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# MUNICIPAL REVENUES AND LAND POLICIES


Edited by Gregory K. Ingram and Yu-Hung Hong

# Municipal Revenues and Land Policies

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# 11

# *Does TIF Make It More Difficult to Manage Municipal Budgets? A Simulation Model and Directions for Future Research*

David F. Merriman

Elected officials, and those who serve them, search for techniques to provide enhanced public services without placing additional burdens on taxpayers. This drive for efficiency seems to grow when there is intense political competition or fiscal stress. Unfortunately, the laudable goal of increased efficiency can be undermined by the use of gimmicks—devices that exaggerate the benefits of public services and mask taxpayer burdens. In the short run, true efficiency gains and gimmicks may yield similar reputational gains to policy makers. There is, therefore, intense pressure to create and use devices, such as tax expenditures, that involve implicit rather than explicit spending and that make the fruits of public expenditure highly tangible and visible.

Gimmicks have two main types of long-run costs. First, because they favor implicit expenditures, gimmicks make monitoring and evaluation more difficult and can reduce rather than enhance efficiency. Second, because gimmicks favor off-budget revenues and expenditures, they obscure budgetary balances, complicate financial management, and can contribute to distorted fiscal choices. For example, the promise of generous (future) pensions to attract and retain government employees has contributed to large structural deficits in many states.

The search for innovative and low-cost ways to promote economic development led to the creation and dissemination of tax increment finance (TIF).

Every U.S. state except Arizona has legislation authorizing some form of TIF.[1] Although the precise designs of the programs differ across states, they have a number of common features (see Council of Development Finance Authorities 2008 for details). All allow local government entities to designate a portion of their geographical area as a development district, usually called a TIF district. The TIF district is assigned a base value equal to the assessed property value in the district at the time of designation. Property tax revenue generated by the base value is unaffected by TIF designation. The TIF property value increment is equal to the total assessed property value in the TIF district minus the base property value.

Owners of real estate parcels within the TIF district continue to pay taxes based on the aggregate rate (the sum of municipal and overlying governments' rate). Revenue generated by the TIF base is divided up in the usual fashion, with the municipality getting only the portion due to its own rate. Property tax revenues generated by the increment—the aggregate tax rate times the value of the increment—flow to the TIF district and can be used only to promote the economic development of the designated area. In most cases, state legislation limits the maximum duration of a TIF agreement, generally to about 25 years, after which time property tax revenues generated by the TIF increment revert back to overlying governments. Often the future tax revenues to be generated by a TIF district are pledged to service debt from the sale of a bond that provides immediate cash for development expenditures.

TIF is innovative in the sense that the amount of the subsidy that developers receive increases with the amount of property value growth. In this way, TIF aligns the incentives of developers—who want subsidies—with the public good as reflected in the rise in market valuations of real estate. However, this alignment of incentives is surely imperfect.

First, in most states, all property value growth, whether it is attributable to TIF or not, becomes part of the increment. In the absence of TIF, some growth in real estate values would probably have occurred in most TIF districts simply because of normal real estate appreciation.

Second, the timing of TIF subsidies often is poorly aligned with the timing of public benefits. In most states, the life of a TIF district varies little from project to project, and as a result, subsidies may persist long after they are necessary or may end before the project can be fully implemented.

Third, because overlying (nonmunicipal) governments contribute to the subsidy but often have little say about when and where TIF districts are established, public authorities may undervalue TIF subsidies. As data presented below show,

1. According to Balsas and Lathey (2007), "The Arizona State Legislature passed TIF in 1977 as part of the Slum Clearance and Redevelopment Law, but in 1980 the Superior Court of Pima County and the Arizona Court of Appeals both ruled against the use of TIF in Arizona." TIF legislation was again enacted in 1999 but later repealed.

municipal governments pay only a small share of the TIF subsidy but get the most immediate gains from property value growth. This artificially increases municipalities' incentive to grant TIF subsidies.

While the above-mentioned TIF design flaws are now widely recognized, less attention has been given to TIF's role in fiscal management. TIF is an unusual, possibly unique, investment vehicle. Compared to direct, explicit government subsidies for economic development, TIF (1) requires no explicit outlay but is funded through forgone and uncertain revenue; (2) back-loads payments in the sense that the revenue forgone rises over time if property values in the TIF district rise over time; and (3) provides a fiscal payoff—an increased property tax base—as an abrupt one-time event that occurs when the TIF district is dissolved.

This combination of characteristics makes it relatively easy for elected officials, and those who serve them, to ignore or obfuscate the fiscal implications of TIF, and they lead to the danger that TIF can be used as a gimmick to enhance political reputations even when it does not best serve the public interest. In most cases, revenues forgone as a result of TIF are not enumerated in budget documents or on individual tax bills. At the time TIF is implemented, it is difficult to develop a complete plan to compensate for the loss of future revenues because the loss of revenue is uncertain. The back-loading of revenue losses means that in many cases elected officials who approve a TIF district will no longer be in office when forgone revenue is most severe. The abrupt one-time increase in assessed property value brought about by the termination of TIF districts also could complicate overlying governments' fiscal plans by increasing the volatility of the property tax base.

How severe are these potential problems? Are the forgone revenues from TIF likely to be large enough that overlying governments will require significantly increased property tax rates or new revenue sources? Will TIF increase the volatility of local governments' general revenue to such an extent that it is difficult to prudently manage their finances? To answer these questions, I first review evidence about the use of TIF and its effects, with particular attention to the experience in Wisconsin. I use the evidence garnered from this review to calibrate a number of simple computer models that simulate the impact of TIF on the general revenues of an overlying government as time passes. The results of these simulations are used to speculate about the likely effect of TIF on local government financial management.

## *Use and Effect of TIF*

Because TIF is nearly always a local program regulated by the state government, there is no comprehensive national database with information about its use.[2]

2. The U.S. Census of Governments attributes revenue from a TIF district to the unit of government that sponsors the district. Thus, revenue from a municipal TIF district would be attributed to the municipality, and revenue from a county TIF district would be attrib-

However, state and local governments often compile relevant data about TIF, and there have been a number of scholarly articles studying the effects of TIF districts. The available evidence shows that TIF is widely used in some states. The Missouri Department of Economic Development reports that in 2007 there were at least 291 TIF projects in 51 cities and four counties. The total anticipated reimbursable (property-tax funded) costs in these TIF districts was nearly $5 billion (Missouri 2008). Swenson and Eathington (2002) report that 323 cities in Iowa had one or more TIF districts that housed 7.7 percent of cities' tax bases. One source reported that more than 10 percent of all statewide property taxes ($2.1 billion) were consumed by California TIF districts in 2001 and that these districts had accumulated $51 billion in bonded indebtedness (see Municipal Officials for Redevelopment Reform 2002).[3] Another study found that TIF districts were responsible for 12.6 percent of construction income in California in 2003 (see Center for Economic Development n.d.).

Brueckner (2001) provides a model that demonstrates how TIF could lead local governments to undertake collectively beneficial economic development activities that otherwise would be precluded by the self-interested behavior of some neighborhoods. However, extensions of Brueckner's model to allow neighborhood spillovers and considerations of political economy show that TIF could be used even in cases where it lowered total economic activity in an area.[4] TIF districts could encourage relocation of commercial and other real estate activities from an area to which they were well-suited to a less desirable area.

Econometric studies of the impact of TIF districts have been conducted in Michigan (Anderson 1990), California (Dardia 1998), Indiana (Man and Rosentraub 1998), Iowa (Swenson and Eathington 2002), Illinois (Dye and Merriman 2003; Smith 2006; Weber, Bhatta, and Merriman 2003, 2007), and Wisconsin (Carroll 2008; Skidmore, Merriman, and Kashian forthcoming). Reviews of much of this literature are contained in Man (2001) and Skidmore, Merriman, and Kashian (forthcoming).[5] The key question that has been examined in most of the literature is whether TIF adoption significantly raises the total economic activity in an area. Empirical findings have been mixed. Man and Rosentraub (1998), Smith (2006), and Carroll (2008) find positive impacts of TIF, while Dardia (1998), Swenson and Eathington (2002), Dye and Merriman (2003), and Weber, Bhatta, and Merriman (2003, 2007) mostly find little or no effect. Anderson's (1990) results do not enable him to answer the question, while Skidmore, Merriman, and Kashian (forthcoming) find evidence that TIF changes cities' behavior

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uted to the county. The census does not separately account for TIF revenues, but lumps them in with other revenues of the relevant governmental unit.

3. TIF districts in California are called redevelopment agencies (RDAs).

4. Merriman, Skidmore, and Kashian (2009) discuss this in more detail. Dye and Sundberg (1998) also provide a model in which TIF may be used to fund inefficient projects.

5. Dye and Merriman (2006) provide a nontechnical review of the literature.

by encouraging annexation, but they do not reach a conclusion about its impact on economic activity within the original city borders.

The difficulty of assessing TIF's impacts is primarily the result of the fact that legislators and developers have an incentive to designate districts as TIFs when they believe the areas are likely to see rapid real estate development. A TIF district that grows rapidly allows the municipality to capture revenue from overlying governments, and it brings political credit to its backers and financial benefits to developers. Analysts who study TIF can usually use only very general data to predict the future development of an area in the absence of TIF, but those involved in TIF designation may have much more specific localized knowledge. Without this extensive localized knowledge, it is difficult to be sure exactly what caused or retarded growth in TIF districts and to compare them to apparently similar areas without TIF designation.

