, misleading. What the table fails to reveal is that generous tax abatements were granted for new construction, both commercial and residential, in the city. Under these abatements, the city did not tax the additional value from new construction for the first three years (Weir and Peters, 1986). The tax savings amounted to several million dollars. In addition, the URA offered low interest loans for commercial and

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residential rehabilitation and construction. Finally, it is worth noting that new federal programs, notably the Economic Recovery Tax Act of 1981, provided important incentives for the renovation of old structures by providing accelerated depreciation and tax credits. Tax reform in Pittsburgh thus entailed raising the tax rate on land and effectively reducing the rate on improvements for *new* structures.

AN ANALYSIS OF THE PITTSBURGH EXPERIENCE

Before turning to our work, we note that there have been three earlier studies of the effects of land-value taxation in Pittsburgh. Pollakowski (1982) was unable to find much in the way of "adjustment effects," as measured by the number of property transactions. However, his data extended only from 1976 through 1980. Bourassa (1987) explored the effects of Pittsburgh's tax system on housing development. Using monthly data on the value of new residential building permits as his dependent variable, Bourassa found that the tax rate on improvements, but not the rate on land, was a statistically significant determinant of the level of residential building activity. Bourassa's findings, while of some interest, are limited in scope, for, as we shall see, the major impetus to development in Pittsburgh has been in the non-residential sector. Of more relevance to our concerns is an interesting study undertaken in the mid-1980s by the Pennsylvania Economy League (1985). At the request of Mayor Richard Caliguiri, the League examined the effects of the graded tax on both the development of the city and the equity of the tax system. Drawing both on extensive interviews with "local development experts" and some quantitative analysis of the graded-tax ratio and development of different properties, the League concluded that "The graded tax has very little effect on development" (p. ii). We will draw on the League's report at various points in our discussion.[11]

We turn now to our study. To provide a baseline for comparative purposes, we have assembled time-series data on new building activity for a sample of 15 cities and metropolitan areas in the general region containing Pittsburgh (the so-called "Rust Belt"). We begin the analysis by simply presenting some summary data on the average annual value of new building permits both before and after 1979–80, the time of the new tax measures in Pittsburgh. As noted in the Introduction, we have two independent sources of data.[12]

Table 3 presents figures for the *real* value of new building permits for the 15 cities in our sample. We have calculated these figures from data provided by Dun and Bradstreet; these data extend back to 1960 but include only the city and not the rest of the metropolitan area. The figures are quite striking: they reveal a typically quite substantial decline in the annual real level of building activity from the period 1960–79 to 1980–9. Only 2 of our 15 cities experienced an increase. Columbus shows a slight rise. But Pittsburgh is a remarkable outlier; the real value of building permits on an annual basis rose by some 70 percent in the 1980s relative to the 20-year period preceding the tax reform.

Table 4 provides some further analysis of the Dun and Bradstreet data. It presents estimates of models in which we have regressed the log of the Dun and Bradstreet data on a constant and a dummy variable with a value of one for years 1980 and after and a value of zero for earlier years (Model 1), or alterna-

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TABLE 3
AVERAGE ANNUAL VALUE OF BUILDING PERMITS
DUN AND BRADSTREET DATA

	1960–79	1980–9	Percent Change
Akron	134,026	87,907	–34.41
Allentown	48,124	28,801	–40.15
Buffalo	93,749	82,930	–11.54
Canton	40,235	24,251	–39.73
Cincinnati	318,248	231,561	–27.24
Cleveland	329,511	224,587	–31.84
Columbus	456,580	527,026	15.43
Dayton	107,798	92,249	–14.42
Detroit	368,894	277,783	–24.70
Erie	48,353	22,761	–52.93
Pittsburgh	181,734	309,727	70.43
Rochester	118,726	82,411	–30.59
Syracuse	94,503	53,673	–43.21
Toledo	138,384	93,495	–32.44
Youngstown	33,688	11,120	–66.99
15 city average	167,504	143,352	–14.42

Note: All data are in 000's of constant 1982 dollars.

