Tax Increment Financing: A Propensity Score Approach

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Abstract

This paper examines the effect of tax increment financing (TIF) on economic growth in the State of Indiana. TIF areas are designated with the intent of spurring economic development characterized primarily by growth in assessed value and in employment within the TIF area. We examine property-level data from 2004 to 2013 and find the average property in a TIF area may display higher assessed values than the average property in a similarly situated non-TIF area. While both TIF and non-TIF properties tend to grow over time, the average property in a TIF area may grow by slightly more than its non-TIF counterpart. We also find that TIF does not statistically significantly impact employment or employment growth over time. While there does not appear to be a multiplicative effect of the presence of enterprise zones and TIF on employment, TIF works with property tax abatements in incentivizing job creation. Our analysis of the effect of TIF on economic development outcomes informs policymakers of the likelihood that a given area will adopt TIF in the context of the "but for" question.

JEL classification: H2; H7; O1; O4

Keywords: Tax increment financing; assessed value; employment; propensity score matching

I. Introduction

Tax increment financing (TIF) is an incentive tool that has been used by a majority of U.S. states with the intent of economic development. TIF areas are supported by the tax revenue generated on the assessed value exceeding the base assessed value (the assessed value in the area before its designation as a TIF area). This tax increment is used to construct infrastructure and fund economic development programming.

The relationship between TIF adoption and economic development has often been modeled on the premises of the "but for" question. While proponents of TIF claim that economic development would not have occurred "but for" the adoption of TIF, opponents argue that an economy would have grown anyway. The "but for" question is especially relevant for local governments. If economic development would have occurred without the establishment of TIF and a municipality instead adopts TIF, any growth in property values is not available to local governments until the public investment has been fully financed. This could be accomplished through debt financing, whereby a bond may be paid off earlier or later than anticipated, or through direct spending of revenue as it is collected. If economic development would not have occurred but for the establishment of TIF, then the goal of the program is achieved. It is often difficult to assess whether the program itself is responsible for economic growth.

This article aims to quantify the relationship between TIF adoption and economic development outcomes as measured by assessed value and employment. As such, we raise the following research questions: 1) To what extent does the presence of TIF influence the assessed values and employment of TIF areas versus their counterparts? 2) Is a municipality's decision to adopt TIF dependent on its proximity to an existing TIF area? and 3) What are the implications for the "but for" question? In an attempt to answer the research questions, this article makes two contributions to the literature. One, we tackle the endogeneity between TIF adoption and economic development outcomes with propensity score matching on property-level data. Two, we consider the existence of spatial dependence across local taxing districts. We expect that economic development projects that affect assessed values (employment) within a TIF area may not only affect assessed values (employment) immediately outside of the TIF area, but may also affect them in neighboring taxing districts (Dye and Sundberg, 1998).

We analyze TIF areas in the State of Indiana from 2004 to 2013. After controlling for various characteristics that influence TIF adoption, we find the average property in a TIF area may display higher assessed values than the average property in a similarly situated non-TIF area. While both TIF and non-TIF properties tend to grow over time, the average property in a TIF area may grow by slightly more than its non-TIF counterpart. We also find that TIF does not statistically significantly impact employment or employment growth over time.

The article is arranged as follows. Section II summarizes the relevant literature. Section III describes the data sample, and the final two sections provide empirical results and the conclusion.

II. Literature Review

Much of the literature relevant to TIF areas relies on the "but for" question. Lester (2013) finds that TIF assignment throughout the city of Chicago fails the "but for" question, as TIF implementation had not resulted in any positive net employment benefits for Chicago's residents. Byrne (2006) discusses the low levels of density within a blighted area of a municipality, where natural growth in property values is likely regardless of the adoption of TIF. Although he finds that TIF areas grow about 29 percent greater than their municipalities, he notes the large variation in success across space. Specifically, he shows that TIF adoption is most successful in visibly blighted areas where local officials recognize the need for economic improvement.

As TIF areas are generally established by local policymakers with specific goals in mind, there exists an inherent selection bias. In order to treat that bias, sound econometric methodology recommends the estimation of TIF adoption prior to the estimation of economic development outcomes. Smith (2009) employs a treatment-effects model to test for selection bias and finds that commercial properties located within TIF areas experience higher rates of appreciation than comparable properties in non-TIF areas. Similarly, Carroll (2008) finds that properties located within an active TIF area in Milwaukee, Wisconsin grow more than properties not exposed to TIF policy at any time over a period of 20 years. However, Dye and Merriman (2000) find that municipalities which adopt TIF may grow more slowly than otherwise if the TIF redistributes growth toward blighted areas.

A locality's adoption of TIF is certainly motivated by competition. Man (1999) studies Indiana cities and finds that growing cities are not more likely to adopt TIF. Rather, cities tend to compete with each other, providing an impetus for TIF adoption. Similarly, Byrne (2006) finds that TIF adoption among municipalities in the metropolitan Chicago area is the result of competition among neighboring municipalities for private development. Moreover, Warner and Zheng (2013) find that governments which rely more heavily on tax incentives tend to firms face more competition than governments that rely on other types of incentives. Anderson (1990) also finds that a municipality may establish a TIF area based on its neighbors' decisions to adopt TIF, possibly due to competition for new businesses. However, Byrne (2005) finds that districts are less likely to consider their neighbors' decisions to adopt TIF and more likely to consider their own fiscal stresses and financial needs when deciding whether to adopt TIF.

Due in part to competition, spatial interactions are often thought to exist among local governments (Boadway, 1989; Brueckner, 2003; Gebremariam et al., 2006). To capture spatial spillovers among the assessed values of TIF areas and their neighbors, Weber et al. (2007) model the effect of distance on the present value of a property and find that while proximity to the average TIF area has a negative effect, proximity to a commercial TIF area in particular has a positive effect. Alternatively, an area may be competing with adjacent areas as a byproduct of its fear of loss in its own AV, as proffered by a reviewer. In that regard, Mason and Thomas (2010) find that one city's adjacency to another city that uses TIF increases the likelihood that a city will approve a TIF as a result of competitive dynamics.