Even if TIF did little to raise the aggregate amount of economic development, it might be a successful policy tool if it redirected development in a socially desired manner. In most states, spurring growth in blighted neighborhoods is an explicit goal of TIF legislation. Gibson (2003) is the only article that studies the within-jurisdiction targeting of TIF. She finds that mild economic distress raises the probability that a neighborhood is included in a TIF district, but that severe economic distress does not. One possible inference from her findings is that the mildly distressed neighborhoods to which TIFs are often targeted are ripe for development, since real estate values there are likely to have more growth potential than neighborhoods with less poverty.

## *Some Notes on the Financial Implications of TIF Use in Wisconsin*

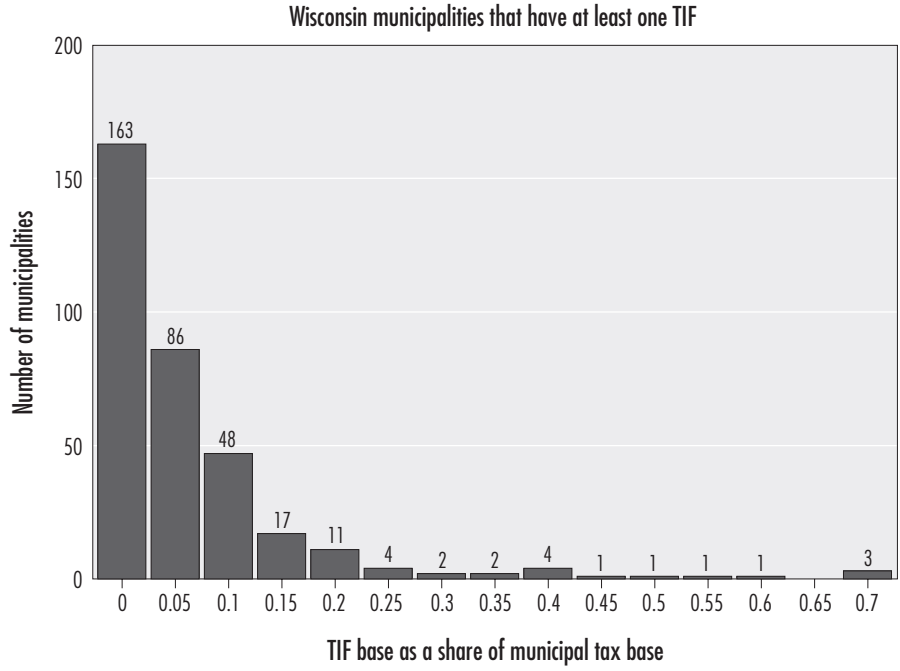
This section provides some descriptive statistics about the use of TIF in Wisconsin. This statistical picture provides background when constructing the simulation model in the next section. Although there is too little national data to know whether the use of TIF in Wisconsin is representative, we do know that Wisconsin's rules about TIF use are relatively typical and that there is less use of TIF in some states and more use in others.

According to data compiled by the state of Wisconsin, the 584 cities and villages (henceforth municipalities) in the state had 489 active TIF districts by 1990.[6] By 2003 (the most recent data available) the number had risen to 789, an average of about 1.3 TIF districts per municipality. In 2003, 236 municipalities had no TIF districts and 349 had one or more.[7] About half (176) of the munici-

6. See Kashian, Skidmore, and Merriman (2007) for more detail about the data and the design of Wisconsin's TIF statute. The author thanks Kashian and Skidmore for sharing the data for use in this exercise.

7. Between 1990 and 2003, one new municipality was formed.

**Figure 11.1**
Distribution of TIF Base as a Share of Municipal Tax Base, 2003




Five cases have been omitted due to incomplete or inconsistent data.

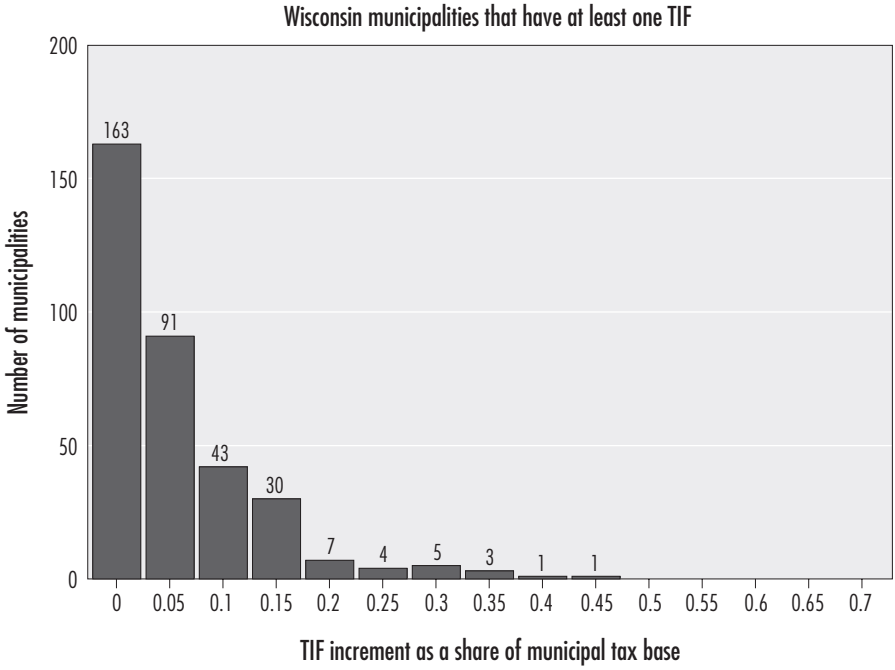
palities with at least one TIF district had exactly one. Four municipalities (Madison, Oshkosh, Janesville, and Milwaukee) each had more than 10 TIF districts.

Figure 11.1 presents TIF base as a share of municipal tax base for Wisconsin municipalities with at least one TIF district in 2003. The TIF base accounted for less than 5 percent of the municipal tax base in about 47 percent (163) of all municipalities with one or more TIF districts. In six municipalities, more than 50 percent of the municipal tax base was frozen in a TIF base. While these were relatively extreme cases, thirty municipalities (about 9 percent of those with TIFs) had more than 20 percent of their municipal tax bases frozen in the TIF base.

Figure 11.2 shows TIF increments as a share of the tax base. In 53 percent of the municipalities with active TIF districts, the increment represented more than 5 percent of the tax base. In 21 municipalities (about 6 percent of those with active TIF districts), the increment represented more than 20 percent of the tax base.

Because TIF districts capture the revenue of overlying governments (like school districts), TIF revenue is a larger share of municipal revenue than the TIF increment's share of the municipal tax base. For example, if a municipality's tax rate was about one-fourth of the aggregate tax rate and if 5 percent of its property

**Figure 11.2**
Distribution of TIF Increment as a Share of Municipal Tax Base, 2003




One case has been omitted due to incomplete or inconsistent data.

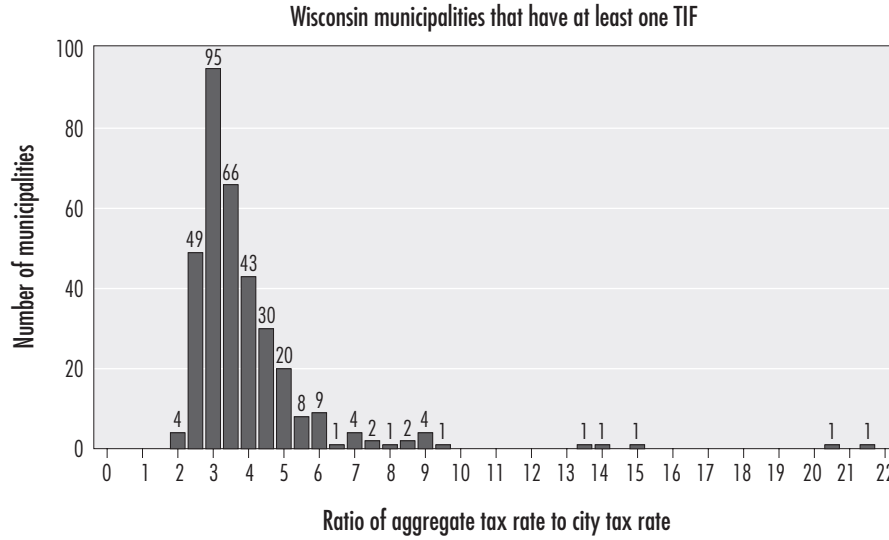
tax base was in a TIF district, the TIF district would garner about 20 percent as much revenue as the municipality.[8]

In Wisconsin municipalities that had at least one active TIF district in 2003, the mean aggregate (including overlying governments) tax rate was about 2.2 percent, with a maximum of 3.1 percent and a minimum of 1.4 percent. In most cases, the municipal tax rate constituted much less than half of the aggregate tax rate, as shown in figure 11.3. In every case, the aggregate tax rate is at least twice the municipal tax rate; and in most cases, it is three to four times as large as the municipal tax rate. This means that even small TIF districts can generate a significant amount of revenue. Managing such ephemeral revenues could be a substantial financial challenge for some municipal governments.