TABLE 4
SUMMARY OF REGRESSION RESULTS
DUN AND BRADSTREET DATA

	Model 1			Model 2			
	Post 1979 Dummy	Constant	R^2	Year	Post 1979 Dummy	Constant	R^2
Akron	–0.385 (3.20)	11.75 (169.20)	0.27	–0.034 (3.63)	0.131 (0.76)	79.59 (4.26)	0.51
Allentown	–0.500 (3.56)	10.72 (132.05)	0.31	–0.021 (1.61)	–0.188 (0.79)	51.71 (2.03)	0.37
Buffalo	–0.088 (0.43)	11.32 (96.51)	0.01	–0.054 (3.25)	0.719 (2.37)	117.32 (3.60)	0.29
Canton	–0.451 (2.52)	10.48 (101.38)	0.18	0.004 (0.23)	–0.510 (1.62)	2.72 (0.08)	0.19
Cincinnati	–0.303 (2.72)	12.63 (196.39)	0.21	–0.025 (2.64)	0.075 (0.43)	62.25 (3.31)	0.37
Cleveland	–0.360 (2.86)	12.65 (174.03)	0.23	–0.032 (3.10)	0.123 (0.65)	76.11 (3.72)	0.43
Columbus	0.150 (1.57)	13.00 (235.08)	0.08	0.013 (1.51)	–0.051 (0.31)	–13.33 (0.77)	0.15
Dayton	–0.145 (1.00)	11.52 (137.70)	0.03	–0.006 (0.45)	–0.052 (0.20)	23.68 (0.87)	0.04
Detroit	–0.283 (2.50)	12.78 (195.41)	0.18	–0.027 (2.83)	0.123 (0.70)	66.12 (3.51)	0.37
Erie	–0.703 (5.10)	10.71 (134.46)	0.48	0.003 (0.22)	–0.748 (3.07)	4.87 (0.19)	0.48
Pittsburgh	0.467 (2.81)	12.03 (125.45)	0.22	–0.031 (2.08)	0.929 (3.41)	72.68 (2.45)	0.33

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TABLE 4 (Continued)

	Model 1			Model 2			
	Post 1979 Dummy	Constant	R^2	Year	Post 1979 Dummy	Constant	R^2
Rochester	–0.296 (1.98)	11.59 (134.46)	0.12	–0.010 (0.71)	–0.144 (0.55)	31.54 (1.13)	0.14
Syracuse	–0.468 (1.96)	11.28 (81.76)	0.12	–0.028 (1.25)	–0.050 (0.12)	66.25 (1.51)	0.17
Toledo	–0.375 (3.63)	11.80 (197.40)	0.32	0.015 (1.54)	–0.596 (3.40)	–17.15 (0.91)	0.37
Youngstown	–1.049 (6.22)	10.32 (106.00)	0.58	–0.031 (2.04)	–0.586 (2.12)	71.02 (2.39)	0.64

Note: *t*–Statistics are in parentheses.

tively, a constant, the dummy variable, and a time trend (Model 2). We find that these estimates confirm the message from Table 3. Of all the cities in our sample, only Pittsburgh in Model 1 exhibits a positive and statistically significant coefficient on the dummy variable. In Model 2, both Pittsburgh and Buffalo have significant dummy variables. Here, we find that the coefficient on the time variable (Year) is negative for most cities and often statistically significant, suggesting a negative time trend over the entire period in levels of building activity in these cities. This is consistent with the general view of economic stagnation that is associated with cities in this region of the country. Interestingly, we find that this is true for Pittsburgh as well as many other cities in the sample. But for Pittsburgh, the downward trend is offset by the powerful effect of the shift (dummy) variable that, we presume, captures the regime change in that city. Taken at face value, these results suggest that Pittsburgh was also on a downward course but that this course was displaced by events taking place at the end of the 1970s.[13]

Table 5 provides summary results from another source of "before and after" data; these data are on a metropolitan area basis with disaggregation between city and suburbs and between residential and nonresidential construction. We have compiled these figures from U.S. Bureau of the Census sources; in contrast to Dun and Bradstreet, they reach back only to 1974.[14] The Census data reveal a general picture of overall city building activity that is roughly consistent with that from Dun and Bradstreet. The real annual value of total building permits is lower after 1979 than before in most cities. But Pittsburgh again stands out, with a dramatic increase of more than 250 percent. The disaggregation that the Census data makes possible provides some further valuable information. We find that the impetus to building activity in the Pittsburgh area was confined to the city; the average annual value of building permits in the suburbs actually declined from the earlier to the latter period. In addition, the data indicate that the primary thrust to increased construction activity was in the nonresidential sector; residential improvements rose only modestly, while nonresidential construction more than tripled in annual value.