III. Data

TIF areas are often established by policymakers for two reasons: 1) to improve blighted areas and 2) to capture property tax revenues of areas expected to have high growth. Anderson (1990) finds that city officials may establish a TIF area to capture the property tax base of a municipality that began experiencing growth prior to its designation as a TIF. So, it could be that TIF is adopted to promote redevelopment within blighted areas, potentially leading to economic growth. On the other hand, positive economic development that is already evident could induce policymakers to adopt TIF. We address the reverse causality between TIF adoption and economic development outcomes by employing the propensity score matching technique (Rosenbaum and Rubin, 1983).

III.I. Treatment

Parcel-level data on TIF areas in Indiana is provided by TIF Management, a database managed by the Department of Local Government Finance (DLGF). The total number of TIF areas in Indiana may be 700 to 800, although the exact number is unknown due to data discrepancies. There are 85 counties with at least one TIF area, and 84 of those have reported some or all of their data. The only county that did not report its data was dropped for this analysis. The fact that some counties that reported TIF data failed to report all of their data presents a limitation for this analysis. As submitters become more familiar with the data management program, compliance should increase, allowing for a more complete analysis in the future.

The original sample contains approximately 123,000 properties in 579 TIF areas. Several local units reported the same parcel number for multiple TIF areas, which is infeasible. After dropping duplicate parcel numbers and observations with missing TIF initiation years, we analyzed approximately 110,000 parcels in 579 TIF areas (or 3.15% of all parcels in the state).

III.II. Outcomes

III.II.1 Assessed Value

The following table shows the change in AV from 2004 to 2013 for TIF and non-TIF properties. The largest percentage change in AV for non-TIF and TIF properties occurred during 2006 to 2007, the period immediately preceding the Great Recession. The periods from 2008 to 2009 and 2009 to 2010 showed year-over-year declines in AV for non-TIF properties but growth for TIF properties. During the period from 2012 to 2013, non-TIF properties declined in AV by approximately 2 percent, on average, while TIF properties declined by approximately 1 percent.

[Table 1 about here]

Table 2 shows TIF properties by type. The majority of TIF properties are identified as residential properties, followed by commercial properties. Properties classified as mobile homes and gas or oil are excluded from this analysis because they are unlikely to be included in a TIF area. The average AV of TIF properties in 2013 is higher than that of non-TIF properties for all property types except residential and agricultural, suggesting that TIF may not impact those properties as strongly as commercial and industrial properties. In contrast, AV for commercial properties in TIF areas are approximately 2.1 times higher than their non-TIF counterparts, while AV for exempt and industrial properties are 1.3 and 2.3 times higher, respectively.

[Table 2 about here]

III.II.2 Employment

While AV provides some indication of economic growth, an examination of employment may be more appropriate as TIF is often intended to stimulate job creation. Table 3 presents the monthly average number of jobs per year for TIF and non-TIF firms. Establishments within TIF areas employed more people annually (based on monthly averages) than those outside of TIF areas over the period 2004 to 2013. TIF and non-TIF establishments felt the effects of the Great Recession from 2007 to 2009 and reduced their employment accordingly. However, TIF establishments suffered less than their counterparts by about 1 percent to 6 percent, on average. Both types currently show growth, although the 2012 to 2013 growth in employment for non-TIF establishments exceeds that of TIF establishments.

[Table 3 about here]

Table 4 shows the distribution of the monthly average number of jobs per establishment in TIF and non-TIF areas by industry. Trade/transportation and information/finance industries are most prevalent among TIF and non-TIF areas. The average establishment in a TIF area contains either the same number or more jobs than the average establishment in a non- TIF area for every industry except public administration. In particular, the average jobs per establishment is significantly higher for TIF manufacturing establishments than non-TIF manufacturing establishments.

[Table 4 about here]

III.III. Controls

Based on Man (1999), we identify fiscal, economic, structural and demographic characteristics used to determine the likelihood of TIF adoption. As TIF areas are often established to promote economic development, we expect TIF adoption to be a function of historical effective tax rates[1] and assessed values. A positive relationship between either and TIF adoption would indicate that prior growth contributes to the designation of an area as a TIF.

As Byrne (2005) hypothesizes, cities with higher municipal tax rates are more likely to establish a TIF area, as raising tax rates for economic development would undoubtedly upset taxpayers more than would adopting TIF. Similarly, as Man (1999) states, it may be that TIF areas are adopted as an alternative mechanism to fund economic development, especially in the face of voters' growing resistance to property tax increases.

The National Center for Education Statistics (NCES) provides economic and demographic variables at the school-district level. Specifically, we examine income, unemployment rate, population density, percent of the nonwhite population, percent of the population aged 65 and over, percent of the population with a Bachelor's degree or higher and industry type provided by NCES' School District Demographics System. These variables are averaged across the period 2008–2012. Warner and Zheng (2013) find that higher business incentive use is associated with lower property taxes and higher rates of unemployment. However, although relatively poor communities stand to benefit more from TIF, they are less likely to generate enough local tax revenue in order to retire the debt undertaken to finance economic development projects within TIF areas (Felix and Hines, 2013). Additionally, population provides an idea of the size of the TIF area, as larger localities tend to be more active in promoting economic development (Reese, 2006). In Indiana, the average TIF area and its surrounding school district contains about 23,000 more people than the average non-TIF school district.

We also examine structural characteristics. Based on county assessor and auditor data, the predominant property land uses include agriculture, residential, exempt, commercial and industrial.[2] Wassmer (1994) states that non-industrial economic development is less likely to be influenced by local incentives than other types of development. Weber et al. (2007) find that proximity to older, industrial TIF areas causes slower appreciation of property values (presumably due to noise, pollution and overall lack of appeal) and proximity to mixed-use

[1] The effective tax rate is calculated as net tax/gross assessed value*100. Under current law, if a property tax bill equals less than $5, the tax bill is increased to $5 by adding a statement processing fee. For small gross assessed values, the calculated effective tax rate approaches above-average values which are nonsensical. Therefore, we replaced the 2013 effective tax rate with the 2013 state average effective tax rate for real properties of 2.42 for parcels with a net tax of $5. Similarly, we replaced the 2004 effective tax rate with the 2004 state average of 1.86.