The financial impact of TIFs will depend on the absolute and relative growth rates of TIF and nonTIF neighborhoods (see Dye and Sundberg 1998). Figure 11.4a shows the distribution of growth rates for nonTIF portions of the municipal tax base in 2003 for municipalities that had at least one active TIF and did

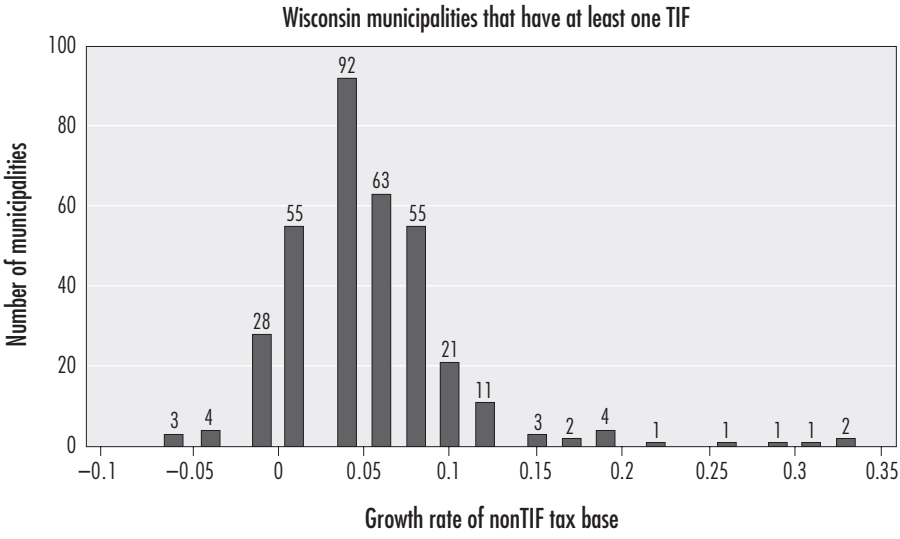
8. Let municipal revenue = (95% × t) and TIF revenue = (5% × 4t). 20% × t / 95% × t = approximately 21%.

**Figure 11.3**
Distribution of Aggregate Tax Rate as a Share of Municipal Tax Rate, 2003



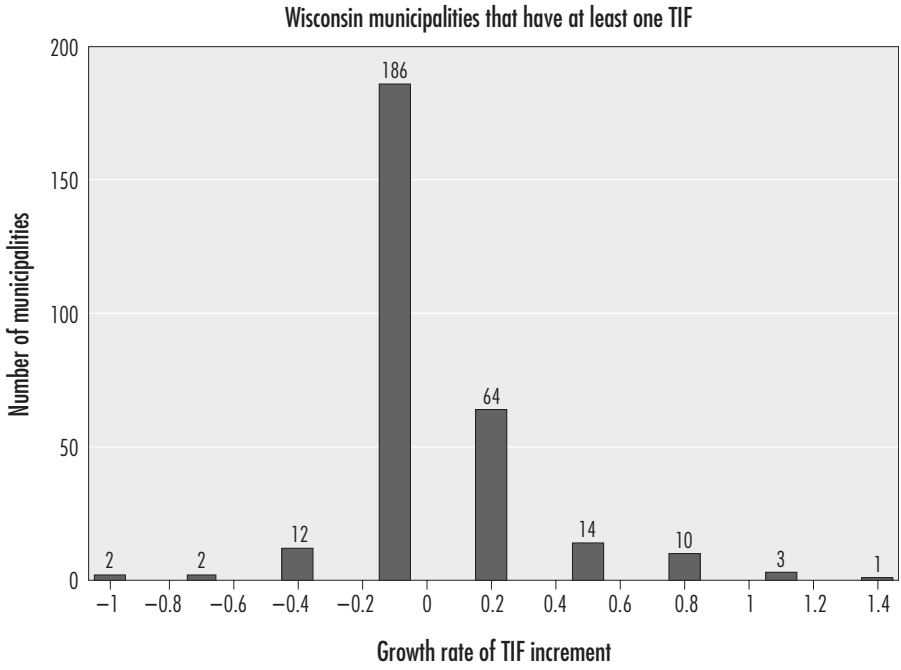

Five cases have been omitted due to incomplete or inconsistent data.

**Figure 11.4a**
Distribution of Growth Rates of NonTIF Tax Base, 2003




Only municipalities with no change in number of TIF districts from 2002 to 2003.

**Figure 11.4b**
Distribution of Growth Rates of TIF Increment, 2003




Only municipalities with no change in number of TIF districts from 2002 to 2003; 12 outliers omitted.

not have a change in the number of TIF districts. The median value is almost exactly 5 percent, but there is a wide variation around the median. Figure 11.4b shows the distribution of growth rates for TIF increments in 2003 in Wisconsin municipalities. The median growth rate of TIF increments (slightly over 11 percent) is much higher than the median growth rate of nonTIF real estate in the same communities. As the empirical literature has emphasized, the higher growth rate in TIF neighborhoods is not necessarily caused by the TIF activities, but could result from selective inclusion of neighborhoods with a high growth potential.

## *Design of a Simulation Model*

TIF districts embody long-term financial commitments by local governments. The implications of these commitments become known gradually and are influenced by a wide variety of factors. These qualities make empirical study of the financial implications of TIF district commitments difficult. To perform such a study, one would need an extremely longtime series of information about the municipality and TIF districts, and one would have to control for many factors other than TIF that influence municipalities' financial condition. It is the difficulty of unambigu-

ously assessing the long-run financial implications of TIF that make it both controversial and a potentially dangerous tool in the hands of elected officials whose terms in office are relatively short.

Although a timely, rigorous, retrospective empirical evaluation of TIF's financial implications is probably impossible, we can learn a considerable amount about TIF's potential effects by developing simulation models that instantly draw out the future implications of current actions. I developed a computer model that simulates the time path of the municipal tax base, municipal revenue, TIF base, TIF increment, and TIF revenue over a century. I simulate the model using various assumptions about how and when neighborhoods are selected for inclusion in a TIF district, the relative growth rate in TIF and nonTIF neighborhoods, and assorted other conditions. For each simulation, I compare the outcomes with one or more TIF districts to a baseline model in which no neighborhoods are included in TIF districts.

The simulation model tracks the market value of 20 neighborhoods for each of 100 years. The market value of neighborhood $i$ ($i$ = 1 to 20) in year one ($MV_i^1$) is assumed to be 1 for all neighborhoods. Market value in year $t$ ($t$ = 2 to 100) is $MV_i^t = (1 + g_i^t)MV_i^{t-1}$, where ($g_i^t$) is the growth rate of neighborhood $i$ in year $t$. Growth rates are determined by a variety of rules (described below) that I use to decide, in each year, whether neighborhoods not yet part of a TIF district are selected into a TIF district. Once a neighborhood is selected into a TIF district, it stays in that TIF district for 25 years, after which time it reverts to a nonTIF neighborhood. If a neighborhood is selected into a TIF district, its market value at the year of selection becomes part of the TIF base. Any growth in value from the year of selection until the TIF district is dissolved 25 years later becomes part of the TIF increment.

The municipal tax base is the sum of the market value of all nonTIF neighborhoods plus the base value of neighborhoods in TIF districts. The TIF increment is the sum of the increments of all the neighborhoods in TIF districts.

## *A Basic Simulation with No Uncertainty*

Municipal designation of a TIF district has the potential to change the amount, timing, and flexibility of municipal property tax revenues. Revenues may be increased because the TIF district gives the municipality access to revenues that otherwise would have gone to overlying governments. Initially, the TIF district has no increment and therefore generates no revenue, but increment and revenue are likely to grow over time.[9] The potential uses of TIF revenue are constrained

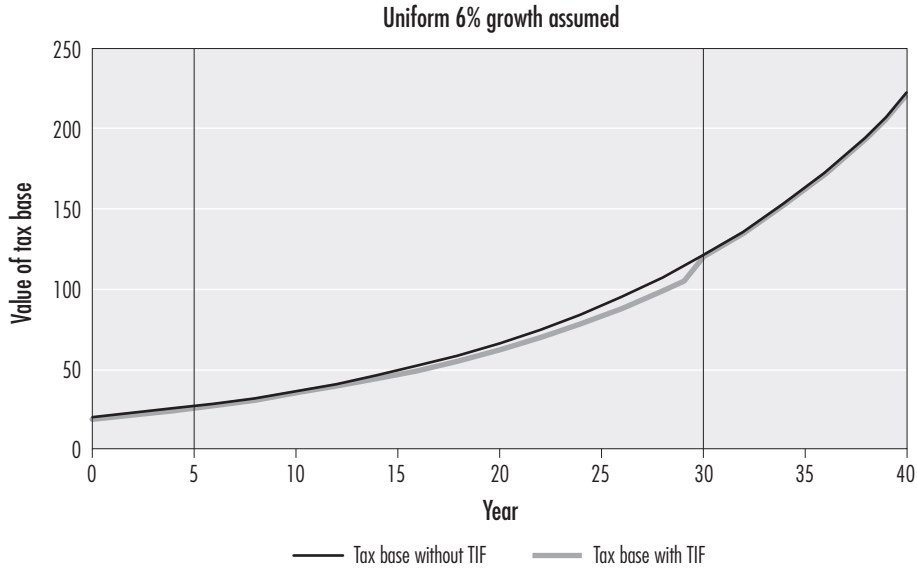
9. Despite the lack of revenue, expenditures in TIF districts are often front-loaded using borrowed funds that will be paid back with future revenues. Early expenditures could cause a surge in property values and growth rates that tails off in future years. Dye and Merriman (2003) present empirical evidence that TIF growth slows over time. An extension of the analyses presented here could model early expenditure surges and consider expenditure and revenue paths simultaneously.

because they legally must be used for economic development in the TIF district that generated them. Once a TIF is dissolved, the tax base of the municipality and overlying governments will receive a positive financial shock as the increment is absorbed into their tax bases. However, the municipality loses revenue because some of the revenue that previously went to the TIF district will go to overlying governments.