As with the Dun and Bradstreet data, we have subjected the Census data to

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TABLE 5
AVERAGE ANNUAL VALUE OF BUILDING PERMITS
U.S. CENSUS DATA

	1974–8			1980–9		
COMMUNITY	City	Suburb	MSA	City	Suburb	MSA
Akron:						
Residential	28,239.1	188,024.7	216,263.8	27,930.2	124,320.1	152,250.2
Nonresidential	61,680.0	60,016.7	121,696.7	46,425.1	83,458.3	129,883.4
Total	89,919.1	248,041.4	337,960.5	74,355.3	207,778.3	282,133.6
Allentown:						
Residential	26,448.6	143,925.2	170,373.8	20,280.5	196,731.1	217,011.6
Nonresidential	34,957.7	64,490.5	99,448.2	29,898.5	109,895.3	139,793.8
Total	61,406.3	208,415.8	269,822.1	50,179.0	306,626.4	356,805.4
Buffalo:						
Residential	8,447.0	183,765.9	192,212.9	8,385.7	179,261.1	187,646.8
Nonresidential	25,474.9	136,969.0	162,443.9	33,697.4	129,651.9	163,349.3
Total	33,921.9	320,734.9	354,656.8	42,083.1	308,913.1	350,996.1
Canton:						
Residential	11,607.9	122,660.2	134,268.1	6,160.7	60,512.6	66,673.3
Nonresidential	14,896.6	47,132.2	62,028.8	17,720.6	44,343.1	62,063.8
Total	26,504.5	169,792.4	196,296.9	23,881.3	104,855.7	128,737.1
Cincinnati:						
Residential	36,123.1	374,212.4	410,335.5	20,238.2	344,201.0	364,439.2
Nonresidential	74,949.7	200,557.3	275,507.0	99,482.9	308,337.6	407,820.5
Total	111,072.8	574,769.7	685,842.5	119,721.1	652,538.6	772,259.8
Cleveland:						
Residential	30,254.2	558,518.4	588,772.6	28,602.6	384,035.5	412,638.1
Nonresidential	182,789.6	419,515.7	602,305.3	201,873.6	277,133.6	479,007.2
Total	213,043.9	978,034.1	1191,078.0	230,476.2	661,169.1	891,645.3
Columbus:						
Residential	153,306.0	226,599.1	379,905.1	216,897.4	241,788.8	458,686.2
Nonresidential	207,045.2	52,714.8	259,760.1	318,663.0	108,639.1	427,302.1
Total	360,351.3	279,313.9	639,665.1	535,560.4	350,427.9	885,988.3
Dayton:						
Residential	7,790.0	218,592.9	226,382.9	9,469.3	140,547.8	150,017.1
Nonresidential	72,792.8	107,213.4	180,006.3	63,031.3	105,572.5	168,603.8
Total	80,582.8	325,806.3	406,389.1	72,500.5	246,120.4	318,620.9
Detroit:						
Residential	53,939.1	1235,572.5	1289,511.6	49,412.1	902,073.4	951,485.5
Nonresidential	198,925.1	664,399.5	863,324.6	187,437.9	909,042.7	1096,480.6
Total	252,864.2	1899,972.0	2152,836.1	236,850.0	1811,116.1	2047,966.0
Erie:						
Residential	10,955.7	41,776.7	52,732.4	4,129.8	29,440.3	33,570.1
Nonresidential	23,113.6	18,203.9	41,317.5	17,052.0	18,845.2	35,897.2
Total	34,069.3	59,980.6	94,049.9	21,181.8	48,285.5	69,467.3
Pittsburgh:						
Residential	35,933.9	425,064.8	460,998.7	43,349.5	295,294.3	338,643.8
Nonresidential	63,467.3	217,861.5	281,328.8	211,749.3	227,749.1	439,498.4
Total	99,401.2	642,926.3	742,327.5	255,098.8	523,043.4	778,142.2
Rochester:						
Residential	3,508.0	194,534.4	198,042.4	9,220.6	280,917.9	290,138.4
Nonresidential	77,452.0	107,759.2	185,211.2	66,538.5	151,044.7	217,583.2
Total	80,960.0	302,293.6	383,253.6	75,759.1	431,962.6	507,721.6

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TABLE 5 (Continued)

	1974–8			1980–9		
COMMUNITY	City	Suburb	MSA	City	Suburb	MSA
Syracuse:						
Residential	9,060.2	101,339.0	110,399.2	7,346.1	125,347.7	132,693.8
Nonresidential	16,168.7	47,338.0	63,506.7	34,473.7	77,838.3	112,312.0
Total	25,228.9	148,677.1	173,905.9	41,819.8	203,186.0	245,005.8
Toledo:						
Residential	57,844.8	177,223.8	235,068.6	33,996.3	146,666.7	180,663.0
Nonresidential	53,465.3	83,833.4	137,298.7	56,700.0	88,513.8	145,213.8
Total	111,310.1	261,057.2	372,367.3	90,696.4	235,180.4	325,876.8
Youngstown:						
Residential	13,667.6	107,541.3	121,208.9	5,705.1	49,797.6	55,502.7
Nonresidential	20,941.8	31,499.4	52,441.1	18,533.4	51,903.9	70,437.3
Total	34,609.4	139,040.6	173,650.1	24,238.5	101,701.5	125,940.0