[2] While we have data on land use, we do not have data on type of TIF area, redevelopment or economic development or mixed-use. We attempt to control for land use through binary variables describing a property's use as agriculture, exempt, industrial, residential or commercial. Information on the purpose of a TIF area for redevelopment or economic development would be useful especially since areas in Indiana may be designated as either. This is a limitation of our analysis and remains for future research.

TIF areas causes more rapid appreciation of nearby housing. Contrarily, Byrne (2006) establishes that industrial TIF areas experience larger growth than other types of TIF areas.

Additionally, we control for the possible influence of enterprise zones and property tax abatements in the designation of TIF. Man (1999) shows that controlling for economic development incentives other than TIF helps explain a locality's decision to adopt TIF. Briffault (2010) compares TIF to enterprise zones and tax abatements and points out that officials are more able to defend their intentions toward adopting TIF in the absence of a tax abatement.

Lastly, we consider spatial dynamics across local taxing districts, which tend to affect each other in their public spending decisions such that one local government has a spillover effect on its neighbor (e.g., Charlot and Paty, 2010; Kauder, 2015). We could build a spatial weight matrix based on a shapefile, preferably at the lowest level of spatial aggregation, the parcel. While the Indiana Geological Survey provides this data, we cannot analyze the database of more than 3.6 million records at a reasonable speed or with accuracy. Therefore, we control for distance between each parcel and the center of the geographically closest TIF area based on previous research (e.g., Davies et al., 2001; Weber et al., 2007). In our sample, the average property in a TIF area and a non-TIF area is located approximately 1.7 miles and 4.1 miles, respectively, from the center of the nearest TIF area.

IV. Results

First we examine the mean difference between TIF and non-TIF parcels for all covariates. Figure 1 shows mean difference p-values before and after propensity score matching. Clearly, TIF parcels and non-TIF parcels are completely incompatible. In fact, the mean difference for every variable was highly statistically significant prior to matching. After matching, the balance is significantly improved, and the mean differences of 6 of 22 variables remain statistically significant after matching. However, the mean differences are more compatible. For example, while the mean difference for *Parcel-TIF distance* was -2.4 before matching, it became 0.1 after matching. And while the mean difference for *Land per acre* was -4.1 before matching, it became 0.6 after matching. This provides an indicator of the matching technique's effectiveness in removing biases among the covariates such that the only observable difference between municipalities is their TIF designation.

[Figure 1 about here]

Table 5 presents the logit estimation results of the treatment equation, or the first stage of the propensity score matching technique, which is estimated with R's Matching package (Sekhon, 2011). The change in AV provides an indication of the type of TIF designation, redevelopment or new economic development. The results suggest that a 100 percent increase in AV growth

from 2004 to 2013 increases the probability of TIF adoption by 0.02 percentage points. While the result is economically small, it indicates that local units may adopt TIF to capture prior growth. Similarly, we examine change in income to assess blight as a prerequisite for TIF adoption. The results suggest that a 100 percent increase in income growth increases the likelihood of TIF adoption by approximately 0.1 percentage points, which is counterintuitive to the general idea of initiating TIF to promote redevelopment. As with AV growth, local units may adopt TIF to capture prior growth as witnessed by rising levels of income.

In addition to these measures, the relevant literature discusses the salience of population growth as an indicator of TIF adoption, although the direction of the impact is unclear. Growing cities may adopt TIF in anticipation of capturing any additional property tax revenue resulting from in-migration. As migrants sort themselves into localities with better schools, better amenities, or in closer proximity to family and friends, the added demand capitalizes into housing prices and thereby generates additional tax revenue. As Smith (2009) finds, property value growth within a TIF area may be attributable to the capitalization of higher quality public services offered in the area. On the other hand, localities that are experiencing a stall in population growth or even depopulation may not consider the adoption of TIF, especially if their neighbors have not done so themselves. Conforming to the latter hypothesis, the results suggest that a 100 percent increase in population growth from 2004 to 2013 decreases the likelihood of TIF adoption by 0.02 percentage points.

Generally, industrial and commercial properties are more likely to be located in TIF areas than are other property types. As such, the results suggest that industrial properties exhibit a 0.016-unit higher likelihood of TIF adoption, and commercial properties exhibit a 0.012-unit higher likelihood than their counterparts. Contrastingly, agricultural and residential properties tend to exhibit a lower likelihood of TIF adoption when controlling for all other factors that are likely to impact TIF adoption.

These findings support the claim by Greenbaum and Landers (2014) that, in general, there appear to be minimal differences between adopters of TIF and their counterparts. Using the 2009 ICMA Economic Development Survey of municipal and county governments, the authors find that past and future economic performance does not differ markedly between adopters and non-adopters. This suggests that factors other than economic behavior may be influencing local governments' propensity to adopt TIF. Of course, these factors may be politically driven and may not necessarily be observed, making the propensity score matching technique appropriate for the analysis of TIF.

Lastly, we answer the question of whether a municipality's decision to adopt TIF is spatially motivated by examining the distance between a parcel and the center of the geographically closest TIF area. The results suggest that areas whose properties are farther from a designated TIF area are less likely to adopt TIF themselves. This indicates the presence of spatial spillovers, whereby properties close to TIF areas are indirectly benefiting from growth in assessed values. As a TIF area begins to achieve financial stability through assessed value growth, its success may be disseminated to surrounding areas that may be able to reap the benefits without having to designate a TIF area of their own. Communities farther from a TIF

area have less incentive to adopt TIF because they are less familiar with TIF as an economic development tool.

[Table 5 about here]

Table 6 presents the estimation results of the economic development outcomes using matched samples derived from the propensity score matching technique. Generally, the mean of the outcome in treated (TIF) areas minus the mean of the outcome in control (non-TIF) areas gives the treatment effect (mean difference). However, separate estimation of the outcome produces more robust results since it allows us to control for determinants of the outcome that are not captured by the estimation of the treatment. Thereby, matched TIF and non-TIF observations are estimated using ordinary least squares, which should produce unbiased estimates (comparative results derived from ordinary least squares estimation without propensity score matching may be provided upon request). We use these results to calculate treatment effects (estimated coefficient times mean difference) at the average of each economic development outcome.