The results of a basic simulation are shown in figures 11.5a to 11.5c. In this simulation it is assumed that all neighborhoods grow at the same constant growth rate of 6 percent whether they are in a TIF district or not. The municipality has no TIF district until year 5, at which time it designates three arbitrarily selected neighborhoods (in this example it does not matter which) as a TIF district. They remain a TIF district for the next 25 years. In year 30 the TIF district is dissolved, and the increment reverts back to the municipal and overlying governments. In this example, TIF designation is purely redistributional, since the growth rate of the neighborhoods is assumed to be unaffected by TIF designation.

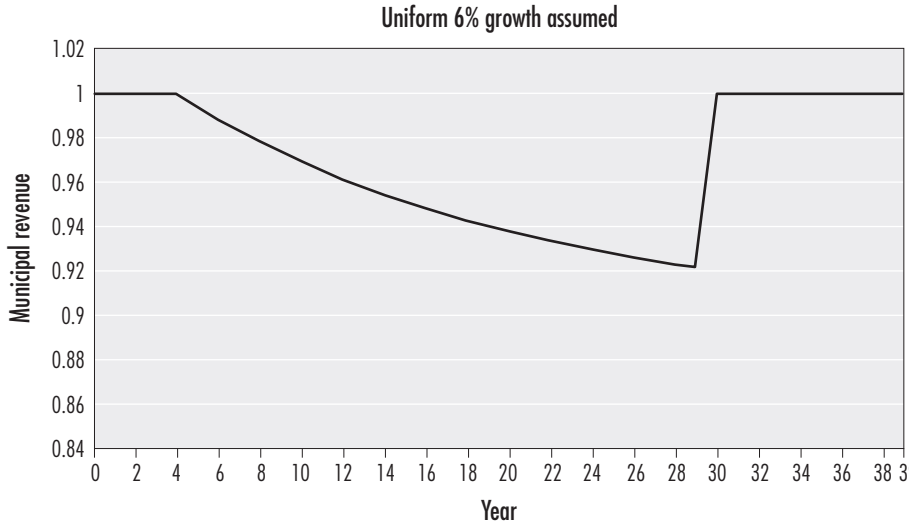
As shown in figure 11.5a, at first the TIF district has virtually no impact on municipal finances because the frozen TIF base remains part of the municipal tax base. As the TIF increment grows, the municipal tax base falls below the level it would have attained had there been no TIF. However, the retardation of municipal tax base growth caused by the TIF district may not be noticed because it is

**Figure 11.5a**
Simulated Municipal Tax Base with and Without TIF: Basic Simulation



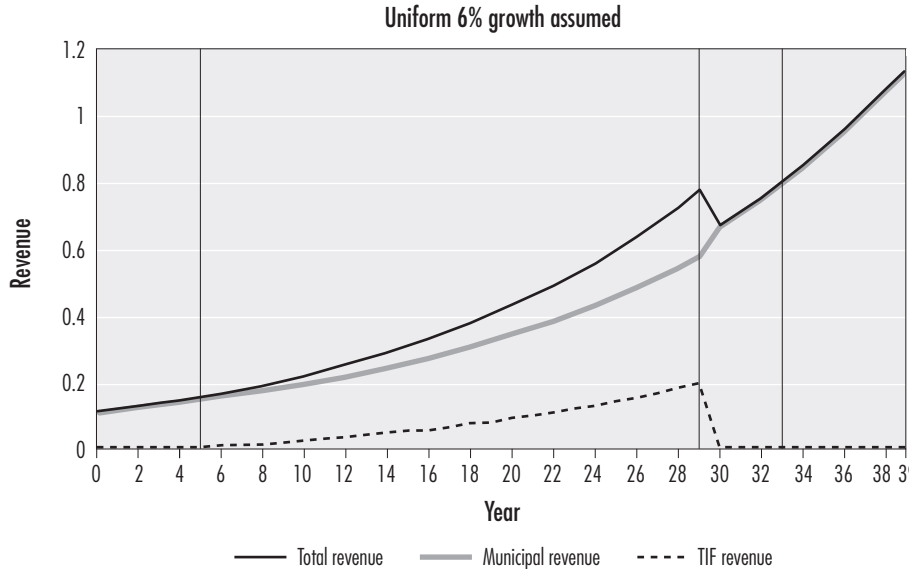

Single TIF starts in year 5, includes 15% of parcels, and ends in year 30.

**Figure 11.5b**
Simulated Municipal Tax Base as a Share of Total Tax Base: Basic Simulation




Single TIF starts in year 5, includes 15% of parcels, and ends in year 30.

**Figure 11.5c**
Simulated Municipal and TIF Revenue: Basic Simulation




Assumes constant TIF tax rate of 2.2% and municipal tax rate of 2.5%. Single TIF starts in year 5, includes 15% of parcels, and ends in year 30.

swamped by the normal 6 percent growth of neighborhoods that are not included in the TIF district. In year 30 the municipal tax base jumps as the TIF district is dissolved.

Figure 11.5b provides an illuminating alternative way of looking at the same data. Until the TIF district is formed in year 5, the municipality has access to its entire tax base; after that year the share of the tax base available to the municipality gradually diminishes to about 91 percent in year 29 and then abruptly increases to 100 percent when the TIF district is dissolved.

Figure 11.5c depicts the tax revenue the municipality and TIF district might raise with their tax bases. The TIF district tax rate is the sum of the tax rates of all overlying governments and is assumed to be about 2.2 percent, near the average for Wisconsin municipalities. The municipal tax rate is assumed to be one-fourth of this level (0.55 percent), which is also about the average for Wisconsin municipalities. Once the TIF district is established, municipal tax revenue will gradually fall below the 6 percent rate of increase of real estate value because the municipality does not have access to the increment within the TIF. However, TIF revenue will gradually increase, and by year 29 it will equal about 41 percent of municipal revenue. In year 30 municipal revenue will jump (in this case about 15 percent), but total (municipal plus TIF district) revenue will diminish because overlying governments will get three-quarters of the revenue from the dissolved TIF increment.

In principle, in a world with known growth rates, the municipal government could alter its property tax rate to smooth revenue so that TIF formation and dissolution would not disrupt financial planning. The municipality might gradually raise the property tax rate as the TIF increment grew and then lower it when the TIF district was dissolved.[10] There are often institutional constraints (e.g., tax and expenditure limits) and political constraints that might make this difficult. The main point here is that the required adjustments would be large; with observed growth rates and TIF district shares, the TIF increment could generate a significant portion of the total revenue available to a municipality.

## *Alternative Simulations Allowing for Uncertainty*

The basic simulation did not account for random variation in the growth rate of neighborhoods or disproportionate clustering of rapidly growing neighborhoods into TIF districts. In this section, I allow for random variation in neighborhood growth rates and mimic observed data by allowing neighborhoods in TIF districts to grow more rapidly than those that are not in TIF districts. Two simulations corresponding to two different causal models track the implications of higher

10. The direction in which the municipality would want to adjust tax rates is actually not clear. As the TIF increment grows, the municipality's unified resources (TIF and nonTIF) rise, but the unconstrained resources (municipal revenues) fall. When the TIF district is dissolved, the municipality's unified resources fall while its unconstrained resources rise.

growth rates in TIF districts. In the first simulation, neighborhood growth rates are random and predetermined, but neighborhoods with high expected growth rates are disproportionately (endogenously) selected into TIF districts. Thus, this simulation corresponds to a world in which TIF does not cause, but merely captures, increased growth rates. In the second simulation, neighborhood growth rates also are random, but the distribution of possible growth rates is shifted to the right for neighborhoods in a TIF district. Thus, this simulation corresponds to a world in which TIF causes increased growth rates.

### ENDOGENOUS SELECTION OF NEIGHBORHOODS INTO TIF DISTRICTS: TIF DOES NOT CAUSE INCREASED GROWTH

This simulation accounts for randomness and heterogeneity in neighborhood growth rates and endogenous selection of neighborhoods into TIF districts. Each year a mean city growth rate is randomly selected from a distribution with a mean of 6 percent and a standard deviation of 2. Each of the 20 neighborhoods is assigned a growth rate from a random normal distribution around the realized city mean with a standard deviation of 2. Neighborhoods are selected into TIF districts randomly using a formula that disproportionately assigns high-growth neighborhoods to TIF districts.[11] Once selected into a TIF district, the neighborhood remains a TIF district for 25 years, at which time the TIF district is dissolved. In this simulation, the city may create new TIF districts each year. As in the first simulation, the TIF districts portrayed here are purely redistributional, since neighborhoods' growth rates do not depend on whether they are in a TIF district.