Note: All data are in 000's of constant 1982 dollars.

some regression analysis. In Table 6, we report the results of re-estimating Models 1 and 2 from Table 4 using our Census data. We are now able to disaggregate the value of new building permits into residential, nonresidential, and office construction and to estimate separate equations for the city and suburbs. We find in Table 6 that, for the city of Pittsburgh, the dummy variable is large and significant for nonresidential construction, and even more so for new office construction. The effects in the Pittsburgh suburbs are much smaller and less consistently significant (although, in one case, namely, Model 1 for office construction, the dummy variable is positive and statistically significant).

The basic data thus suggest that, as compared to other cities in the region, something quite dramatic happened to levels of building activity in Pittsburgh after 1979–80. Moreover, this appears to have been a city phenomenon that did not extend to the suburbs and one that was driven primarily by increased building activity in the nonresidential sector.

This brings us to the question of the forces that induced this striking increase in city nonresidential construction activity in the 1980s and, in particular, to the role played by the new tax measures. The tax changes could, in principle, have encouraged building activity in two ways. First, as we have discussed, the dramatic increase in the tax rate on land *might* have had a timing effect that would have induced earlier development of unused parcels than otherwise. And, second, the tax abatements on new structures served as a potential inducement to new construction.

The first of these effects, as we noted earlier, depends critically on the nature of assessment practices. As we have seen, the crucial condition is whether land assessments for purposes of taxation are dependent on the particular use of a parcel or whether they consistently reflect the highest and best use of a parcel irrespective of its current employment.

We have explored this issue with some care, including several discussions with the Director of Assessments for Allegheny County (of which Pittsburgh is part). And it turns out to be a complicated

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TABLE 6
SUMMARY OF REGRESSION RESULTS
PITTSBURGH SUBSAMPLE, CENSUS DATA

	Model 1			Model 2			
	Post 1979 Dummy	Constant	R^2	Year	Post 1979 Dummy	Constant	R^2
City:							
Residential	0.168 (0.74)	10.43 (56.16)	0.04	–0.063 (1.58)	0.701 (1.71)	134.47 (1.66)	0.20
Nonresidential	1.085 (4.09)	11.04 (50.93)	0.56	–0.053 (1.05)	1.533 (3.06)	115.16 (1.16)	0.60
Office	1.967 (2.12)	8.52 (11.25)	0.26	–0.273 (1.65)	4.287 (2.59)	547.88 (1.68)	0.39
Suburb:							
Residential	–0.366 (2.62)	12.93 (113.30)	0.35	0.083 (6.08)	–1.073 (7.84)	–151.36 (5.60)	0.84
Nonresidential	0.088 (0.64)	12.24 (109.24)	0.03	0.041 (1.68)	–0.260 (1.07)	–68.56 (1.42)	0.21
Office	0.495 (2.55)	10.21 (64.31)	0.33	0.077 (2.48)	–0.163 (0.52)	–142.75 (2.31)	0.56

Note: *t*-Statistics are in parentheses.

and quite tricky matter. For the major building projects in the CBD in the early 1980s, there were apparently available some "good" and recent sales of vacant land parcels, which were used as a basis for the land assessments. But this really does not answer our question. The issue is whether at some later date, if land values changed as a result of new highest and best uses, the assessed land-values would be adjusted accordingly. The assessor's answer to this question is, in principle, yes. Land assessments would, in principle, be adjusted to reflect changes in the values of existing vacant parcels. This would appear to indicate that timing effects are unimportant.

However, things are not quite this clear-cut. In fact, the determination of assessed land-values is more complex and pragmatic than the discussion to this point would suggest. It is, we have learned, quite typical for property assessments involving large parcels in the city to be appealed and subsequently litigated. And, frequently, this procedure produces reductions in the land assessments. The outcome is often a kind of "compromise," in which numerous criteria are brought to bear. Thus, it would not be at all surprising if, through one channel or another, existing patterns of land use had some impact on land assessments. For this reason, timing effects of the kind discussed by Bentick (1979) and Mills (1981) cannot be ruled out categorically in the Pittsburgh case. But it is our sense that such effects were probably not of much importance in development decisions. Some pieces of informal evidence support this conclusion. First, in their interviews with development experts, the Pennsylvania League (1985)

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found no evidence that the increase in rates of land taxation exerted a noticeable impact on construction activity. "Most of those interviewed stated that property taxes played a very small part in any development decision and that the effects of the graded tax were negligible" (p. 20). And, second, the League found that several of the major projects that were begun in 1981 were well along in the planning stages *before* the increase in the graded-tax ratio.[15]