Due to the largeness of the sample, we analyze outcomes as a level at one point in time, 2013, and as a growth rate from 2004 to 2013 (where all explanatory variables are evaluated at the beginning of the period, or 2004). The growth rate is considered a difference-in-difference, or change in outcome over time. A panel analysis of outcomes for each year from 2004 to 2013, which would yield nearly 40 million records, may strengthen our analysis and remains a natural direction for future research. Additionally, growth rates from later cohorts, say 2005 to 2013, may produce different results and remain for future research.

As noted in the relevant literature, the effect of TIF must be interpreted with caution due to the "but for" question. While the average AV per TIF property was $181,000 greater than that of the non-TIF property in 2013 (see Table 1), we cannot say that is solely due to the presence of TIF. In other words, we cannot infer that growth would not have happened "but for" TIF. Since we do not know in all cases whether prior economic growth influences the adoption of TIF or whether TIF adoption spurs economic development, we must control for characteristic differences between TIF and non-TIF areas.

[Table 6 about here]

The results suggest that the average TIF property tends to display AV of approximately $14,700 (see the Appendix for descriptive statistics of the matched sample for all outcomes) more than non-TIF properties that exhibit very similar characteristics. This amounts to approximately 13 percent of the average AV per property (TIF and non-TIF) of $115,000. Hicks and Faulk (2015) similarly find that TIF positively influences AV growth. The authors show that a $1 million increase in TIF AV leads to an increase of $4.43 to $5.26 per capita in AV in the county, a small but positive effect.

When analyzing the change in AV over time, we examine only cohorts that adopted TIF between 1967 (the first year of initiation) and 2004. Adding other cohorts (such as those that adopted TIF more recently) may confound the effect of TIF over time, especially since they may not have had much time to grow. Note that any properties established or built between 2004 and 2013 may not capture the effect of TIF, posing a limitation to this research.

The results suggest that over a ten-year period prior to which properties were designated in a TIF area, both TIF and their control non-TIF properties experienced positive growth. However, TIF properties tend to grow by only 0.02 percentage points more than their counterparts. This difference is economically small and suggests that while TIF properties exhibit higher growth, they tend to grow only marginally over time compared to non-TIF properties. This finding coincides with Dardia (1998), who finds that California property values inside TIF areas grow faster than their matched non-TIF pairs but that the growth is not large enough to allow the projects to be self-financing.

As properties tend to experience naturally occurring growth in assessed values over time, it is important to examine the effect of TIF on other measures of economic development. As tax increment financing is often intended to stimulate job creation, an examination of employment may be more appropriate. The "but for" question is still valid, as growing establishments may induce the adoption of TIF and TIF adoption may lead to job creation. Recall from Table 3 that the average TIF establishment had 7.4 more employees than the average non-TIF establishment. After controlling for characteristics that influence TIF adoption, we find, however, that the average TIF establishment does not fare any better than its counterpart in creating jobs. Additionally, the results suggest that over a ten-year period, TIF did not statistically significantly impact job creation.

These results suggest that TIF fails to have any meaningful impact on employment or employment growth. As Beekmans et al. (2015) surmise, local economic development policies appear to have little to no effect on redevelopment or revitalization. Instead, other criteria such as politics may be influencing an area’s decision to adopt TIF. Ploegmakers and Beckers (2014) likewise find that regeneration policies are failing to effect desired improvements to deprived urban areas, bringing to question whether public monies are being allocated appropriately.

Evidence on the effectiveness of TIF on employment is more mixed than that on property values, which, while considered an economic development outcome, does not measure economic activity holistically. Of course, the larger consensus on the positive effect of TIF on property values could be reflecting the underlying mechanism of TIF, whereby property values are expected to increase in order for the designated area to be self-financing. To bridge the gap, we further analyze employment.

TIF and non-TIF businesses behave and evolve differently, making the use of spatial regimes appropriate. The regime shift permits explanatory variables to vary over space (i.e., TIF-non-TIF spectrum), providing a way to combat spatial heterogeneity. As such, we interact a dummy variable indicating whether a parcel is contained within a TIF area with all explanatory variables and the intercept.

[Table 7 about here]

The results suggest that after matching on the propensity score, prior employment growth and prior AV growth are statistically significantly different in TIF and non-TIF areas. The figures show no indication of both TIF and non-TIF establishments converging in job creation. Interestingly, high prior AV growth has the same effect on employment as low growth, implying that property value does not impact job creation. Prior employment growth does affect current employment, however. This is perhaps expected, as establishments tend to maintain administrative budgets based on past experiences.

[Figure 2 about here]

Next, we discuss effective tax rates, which consider local income taxes, property tax caps, exemptions and deductions. The results show that TIF and non-TIF establishments behave differently along the entire range of effective tax rates, with TIF establishments creating more jobs than their counterparts at low and high effective tax rates alike. As Hicks and Faulk (2015) surmise, it may be that areas with higher effective tax rates use TIF more intensively than areas with comparatively lower tax rates.

But that does not tell the entire story. Think about city planning and population. The largest cities in Indiana obviously boast the largest populations, which create increased demand for public services such as schools, libraries, police officers and firefighters. As a result, the net tax in these areas tends to be higher than the average, thereby leading to higher-than-average effective tax rates. At the same time, these urban and suburban areas are where economic development is already evident. In Indiana, these areas and their surrounding areas have predominantly adopted TIF. So, it makes sense that TIF establishments with higher effective tax rates tend to use TIF more intensively than their counterparts. Additionally, the results show that the differential effects of effective tax rates in TIF versus non-TIF areas on employment tend to converge at higher rates. This suggests that non-TIF establishments begin to respond more like their counterparts at higher effective tax rates.

At the other end of the range, low effective tax rates are a function of low net taxes, which could be a function of various forms of property tax relief. It could be that TIF establishments are able to create more jobs than their counterparts in areas with greater property tax relief and lower effective tax rates as residents shift their income toward other goods and services. This scenario is more likely where property tax relief takes the form of exemptions and deductions. Alternatively, low net taxes could be a function of high assessed values, which provide an indication of the community wealth and suggest that TIF establishments in wealthier communities tend to create more jobs than their counterparts. This coincides with the argument that TIF in Indiana is not being used to promote redevelopment within blighted areas.