Figure 11.6a shows the municipal and total tax base for the first 40 years from one realization of the simulation.[12] The pattern is much the same as in the previous simulation. The municipal tax base very gradually falls below the total tax base. Because growth rates are randomly assigned in this simulation, the lines are less smooth than in the previous simulation. Because the city can create TIF districts in each year, the municipal tax base increases less abruptly as TIF districts are dissolved.

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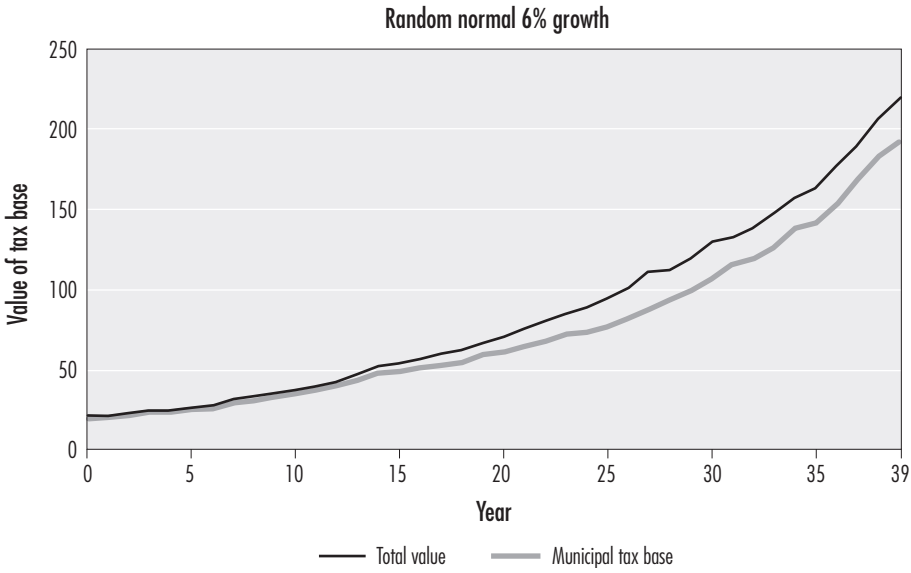
11. Technically, I use the formula $TIF_i = 1$ if $\mu_i > .985 - .015(E(G_i) - E(\bar{G}))$, where the region is assigned to a TIF only if $TIF_i = 1$. $\mu_i$ is chosen from a uniform random distribution between 0 and 1. $E(G_i)$ is the mean growth rate of neighborhoods in the region over the next 25 years (known with certainty in the implementation), and $E(\bar{G})$ is the mean growth rate of neighborhoods in the city over the next 25 years (also known with certainty in the implementation). A nonTIF region with the mean rate of growth in the city would have a 1.5 percent chance of being selected into a TIF in any particular year. Each 1 percent increase in a region's expected growth rate relative to the city increases the probability that the region will be selected into a TIF district by 1.5 percent. Any region with an expected growth rate more than 1 percent below the city mean is certain not to be included in a TIF district.

12. A figure showing all 100 years of the simulation is similar to figure 11.6a. However, due to scaling, it appears to take more years for the total and municipal tax bases to diverge.

Figure 11.6b shows the municipal tax base as a share of the total tax base over the entire 100-year period for this same realization of the simulation. Two trends are immediately evident. First, the share of the tax base in TIF districts is large (as much as 25 percent of the total) relative to the previous simulation, and it is erratic. The large share of the tax base in TIF districts is the result of the disproportionate selection of regions with high expected growth into TIF districts. The erratic share of the tax base in TIF districts is the result of the fact that large TIF districts end abruptly and return to the municipal tax base. Figure 11.6c shows municipal and total revenues for the first 40 years of this simulation. Mirroring figure 11.6b, TIF revenues are large relative to municipal revenues and vary erratically over time. Erratic movements in TIF revenues may complicate the financial management of cities.

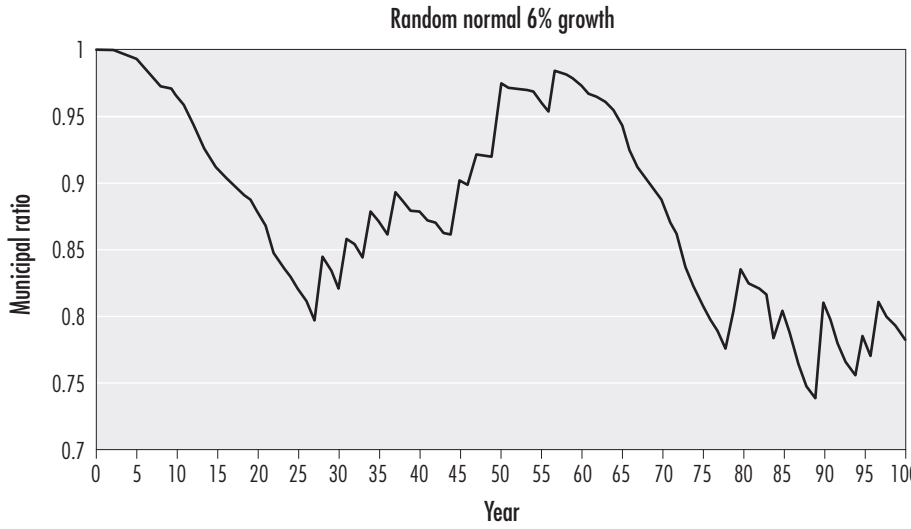
Figures 11.6a to 11.6c portray one realization from a randomly generated process. To get a better understanding of the typical effect of TIF on municipal finances, I conducted 1,000 random simulations of the process. Each simulation generates 100 years of data about the municipal tax base and the TIF increment. Assuming constant property tax rates (2.2 percent aggregate rate and 0.55 municipal tax rate) yields 100 years of data about tax revenues. I used the simulation results to measure the volatility of municipal tax bases and revenues with and without TIF districts. Volatility was measured by the root mean square error (RMSE)

**Figure 11.6a**
Simulated Municipal Tax Base with and Without TIF: TIF Does Not Cause Growth



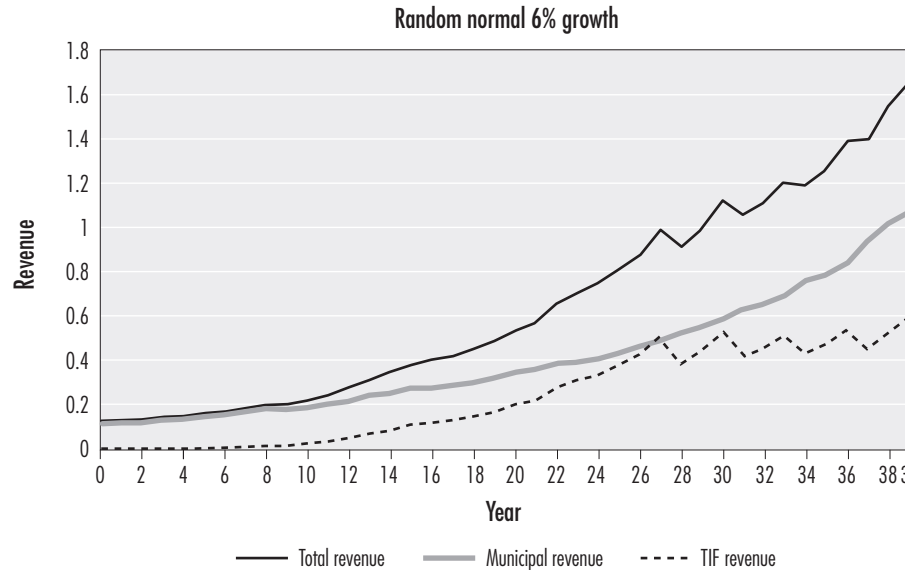

TIF assignment rule: nonTIF parcel with mean expected growth has 1.5% chance of being assigned to a TIF. Each 1% increase in expected growth increases probability of being assigned to a TIF by 1.5%.

**Figure 11.6b**
Simulated Municipal Tax Base as a Share of Total Tax Base: TIF Does Not Cause Growth




TIF assignment rule: see figure 11.6a.

**Figure 11.6c**
Simulated Municipal and TIF Revenue: TIF Does Not Cause Growth




Assumes constant TIF tax rate of 2.2% and municipal tax rate of 0.55%. TIF assignment rule: see figure 11.6a.