There are obviously things other than the fiscal system that influenced development decisions in Pittsburgh. And we turn to them now. As mentioned earlier, there was undertaken in the late 1970s a concerted renewal effort under the title of Renaissance II. Moreover, it is clearly important to look for elements in the general economic "climate" that might have favorably influenced economic activity. Of particular importance is the state of excess demand for structures. As a proxy for this variable, we present in Table 7 data that we have assembled for ten of our cities for selected years on vacancy rates in downtown office buildings. The figures for Pittsburgh are striking: they indicate that by 1980 the vacancy rate had fallen below one percent, suggesting the existence of considerable excess demand for new office space. The data indicate, moreover, that the construction of several massive new office buildings in the early 1980s effectively remedied the situation, as office vacancy rates rose sharply by the middle of the decade.

The excess demand for office space was undoubtedly an important contributor to the decisions to erect new office complexes in the city. However, the rest of Table 7 is of interest in this respect. Several other cities in our sample likewise exhibit quite low downtown office vacancy rates. But they did not experience the building boom that characterized Pittsburgh in the 1980s.

To look at this a bit more closely, we have undertaken some regression analysis of the time-series data for Pittsburgh, in which we allow for the effects of both the vacancy rate and the regime change. In equations 1 and 2, we report the results of re-estimating Models 1 and 2 using the log of the Dun and Bradstreet data (LDB) and including, along with the dummy variable (D) for the tax regime (and the time variable (Y) in Model 2), the annual occupancy rate (R) for office buildings:

1 Model 1

$$\text{LDB} = 6.69 + 0.597D + 0.057R$$
$$\quad (1.79)\ (3.90) \qquad (2.98)$$

$$R^2 = 0.41$$

2 Model 2

$$\text{LDB} = 45.96 + 0.870D - 0.020Y + 0.048R$$
$$\quad (1.58)\ (3.46) \qquad (1.35) \qquad (2.43)$$

$$R^2 = 0.45$$

We find, first, that the estimated coefficient of the occupancy rate is positive and significant in both equations; a one-percentage-point increase in the occupancy rate raises real building permits by roughly five percent. Second, the post-1979 dummy variable remains positive and significant, though slightly smaller than in Table 4. These results are thus consistent with the view that the shortage of office space, although an important determinant, is not the sole explanation of the building boom in Pittsburgh in the 1980s.[16]

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TABLE 7
DOWNTOWN OFFICE VACANCY RATES
SELECTED CITIES 1977–88

	1977	1978	1979	1980	1981	1982	1983	1984	1985	1986	1987	1988

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The dummy or regime-shift variable (*D*) in both Models 1 and 2 captures several elements that we mentioned earlier—not only changes in the city's tax system, but also other components of Renaissance II. Of particular note was a provision granting property tax abatements for new construction under which the city did not tax the value from new construction for the first three years. To get some sense of the order of magnitude of this tax concession, we have made some crude calculations with what seem to us reasonable representative values of the key parameters. Actual assessments of some of the major new projects indicate that they were highly capital-intensive, with the value of structures constituting about 90 percent of the total value of the property and with land about ten percent of the total value. Assuming a ten percent rate of discount, we calculate that, for such a representative property, the provision that forgives the tax on structures for the first three years serves to reduce the present discounted value of the future stream of property tax liabilities by about 15 to 20 percent. This, in turn, translates into something like a 1.5 percent subsidy (reduction in price) to new construction. We suspect that a subsidy of this magnitude, even with generous elasticity estimates, can account only for a modest fraction of the large increase in construction activity.

There remains the puzzle of the striking difference in construction behavior between the residential and nonresidential sectors. Why was the boom in building activity in the 1980s in Pittsburgh concentrated in the commercial sector? To explore this issue, we collected some additional data on residential vacancy rates for both homeowner and rental units for the cities in our sample. The data indicate that vacancy rates for residential units in Pittsburgh are not unusually low; the rates for both home-owner and rental units are comparable over this period to those in other cities in the region. For example, the vacancy rate in rental dwellings in 1980 was 7.1 percent in Pittsburgh; this rate ranged from 5.7 to 9.5 percent in 1980 for other cities in our sample. The explanation for the puzzle thus seems to be that there was significant excess demand for new office space in Pittsburgh but not for residential dwellings. This would underscore the importance of the state of the market in determining levels of new construction. We note from Table 5, however, that residential construction (as measured by the value of new building permits) did rise in Pittsburgh in the 1980s relative to the preceding decade, and this is in contrast to most other cities in our sample, which experienced declines in both residential and nonresidential construction. But the increase in residential construction in Pittsburgh was clearly dwarfed by what took place in the nonresidential sector. The apparent explanation is the different levels of excess demand in the two sectors.