However, when compared to the effect of population density on employment, TIF establishments tend to create fewer jobs at high levels of population density than at low levels, albeit still more than non-TIF establishments. There is indeed a strong relationship between population density and employment. As Baumont et al. (2004) state, urban growth has resulted in employment decentralization from the central city toward the suburbs (see also Stansel, 2005 for an analysis of U.S. metropolitan areas and Kim et al., 2013 for an analysis of the Seoul Metropolitan Area). Additionally, McMillen (2004) cites U.S. Census data in describing the decentralization of employment for a group of Midwestern metropolitan areas. As the percentage of suburban residents working in the city declined, the percentage of city residents working in the suburbs rose, implying that employment has moved away from concentrated to less densely populated areas.

[Figure 3 about here]

Based on U.S. Public Interest Research Group's (PIRG) statewide study of TIF, a majority of the states require the presence of blight (however defined in a state's statute) and/or a "but for" test in order for a local unit to create a TIF area. In Indiana, however, a TIF area may be established within a blighted area to promote redevelopment or within a non-blighted area to promote economic development. Still, it is worthwhile to examine whether TIF has a bigger impact in distressed areas than in non-distressed areas. Figure 4 presents estimated probabilities of the effect of TIF on employment across establishments with varying levels of unemployment. TIF establishments tend to create more jobs than non-TIF establishments at all levels of unemployment. The figure also shows that TIF establishments tend to create more jobs at low levels of unemployment than at high levels of unemployment, suggesting that TIF in Indiana is not necessarily being used to promote redevelopment within blighted areas.

[Figure 4 about here]

As motivated above, non-TIF incentives such as enterprise zone provisions and property tax abatements tend to influence the likelihood that a TIF area will be adopted. For example, Gibson (2003) notes that TIF areas are often connected to empowerment zones, which are the federal equivalent of state-designated enterprise zones. Similarly, using the 2009 ICMA data, Greenbaum and Landers (2014) find that 120 of the 199 municipal and county governments that offer enterprise zones also offer TIF and that 224 of the 359 governments that offer tax abatements also offer TIF. This provides an impetus for studying the interaction of TIF with each of these incentives. While a positive effect on either interaction would suggest a complementary relationship between TIF and a non-TIF incentive, a negative effect would suggest that the overlapping economic development incentives actually hinder economic growth. It may be that one incentive crowds out the other incentive such that neither is able to fully reach its potential to effect growth in economic activity.

There does not appear to be a multiplicative effect of the presence of enterprise zones and TIF on employment. This could be because the recent literature on enterprise zones finds they have little to no impact on economic growth outcomes (e.g., Reynolds and Rohlin, 2015; Whitacre et al., 2015; Elvery, 2008; Bondonio and Greenbaum, 2007). However, the results suggest that TIF works with property tax abatements, which can be used to encourage businesses to locate to or expand at a particular location, in incentivizing job creation. Both incentives appear to reinforce each other's effect on employment. The results suggest that the average establishment that is included in a TIF area and claims property tax abatements tends to create more jobs than its counterparts, signifying the complementary relationship between property tax abatements and TIF, both of which are hugely popular among local governments.

It is possible that property tax abatements are offered to some firms with the intention of attracting subsequent firms. It is also possible that firms themselves identify attractive locations and request abatements (Reese, 2006). As firms begin to relocate to an area based on lower taxes, other firms may follow, thereby leading to the agglomeration of an industry (Coulson et al., 2013). Additionally, as He and Romanos (2015) find, vertical and horizontal linkages between suppliers and the market tend to influence the movement of a firm to an area with industrially similar firms. That is, sector-specific firms tend to move to areas where they can harness the resources and knowledge already available. As a result, lower tax rates may not necessarily attract firms in search of operational support (Gerritse, 2014) but may provide a breeding ground for leading firms.

V. Conclusion with Policy Recommendations

TIF areas are designated with the intent of spurring economic improvement within the TIF area. Our research set out to quantify the extent to which the presence of TIF influences the assessed values and employment of TIF areas versus their counterparts. The use of TIF to promote redevelopment or spur economic development should lead to growth in assessed values and/or employment. However, prior research finds inconclusive results on the effectiveness of TIF. We employ propensity score matching models to estimate the statistical relationship between the presence of TIF and 1) assessed values; and 2) employment. We aim to determine whether these economic development outcomes are systematically different between TIF and non-TIF areas. We investigate this by statistically comparing TIF properties and TIF establishments and their similarly situated non-TIF counterparts.

While the descriptive statistics suggest much higher growth in AV and employment in TIF areas and thereby attribute any differences in economic growth between TIF and non-TIF areas solely to the presence of TIF, the results of the propensity score matching technique suggest otherwise. The econometric estimates of the growth rate differences are much lower, which has an important bearing on the "but for" question as it relates to TIF. Our estimates suggest that most of the differences in AV and employment between TIF and non-TIF areas is not attributable to the TIF program. Rather, it is attributable to other policy, economic, and geographic factors.

As previous research has found, local officials sometimes adopt TIF to capture the property tax base of a locality that began experiencing growth prior to its designation as a TIF. In other words, they may attempt to capture growth that is already occurring. As TIF areas were originally established to reduce blight and spur economic development, their relatively small concentration in rural areas, which tend to have less wealth and prosperity than urban areas, is surprising. As rural counties tend to suffer from more outmigration and less ability to recover from economic downturn than their urban counterparts, one would expect local officials to designate more rural TIF areas.

One way to measure rurality is population density. We find that TIF establishments tend to create more jobs than non-TIF establishments at low and high levels of population density. If urban growth leads to decentralization of employment from the city center toward its suburbs, we should see establishments in low-density areas creating more jobs than in high-density areas. While we find this is true for TIF establishments, it is not true for their counterparts. In fact, non-TIF establishments tend to create a similar number of jobs regardless of the population density of the surrounding area.

Clearly, TIF establishments have some advantage over non-TIF establishments with respect to job creation. But is it necessarily their designation? Or could it be other factors? The relationship between TIF adoption and economic development has often been modeled on the premises of the "but for" question. If the opponents of TIF are correct, then rural counties that do not adopt TIF may be exempted from possible displacement of property tax revenue. However, if the proponents are correct, rural counties may be missing out on an opportunity for economic growth.