**Table 11.1**
Summary Statistics About Root Means Square Error and Property Values in Year 50 from 1,000 Simulations in Which Expected Growth Causes TIF

| | Mean | Standard Deviation | Minimum | Median | Maximum |
|---|---|---|---|---|---|
| RMSE real estate value with no TIF | 0.048 | 0.014 | 0.020 | 0.046 | 0.112 |
| RMSE real estate value with TIF | 0.076 | 0.021 | 0.029 | 0.074 | 0.171 |
| RMSE combined municipal and TIF property tax revenue | 0.134 | 0.031 | 0.054 | 0.133 | 0.251 |
| Total property value in year 50 | 407 | 56 | 243 | 402 | 649 |
| Municipal property value in year 50 | 352 | 53 | 201 | 347 | 586 |

RMSE obtained from regression of log of dependent variable on a constant and year over the 100 years in each simulation.

from a regression of the natural log of the tax base (or revenue) recovered from each year of each simulation on a constant and year.[13]

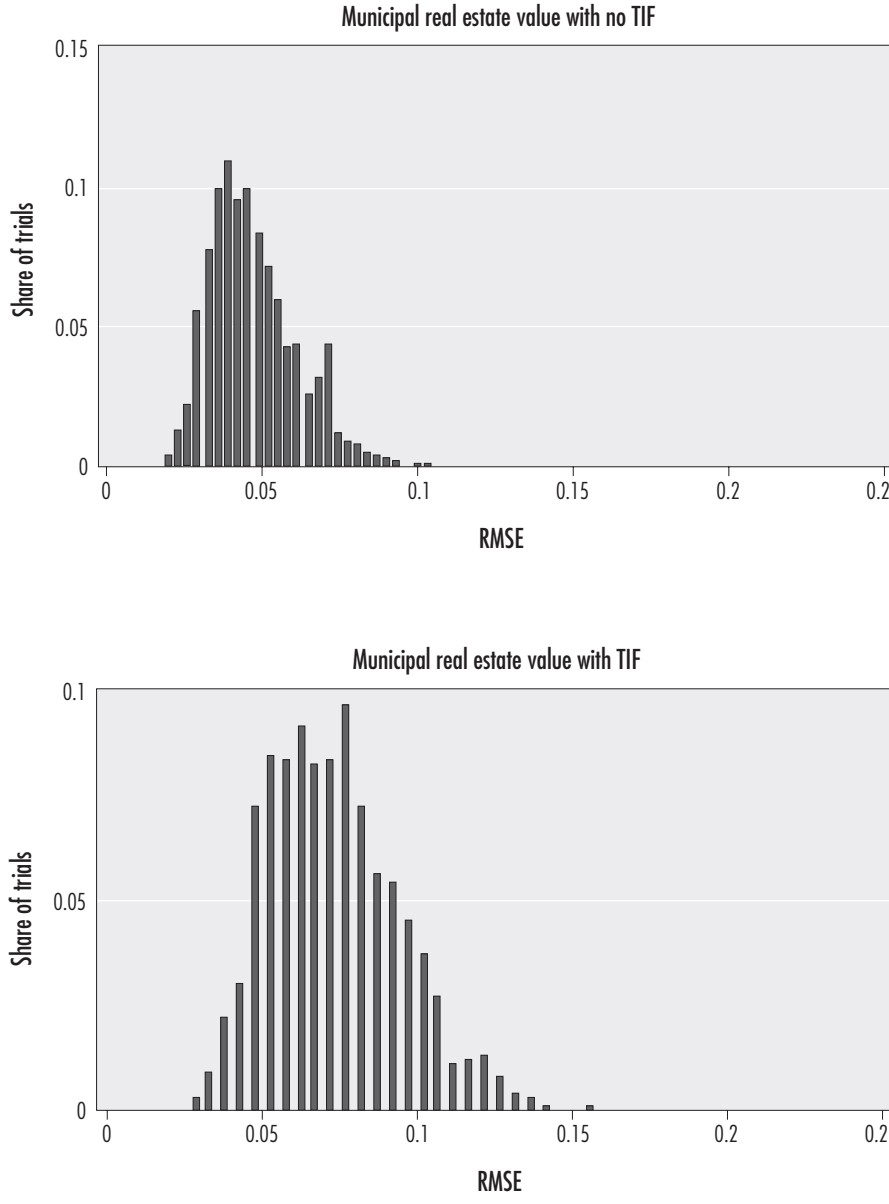
Table 11.1 summarizes the results. The mean RMSE from a regression on municipal real estate value was about 4.8 percent when there was no TIF; when TIF districts were allowed, RMSE increased to 7.6 percent. Since revenue generated by a fixed municipal property tax rate is perfectly correlated with the municipal property tax base, these results indicate that a TIF could significantly increase the volatility of municipal revenue. In fact, even this increase is an understatement of the potential increase in volatility from a TIF because it neglects revenue flowing to TIF districts as a result of the tax rates of the overlying district. As shown in table 11.1, total municipal revenues (TIF and own) are even more volatile than municipal revenue with a TIF. The mean RMSE of 13.4 percent is almost three times as large as the RMSE of real estate value (and revenue) without TIF districts.

I also extracted the total property value and municipal property value (total value less the TIF increment) in year 50 from each simulation. The large increase in volatility of property tax base and revenue is not the result of very large TIF increments. In the mean (and median) simulation, TIF increment accounts for only about 12.5 percent of total property value. Many municipalities in Wisconsin and elsewhere have TIF increments this large or larger.

Figure 11.7 shows the distribution of RMSE generated by 1,000 simulations of the model. Clearly, the variance of municipal real estate values and revenue is likely to be much higher under a regime that allows TIF than under one that does not.

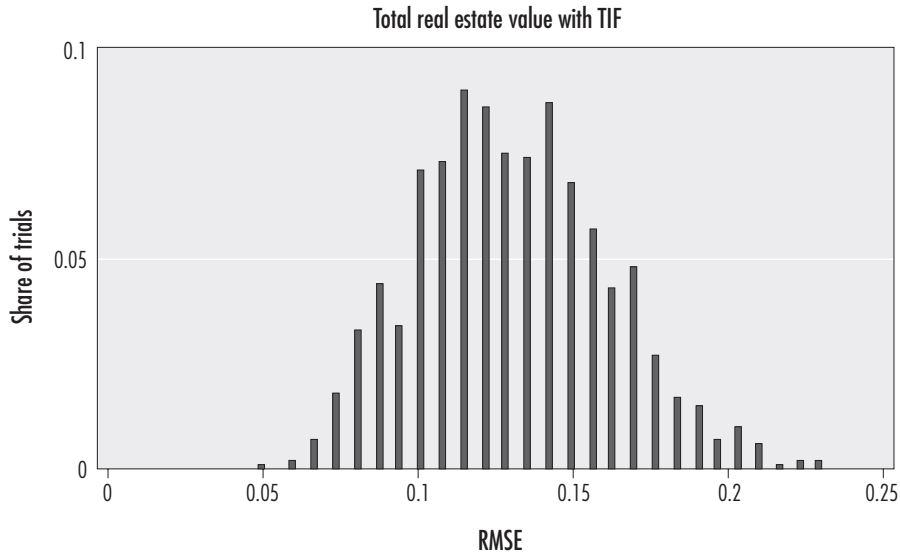
13. This is an unbiased measure of the variance of the dependent variable, since our simulations impose stationarity on the stochastic process generating revenue (see Sobel and Holcombe 1996).

**Figure 11.7**
Distribution of Variance with and Without TIF: TIF Does Not Cause Growth




*(continued)*

**Figure 11.7**
*(continued)*




Note: Variance measured by root mean square error (RMSE) in all graphs. All graphs based on 1,000 simulation trials. RMSE in each trial obtained from regression of log of dependent variable on a constant and year over 100 years.

### RANDOM SELECTION OF NEIGHBORHOODS INTO TIF DISTRICTS: TIF CAUSES INCREASED GROWTH

This simulation assumes random selection of neighborhoods into TIF districts. Being assigned to a TIF district is assumed to cause expected growth rates to increase. Neighborhood growth rates are determined using the following sequence of steps:

1. Each year a mean city growth rate is randomly selected from a distribution with a mean of 6 percent and a standard deviation of 2 percent.
2. Each of the 20 neighborhoods is then assigned a growth rate from a random normal distribution around the realized city mean with a standard deviation of 2.
3. Neighborhoods are selected into TIF districts randomly without regard to their expected growth rate.[14]

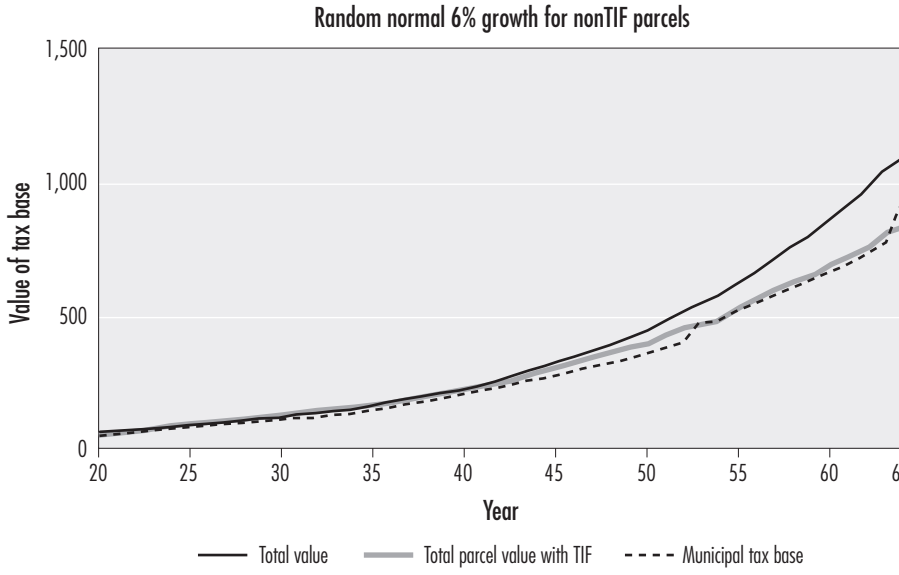
14. In this simulation a nonTIF neighborhood has only a 0.5 percent chance of being selected into a TIF district in a given year. Although the probability of being selecting into a TIF district is lower in this set of simulations than in the previous set, the total share of property value in a TIF district is comparable because TIF increases the expected growth rate of selected neighborhoods.