Interpretation and Conclusions

It is now time to try to draw together the various strands of evidence and assess the role that land-value taxation has played in the resurgence of building activity in the 1980s in the city of Pittsburgh. There are obviously serious limitations inherent in any exercise that involves the analysis of a single case of any phenomenon. And we are acutely aware that not only do we have a single case of land-value taxation, but the shift of tax regimes that took place at the end of the 1970s was part of a larger program, Renaissance II, that aimed at urban renewal. It is clearly impossible to

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disentangle fully the effects of all the various elements of the renewal effort. Nevertheless, theory and evidence together do, we believe, suggest a reasonable interpretation of the Pittsburgh experience. And we offer that interpretation to conclude our study.

The basic data are clear on certain things. Following the change in regimes at the end of the 1970s, Pittsburgh experienced a striking building boom, far in excess of anything that took place in the other major cities in the region. The building boom was basically a city phenomenon; it did not extend to the rest of the metropolitan area. It was, moreover, a boom primarily in commercial building activity. The residential sector experienced only a modest increase in new construction (although even this is noteworthy in the context of the nationally depressed housing markets of the early 1980s). The central thrust took the form of several major new office buildings in the CBD in response to a marked shortage in office space that characterized the transformation of the Pittsburgh economic base from its earlier heavy manufacturing orientation to a more diversified, service-oriented economy.[17]

How do we account for the Pittsburgh building boom? It seems clear at the outset that certain underlying economic conditions were favorable. By 1980–1, the downtown office vacancy rate had fallen to less than one percent, suggesting an existing excess demand for office space. Renaissance II appears to have mobilized this excess demand and transformed it into new commercial construction. However, the excess demand itself does not seem to be the entire story, as two pieces of evidence suggest. First, as Table 7 indicates, Pittsburgh was not the only city in the region with low office vacancy rates in the late 1970s. But the other cities in our sample did not experience an expansion in commercial building activity anything like what happened in Pittsburgh. And, second, as we found in our regression analysis, even after allowing for the significant effect of office vacancy rates on new building activity, the dummy variable for the regime change remains large and statistically significant. This suggests that, while excess demand was obviously quite important, it was not the only factor behind the dramatic expansion in commercial building.

This is, incidentally, an issue of considerable contention among city officials and others close to the Pittsburgh experience. Some suggest a major role for fiscal incentives. Rybeck (1991), for example, quotes the Pittsburgh City Council President as follows: "I'm not going to say the land tax is the only reason a second renaissance occurred, but it's been a big help" (pp. 4–5). In contrast, a major official and a close observer (independently) have asserted categorically to us that all the major projects that were undertaken in the CBD would have been undertaken in the absence of any increase in land taxes; their view is that the shortage of office space was the basic driving force in these investment decisions.

But to conclude from this that the role of land taxation was relatively unimportant is, in our view, a serious misinterpretation. Assuming that the timing effects we discussed earlier were of minor importance, we are left with the view that, in accordance with traditional economic theory, a major increase in land-value taxation is likely to be (roughly) neutral. The critics of land-value taxation have suggested that the Pittsburgh tax reform was unimportant

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because it had little effect on development. In the interviews of those knowledgeable about development, the study of the Pennsylvania Economy League obtained repeatedly the response that the shift to heavier land taxation had no (or little) discernible impact on development decisions (Weir and Peters, 1986). From this, it was concluded, incorrectly we believe, that increased land-value taxation played little role in Renaissance II.

The point here is that if land taxation were neutral, we would *expect* it to have no effect on any decisions. This is its very appeal: it does not distort economic choices. Thus, the responses of those interviewed are fully consistent with the traditional view of the neutrality of land taxation. Land taxation should not, and apparently did not, in itself hasten development.

The role of land-value taxation is to be understood in terms of the revenue alternatives. Pittsburgh was under severe fiscal pressure in the late 1970s, and some type of tax increase was necessary to restore budgetary solvency. Had an increase in land-value taxation not been introduced, city officials would have turned to another form of taxation: higher taxes on structures, or a major increase in the city's wage tax. The interesting, and the relevant, issue here is the response of the Pittsburgh economy to such an alternative tax.