Property tax abatements can be used to encourage businesses to locate to or expand at a particular location, thereby incentivizing job creation. Local officials tend to adopt TIF where property tax abatements are present. As a result, the average establishment that is included in a TIF area and claims property tax abatements tends to create more jobs than its non-TIF counterparts, signifying the complementary relationship between property tax abatements and TIF, both of which are hugely popular among local governments. Just as a majority of TIF areas are located in urban counties, a majority of tax abatements are given to businesses in urban counties, bringing to question whether rural counties are generally less likely to use tax abatements and TIF to attract businesses or whether businesses, and especially new businesses that are not already knowledgeable about abatements, are less likely to respond to those incentives.

Additionally, the decision to adopt TIF may be spatially motivated, whereby a local unit may adopt TIF based on its proximity to an existing TIF area. This indicates the presence of spatial spillovers, whereby properties close to TIF areas may be indirectly benefiting from growth in AV. As a TIF area begins to achieve financial stability, its success may be disseminated to surrounding areas that might reap the benefits without having to designate a TIF area of their own. Communities farther from a TIF area have less incentive to adopt TIF because they are less familiar with TIF as an economic development tool. Rural counties tend to be farther from a TIF area, meaning they may not be able to reap any positive spillovers from other TIF areas.

As previous research has noted, the higher frequency of TIF in urban areas could be a function of the “rich getting richer.” While the premise of TIF lies in the redevelopment of blighted areas, a majority of Indiana TIF areas have been created for the broader purpose of economic development. Local commissions must rigorously defend their decisions to designate an area as a TIF before getting approved by a hearing body. But many rural areas lag behind urban areas in their resources and administrative capacity, making them susceptible to further inequities.

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Figure 1. TIF and non-TIF Mean Differences Before and After Propensity Score Matching

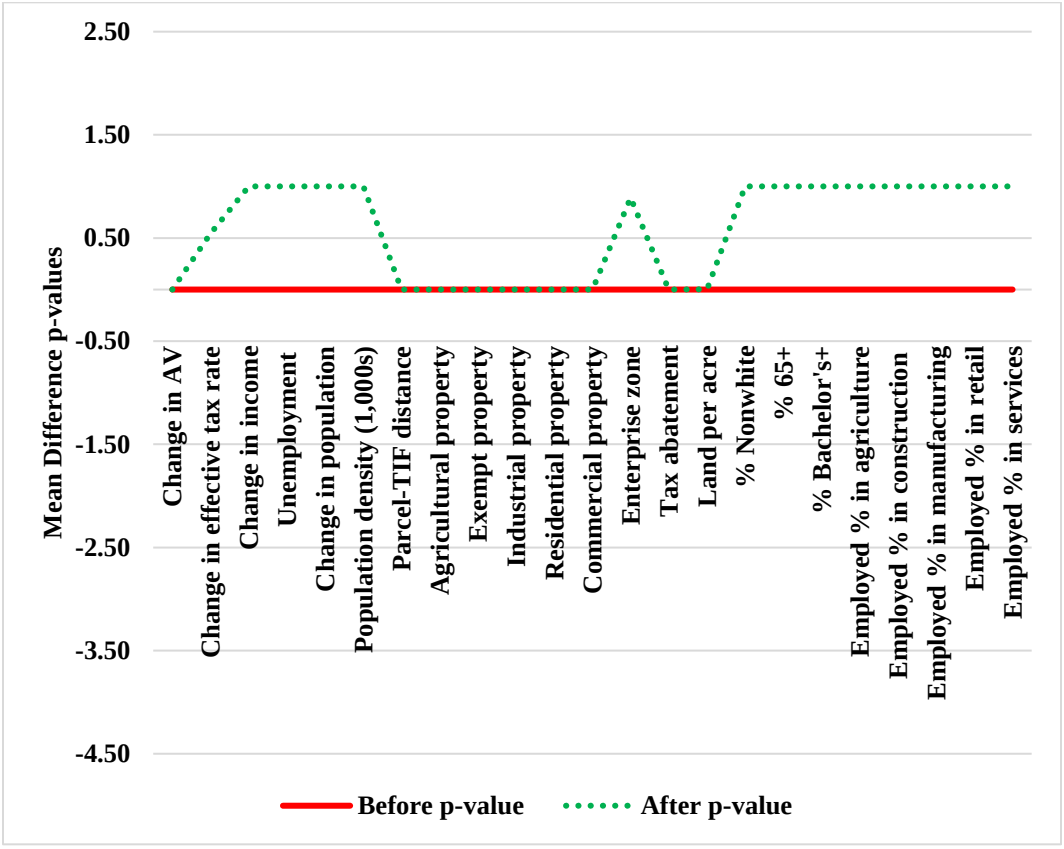

Figure 2. The Effect of Prior AV (top) and Employment (bottom) Growth on Job Creation for non-TIF and TIF Establishments