4. Neighborhoods that are selected into a TIF district are randomly assigned a growth increment (above and beyond the randomly assigned growth rate) with a mean of 4 percent and standard deviation of 2 percent during the years they are part of a TIF district.

Once selected into a TIF district, the neighborhood remains a TIF for 25 years, at which time the TIF district is dissolved. The city may create new TIF districts each year. Unlike the previous simulations, the TIF districts portrayed here increase neighborhood and municipal growth rates.

Figure 11.8a shows the municipal tax base, the total tax base, and the tax base if there were no TIF districts for a 40-year period from one realization of this simulation. In this simulation there are no TIF districts until about year 35, so the three tax bases coincide. Once a TIF district is formed, the municipal tax base gradually falls relative to the total tax base. Generally, the municipal tax base will at first be lower than it would have been had there been no TIF district, since the municipality temporarily loses the ability to tax the increment from the TIF district. However, in this simulation TIF adoption increases the growth rate of neighborhoods in the TIF so that after a municipality's first TIF district is dissolved, the municipal tax base may be as great or greater than it would have

**Figure 11.8a**
Simulated Total and Municipal Tax Base with and Without TIF: TIF Causes Growth



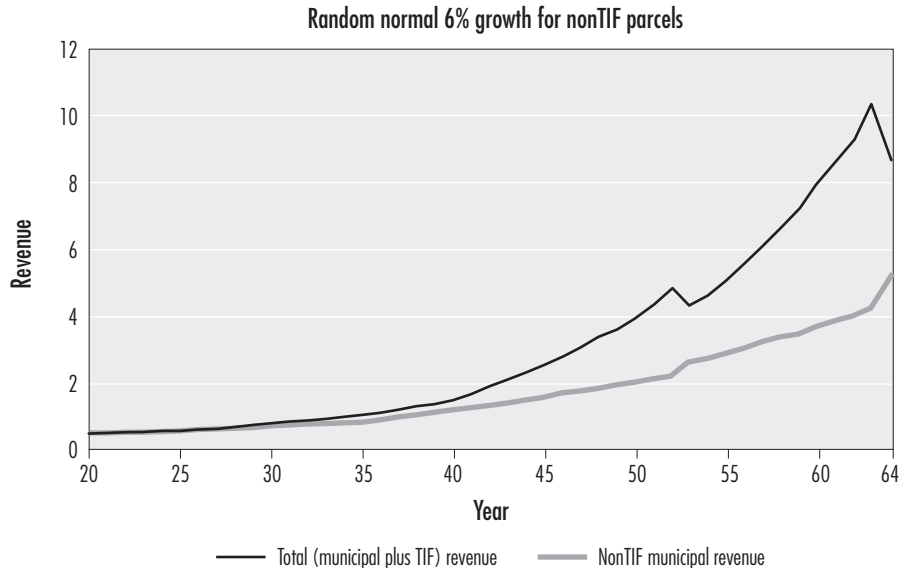

TIF assignment rule: nonTIF parcel has 0.5% chance of being assigned to a TIF. Being assigned to a TIF increases expected growth rate from 6% to 10%.

been if there were no TIF districts. In the realization of the simulation depicted in figure 11.8a, the municipal tax base with the TIF is about equal to the municipal tax base without the TIF after year 55, but it is clear that the municipal tax base is more volatile when there is a TIF district than it would have been if TIF districts had not been allowed.

Figure 11.8b shows total and municipal revenue with TIF for the same realization of the simulation depicted in figure 11.8a. It is clear that, with a constant tax rate, total (municipal plus TIF) tax revenue is once again much more volatile than municipal revenue (with or without TIF) because it varies abruptly as TIF districts are dissolved.

To get a better understanding of the typical effect of a TIF that successfully increases property values, I conducted 1,000 random simulations of the process. Again, each simulation generates 100 years of data about the municipal tax base and the TIF increment. Assuming constant property tax rates (2.2 percent aggregate rate and 0.55 municipal tax rate) yields 100 years of data about tax revenues. I used the simulation results to measure the volatility of municipal tax bases and revenues with and without TIF districts. Volatility again was measured by the root mean square error (RMSE) from a regression of the natural log of the

**Figure 11.8b**
Simulated Total and Municipal Revenue with TIF: TIF Causes Growth




Assumes constant total tax rate of 2.2% and municipal tax rate of 2.5%. TIF assignment rule: see figure 11.8a.

**Table 11.2**
Summary Statistics About Root Mean Square Error and Property Values in Year 50 from 1,000 Simulations in Which TIF Causes Growth

| | Mean | Standard Deviation | Minimum | Median | Maximum |
|---|---|---|---|---|---|
| RMSE real estate value with no TIF | 0.047 | 0.014 | 0.024 | 0.045 | 0.105 |
| RMSE real estate value with TIF | 0.057 | 0.019 | 0.023 | 0.054 | 0.158 |
| RMSE combined municipal and incremental real estate value with TIF | 0.090 | 0.027 | 0.035 | 0.087 | 0.197 |
| RMSE combined municipal and TIF property tax revenue | 0.162 | 0.042 | 0.069 | 0.159 | 0.298 |
| Total property value in year 50 with TIF | 510 | 87 | 274 | 500 | 937 |
| Municipal property value in year 50 | 451 | 77 | 253 | 445 | 778 |
| Total property value in year 50 without TIF | 403 | 54 | 254 | 400 | 576 |

RMSE obtained from regression of log of dependent variable on a constant and year over the 100 years in each simulation.

tax base (or revenue) recovered from each year of each simulation on a constant and year.[15]

Table 11.2 summarizes the results. The mean RMSE from a regression on municipal real estate value was about 4.7 percent when there was no TIF; when TIF districts were allowed, the RMSE from a regression on municipal real estate increased to 5.7 percent, and the RMSE on combined municipal and incremental real estate value was 9.0 percent. Since revenue generated by a fixed municipal property tax rate is perfectly correlated with the municipal property tax base, these results indicate that a TIF could significantly increase the volatility of municipal revenue.

But once again this increase is an understatement of the potential increase in volatility from TIF because it neglects revenue flowing to TIF districts as a result of the tax rates of overlying districts. As shown in table 11.2, total (TIF and own) municipal revenues are even more volatile than municipal revenue with a TIF. The mean RMSE of 16.2 percent is once again almost three times as large as the RMSE of real estate value (and revenue) without TIF districts.

I extracted the total property value, the municipal property value (total value less the TIF increment), and the property value that would have occurred in year

15. Again, this is an unbiased measure of the variance of the dependent variable since our simulations impose stationarity on the stochastic process generating revenue (see Sobel and Holcombe 1996).

50 if TIF had not been allowed from each simulation. The large increase in volatility of property tax base and revenue is not the result of very large TIF increments. In the mean (and median) simulation, TIF increment accounts for about one-tenth of total property value in year 50, and TIF increases total property value by about 25 percent compared to what it would have been if TIF had not been allowed. Many municipalities in Wisconsin and elsewhere have TIF increments as large as or larger than those depicted in the simulations.

Figure 11.9 shows the distribution of RMSE generated by the 1,000 simulations of the model. Clearly, the variance of municipal and total real estate values and revenue is likely to be much higher under a regime that allows TIF than one that does not.

## *Conclusions and Lessons for Improved Design of TIF*

The simulations presented in this paper strongly suggest that TIF is likely to increase revenue volatility. While many claims and counter charges about TIFs' social and economic effects have been widely discussed, less attention has been paid to their more mundane potential effects on fiscal management. TIF increments and revenues increase extremely gradually, but are subject to abrupt change when TIF districts are dissolved. While national data are unavailable and state data are often sparse and difficult to access, available information suggests that TIF increments and revenues will be, or already are, very large in many municipalities. The analysis in this paper shows that plausible assumptions about the extensiveness of TIF use, distribution of TIF and nonTIF growth rates, and municipal and aggregate tax rates generate tax base and revenue series that are much more volatile in municipalities with TIFs than in those without TIFs. This is true whether the higher rate of property value growth found in TIF districts is caused by TIFs or is the cause of the areas being declared TIF districts. Thus, policy decisions that municipalities have already made may ensure that they will face future revenue shocks as TIF districts grow and dissolve.

From past literature and the analysis contained in this chapter, we can draw several lessons about the design of TIFs. First, for reasons discussed earlier, increases in property values that are not caused by TIFs should be excluded from the TIF increments. Admittedly, in practice it can be difficult to separate TIF-induced growth from growth that would have occurred anyway. Even crude estimates of TIF-induced growth are likely to be better than the widespread current practice of assuming zero growth in the absence of TIFs. Some states assume that TIF causes all growth over and above the rate of consumer price inflation. While this is a start, during normal economic times it might be preferable to credit TIF only with growth above the average rate of real estate appreciation. Still more sophisticated models tailored to individual TIF sites would be a further improvement.