Although we do not have a model of the Pittsburgh economy with which to generate some actual estimates of the economic response to alternative tax reforms, there is a recent empirical literature that is, at least, quite suggestive. This literature (in contrast to some earlier and cruder work) finds that business location decisions and economic growth are quite sensitive to levels of state and local taxes (see, for example, Helms, 1985; Newman and Sullivan, 1988; Bartik, 1991.) Moreover, as Bartik points out, "Tax effects on business location decisions are generally much larger for intrametropolitan business location decisions than for intermetropolitan or interstate business location decisions" (1991, p. 39). Drawing on the existing empirical literature, Bartik suggests that the long-run elasticity of business location decisions with respect to local taxes probably ranges from –1.0 to –3.0 in an intrametropolitan setting. From this perspective, increases in other city taxes might have been expected to have damaging effects on the city's economic renewal efforts.[18] The appeal of land-value taxation is its basic neutrality: it does not create the adverse fiscal incentives that accompany other revenue measures.

It is against the backdrop of such alternatives that the tax on land-values needs to be considered. As we noted earlier, the role of land-value taxation in Pittsburgh should be understood in a setting of *differential* taxation. The relevant issue here is how the effects of the land-value tax *compare* with those of the available alternative sources of tax revenues.

At the same time, it is important to remember that the Pittsburgh fiscal reform took place in a setting of strong demand for office space. We certainly cannot conclude from the Pittsburgh experience that tax reform *in itself* is capable of generating major urban renewal efforts. Our findings thus do not support some of the more extravagant claims that land-tax proponents have made for the role of the tax in stimulating economic activity. The contribution of land-value taxation is to be understood not in terms of any direct

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stimulus to development, for there is likely to be little or none if the tax is basically neutral. Rather, land-value taxation provides city officials with a tax instrument that generates revenues but has no damaging side effects on the urban economy. In this way, it allows the city to avoid reliance on other taxes that can undermine urban development.

ENDNOTES

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[1] There are a few instances of land-value taxation in practice; they typically involve a graded property tax system under which land is taxed at a higher rate than the structures on the land. They include (in addition to Pittsburgh) some smaller cities in Pennsylvania and, outside the United States, certain cities in Australia and South Africa.

[2] For some sense of the magnitude of this effect, see the computable general-equilibrium analyses in the papers by DiMasi (1987) and Follain and Miyake (1986).

[3] We have constructed a formal intertemporal model that embodies both the capital-intensity and timing effects. We are happy to provide interested readers with an appendix that presents this model.

[4] This admittedly abstracts from whatever effects the tax revenues have on government spending or, alternatively, on revenues from other tax sources. It also ignores possible changes in behavior by landowners (or others) from the associated income and portfolio effects (Feldstein, 1977).

[5] Wildasin (1982) points up another potential source of intertemporal non-neutrality: changes in the tax rate on land over time. For example, increasing tax rates over time would tend to penalize projects whose returns are more concentrated in the distant future.

[6] As Tideman (1982) has emphasized to us, the timing effect depends critically on the *systematic* association of land assessments with actual use. Simple random errors or inaccuracies in assessments will not, in themselves, compromise the neutrality property of land-value taxation.

[7] What some observers may have in mind implicitly is that a reduction in the tax rate on structures accompanying the increase in the rate of taxation on land will encourage development. This is true, but it is the reduced penalty on structures that encourages development not the higher rate of taxation of land. More on this shortly.

[8] This distinction between balanced budget and differential tax analysis is also an important issue in understanding the impact of land taxation on the capital intensity of development. If the tax on land is raised and no other taxes are changed (balanced budget analysis), capital intensity should remain unchanged. If the tax on land is raised and the additional revenues are used to reduce the tax on structures (differential tax analysis), then capital intensity should rise. Our data do not allow us to investigate changes in capital intensity in Pittsburgh or in the other cities in our sample. A careful analysis of this issue would be an interesting and important extension of our work.

[9] For a useful description of the historical evolution of Pittsburgh with a focus on the renewal efforts under Renaissance I and II, see Stewman and Tarr (1972).

[10] The commercial building boom in Pittsburgh under Renaissance II has encompassed a number of major projects: PPG Place (six buildings, including a 40-story office tower), One Oxford Center (a 46-story office tower and retail complex), The Steel Plaza/One Mellon Bank Center (a 53-story office tower and retail complex that includes the main station of the Light Rail Transit system), Allegheny International's headquarters, Liberty Center, the Hillman Complex, and several others.

[11] For a valuable published presentation of the League's study, see Weir and Peters (1986).

[12] See the Appendix for a more detailed description of the sources and nature of our data.

[13] We have also analyzed these data using an interrupted time-series model. These models are used widely to examine the impact of a discrete event. Recently, for example, Bonham et al. (1992) used such a model in their study of a hotel room tax. The results from the interrupted time-series model are very similar to those in Table 4 and are available upon request.

[14] We note that there is more than one "central city" in the Allentown and Youngstown MSAs. The Census data encompass all those cities, but the Dun and Bradstreet figures include Allentown and Youngstown alone.