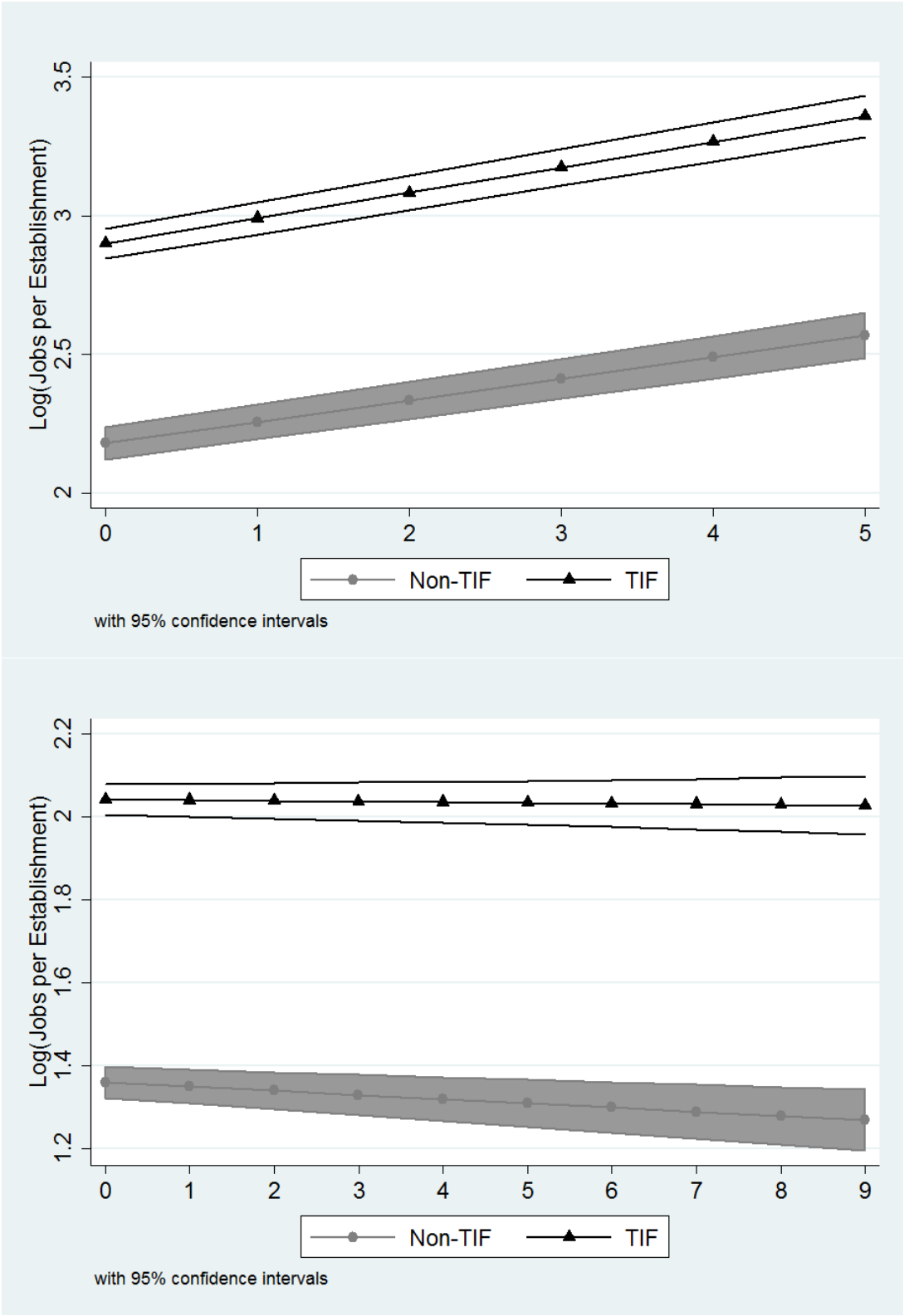

Figure 3. The Effect of Effective Tax Rate (top) and Population Density (bottom) Growth on Job Creation for non-TIF and TIF Establishments

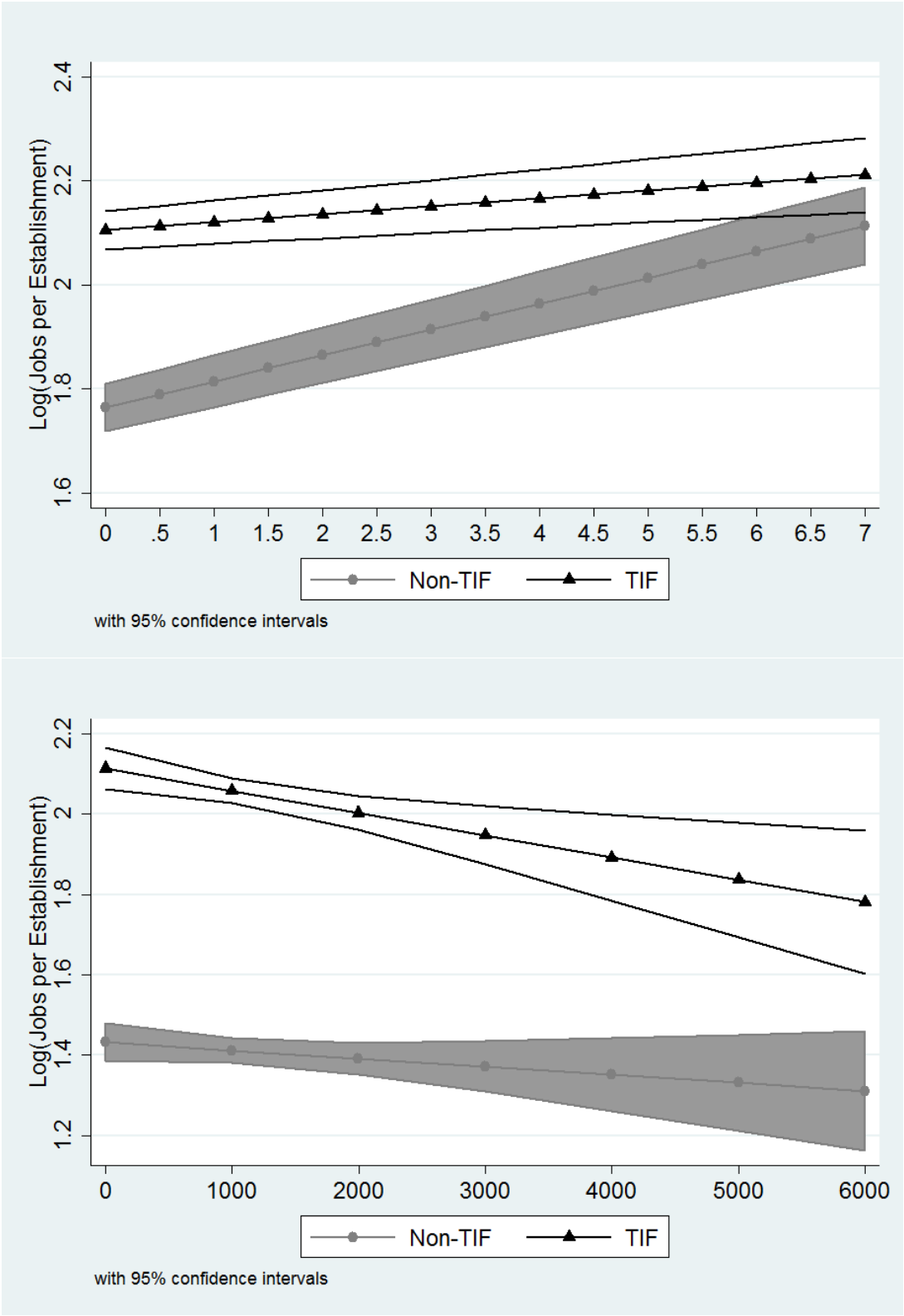

Figure 4. The Effect of Unemployment Rate on Job Creation for non-TIF and TIF Establishments