Second, the duration of TIF districts should not be uniform, but should be as short as the development goals embodied in a particular district allow. If the

**Figure 11.9**
Distribution of Variance with and Without TIF: TIF Causes Growth

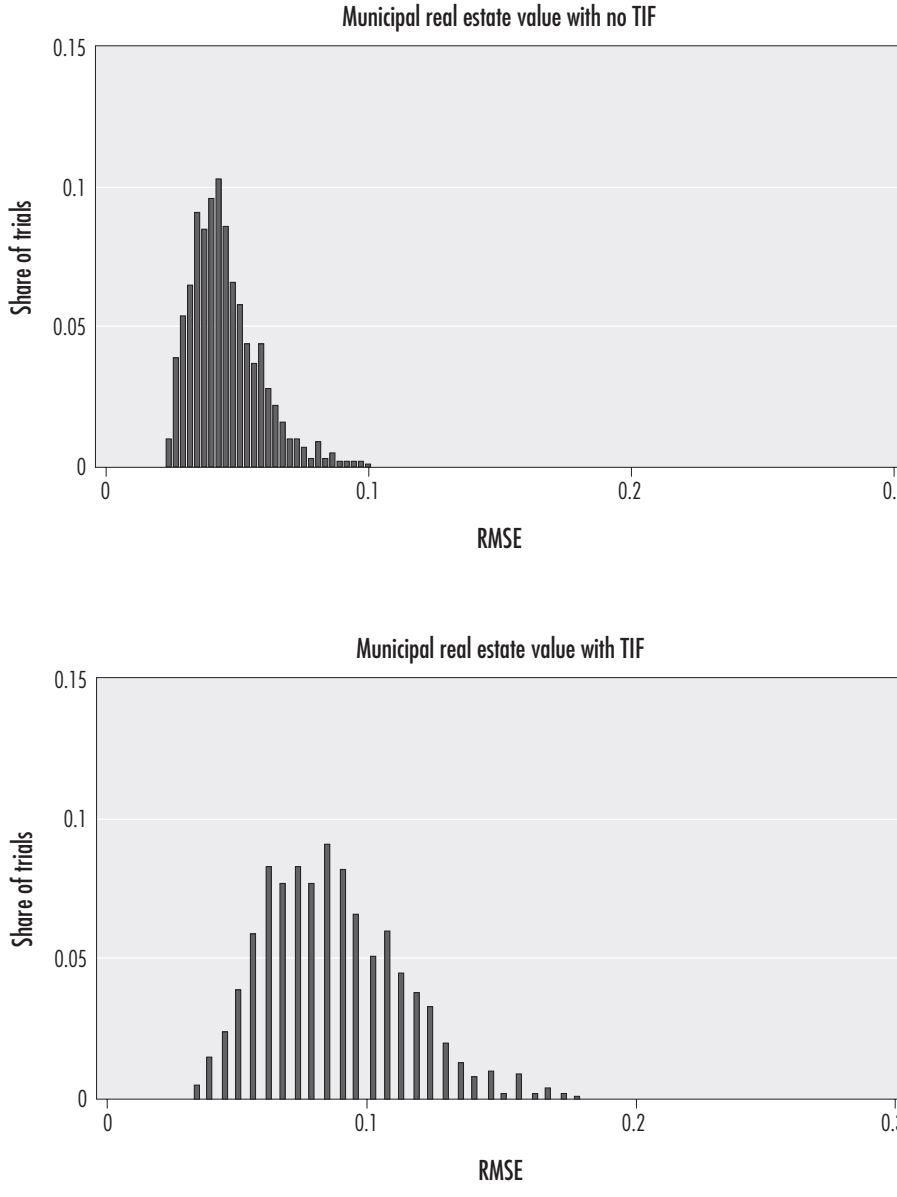



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**Figure 11.9**
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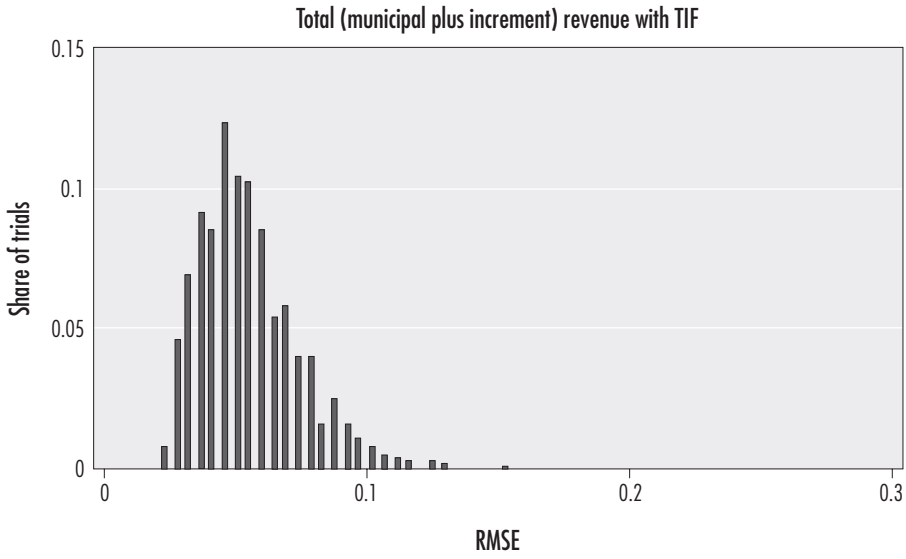


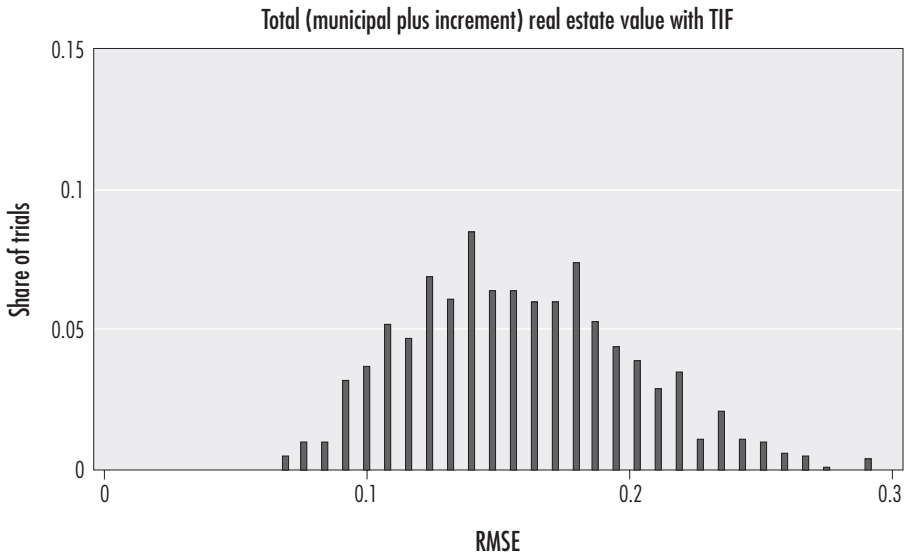


Note: Variance measured by root mean square error (RMSE) in all graphs. All graphs based on 1,000 simulated trials. RMSE in each trial obtained from regression of log of dependent variable on a constant and year over 100 years.

TIF district is maintained after real estate parcels have been developed, revenue is siphoned from the coffers of municipal and overlying governments. If the TIF district ends before development goals can be achieved, real estate appreciation may be foiled, and developers may be unwilling to participate. The simulations presented here show that, in general, the longer the life of the TIF district, the greater the fiscal shock when it ends.

Third, either revenue from overlying governments should be excluded from TIF funds, or overlying governments should be given an equal voice in the establishment of TIF districts. The typical state TIF law that allows municipal governments to capture tax base from overlying governments distorts incentives and encourages overuse of TIF districts.

Finally, the simulation analysis presented in this chapter strongly suggests that proposals for a TIF district should be required to contain a formal fiscal plan to maintain local infrastructure once the TIF district ends. These plans should explicitly recognize that, when the TIF district ends, the property value increment that reverts to the municipality is likely to generate much less revenue than the TIF district generated. Thus, the total revenue available to the municipality is likely to be reduced. State statutes might allow or require that municipalities set aside funds toward an endowment that could be used to service infrastructure in the TIF district long after the district ends.

## *Directions for Future Research*

The simulations reported here are best viewed as suggestive or perhaps cautionary rather than definitive. Clearly, more in-depth studies using actual data from real municipalities could be informative. The simulations suggest, however, that studies using only a few years of data may provide little insight. If TIF district growth is gradual, no large financial problems may be evident in the data over a period of 10 or 15 years, even though large future problems loom. The simulations also indirectly suggest that the biggest increase in financial volatility will not necessarily occur in large cities, which may have large and diverse portfolios of TIF districts. Rather, the municipalities most at risk of being caught unaware could be small, relatively unsophisticated cities that have only one or two TIF districts. These small cities also typically have the least access to nonproperty tax revenues that might buffer volatility in property tax revenues brought about by TIF districts. Thus, examination of the impact of TIF on the finances of a broad range of cities may be necessary.

Finally, this examination focused on the impact of TIF on the finances of general purpose municipal governments that usually have the autonomy to start and dissolve TIF districts. However, the finances of overlying governments, including counties, school districts, and other special purpose governments, also will be affected by TIF enactments and dissolution. Often these governmental units have very little say in TIF policy and hence are vulnerable to decisions beyond their control. Because school districts are often much smaller than municipalities, a

new TIF district may take a large share of their tax base compared to a municipality. Also, because these governmental units do not have direct control over TIF policy, they may fail to monitor activity and hence may be unprepared for the financial implications of TIF districts within their geographic boundaries. Further study of these issues is warranted.

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