[15] We recall also Bourassa's study (1987) of the residential sector, in which he found in his

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regression equations that the land tax was an insignificant determinant of the level of residential building permits, while the tax rate on improvements had a substantial and statistically significant effect.

[16] A reviewer raised the concern that the relevant occupancy rate for equations 1 and 2 is not the *current* occupancy rate but the *expected* rate. We have investigated this issue by reestimating these equations using a variety of approaches to defining a variable for the expected occupancy rate; in some instances, we used a weighted average of past rates, and in others, we used the actual future rate on the assumption that developers accurately forecast the future. None of these exercises changed the results in any essential way; in all the various cases, the dummy variable for the regime shift remained highly significant and without much change in magnitude.

[17] Rybeck (1991) has suggested to us that some of the land-intensive city development may have come at the expense of suburban development, thereby offsetting certain tendencies in metropolitan areas toward urban sprawl. This is an interesting issue that merits further study.

[18] For example, two econometric studies of Philadelphia found that the city wage tax resulted in large job losses in the city. Grieson (1980) estimated that a one-percentage-point increase in the wage tax in Philadelphia in 1976 led to a 10 to 15 percent loss in employment in the city by 1980. A later study by Inman (1992) turned up similar findings. He estimated that a potential increase in the Philadelphia wage tax from about five to six percent would result in a loss of over 80,000 jobs (or of 12.7 percent from existing employment levels). However, as one reviewer pointed out to us, the Philadelphia findings are not readily transferable to Pittsburgh because of a crucial difference in the structure of the tax. In Philadelphia, the tax is a commuter tax; the suburbs around Philadelphia do not have wage taxes of their own. In contrast, in Pittsburgh, the first claim on a person's income resides in his place of residence. So when the city of Pittsburgh raises the wage tax, suburbs tend to do likewise in order to get what, from their perspective, is essentially "free money." For this reason, the incentives for businesses to leave the city would be somewhat weaker in Pittsburgh than in Philadelphia. Nevertheless, higher wage taxes in the Pittsburgh metropolitan area could be expected to have a detrimental impact on economic growth in both the city and suburbs.

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APPENDIX: DESCRIPTION OF THE DATA

The variables that we seek to explain in this paper are various measures of the level of planned building activity in our sample of cities. We have two basic sources for these variables. The first is the Dun and Bradstreet Corporation. As part of their "Current Economic Indicators," Dun and Bradstreet publishes on a monthly basis the value of building permits for the nation's 202 largest cities. From the monthly data, we constructed an annual time series on building permit values reaching back to 1960 for each of the cities in the sample. We converted the series to real terms by deflating the Dun and Bradstreet figures by the gross national product implicit price deflator for the nonresidential structures component of fixed private investment. We note that these data refer to the city alone, not to the wider metropolitan area, and that they are not disaggregated by type of construction.

Our second source of data on the value of new building permits is the U.S. Bureau of the Census Building Permit Data. Assembling these data was considerably more complicated. In terms of coverage over time, we have been able to pull together data for 1974–8 and for 1980–9; we have been unable to get data for the single year 1979. Hence, our before and after figures in Table 4 in the text refer to the periods 1974–8 and 1980–9. We encountered a further problem in that the Census retired the SMSA concept in 1984 and specified metropolitan areas as MSAs or PMSAs (Primary Metropolitan Statistical Areas). This involved some substantive changes (i.e., additions or deletions of counties) for five of the metropolitan areas in our sample (including Pittsburgh). We thus had to adjust the figures for years subsequent to 1983 by obtaining the relevant county data and adjusting the data. The great appeal of the Census data is their disaggregation. First, the data are broken down between city and suburbs, and, second, they are disaggregated into some 23 different types of construction activity. This has allowed us in our Table 4 to distinguish both between city and suburbs and between permits for residential and nonresidential construction. We have deflated these data in the same manner as the Dun and Bradstreet figures.

Our starting point for the data on tax rates was Pollakowski (1982, Table 1, p. 2). We obtained help from the Chief Accounting Officer, Mark D. Gibbons, in the Office of the City Controller in updating this table and in correcting several errors.

Finally, the source of data for city office vacancy rates is the Building Owners and Managers Association International (BOMA). They publish annually the *BOMA Experience Exchange Report*, which contains a wealth of information on city office buildings, including estimated occupancy rates. We were able to construct a time series for Pittsburgh reaching all the way back to 1960 to coincide with our Dun and Bradstreet data on new building permits. We were not able, however, to get such complete data for all the cities in our sample. We thus have office vacancy rates only for selected years for most of the other cities in the region.