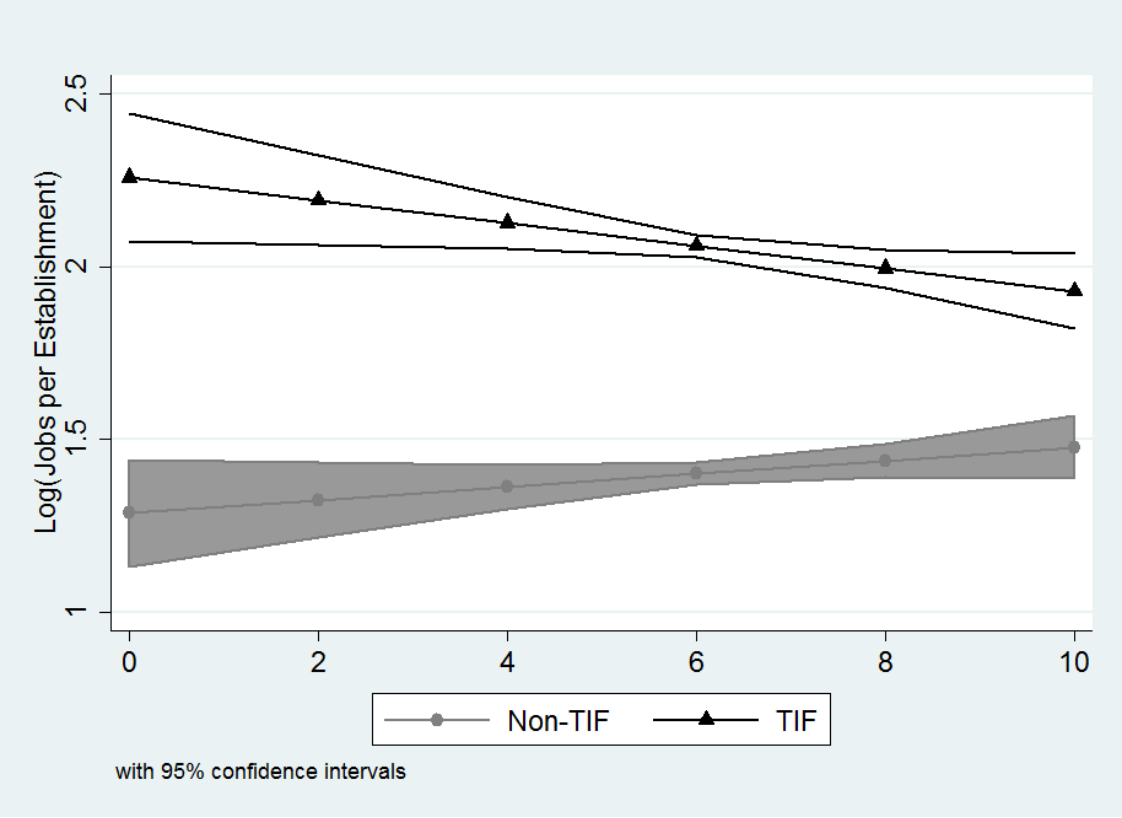

TABLE 1: Average AV per Property by Year

Year	Non-TIF			TIF		
	AV	Annual Change	# of properties	AV	Annual Change	# of properties
2004	$95,632	-	3,395,007	$177,727	-	94,460
2005	$95,654	0.02%	3,393,079	$191,632	7.80%	96,388
2006	$95,871	0.20%	3,384,718	$195,855	2.20%	104,749
2007	$111,703	16.50%	3,384,004	$259,456	32.50%	105,463
2008	$112,958	1.10%	3,380,562	$275,172	6.10%	108,905
2009	$112,551	-0.40%	3,377,964	$296,630	7.80%	111,503
2010	$112,421	-0.10%	3,377,063	$306,698	3.40%	112,404
2011	$111,430	-0.90%	3,369,306	$299,369	-2.40%	120,161
2012	$111,203	-0.20%	3,367,041	$293,132	-2.10%	122,426
2013	$108,813	-2.10%	3,366,718	$289,880	-1.10%	122,749

Notes.

1. 2004 is the first year for which we have parcel-level data.
2. Counties that did not provide parcel-level information were dropped for this analysis.
3. Values correspond with all TIF areas initiated by a given year. For example, 2005 corresponds with all TIF areas that were in place by 2005.
4. The reported AV from 2008 to 2011 would likely lag the Great Recession and should be interpreted with caution.

TABLE 2: Non-TIF and TIF AV by Property Type, 2013

	Non-TIF		TIF	
Type	Share of Properties	AV	Share of Properties	AV
Residential	74.6%	$100,841	49.9%	$76,429
Commercial	4.2%	$313,706	26.0%	$647,150
Exempt	5.1%	$88,664	13.4%	$111,011
Industrial	0.8%	$429,290	6.5%	$1 M
Agricultural	14.5%	$83,822	3.1%	$69,236
Other	0.9%	$37,130	1.1%	$125,107

TABLE 3. Monthly Average Jobs and Annual Change in Jobs per Establishment by Year

	Non-TIF		TIF	
Year	Jobs	Annual Change	Jobs	Annual Change
2004	17.8	-	23.7	-
2005	17.1	-3.60%	23.4	-1.20%
2006	16.5	-3.70%	23	-1.90%
2007	15.7	-4.90%	23.2	0.90%
2008	14.6	-6.90%	22	-5.20%
2009	13.3	-9.20%	20.2	-8.10%
2010	13.9	4.60%	20.8	2.90%
2011	14.1	1.80%	21.1	1.20%
2012	14.5	2.60%	21.8	3.50%
2013	14.7	1.70%	22.1	1.30%

Table 4. Monthly Average Jobs per Establishment by Industry, 2013

NAICS	Industry	Non-TIF		TIF	
		Industry Share of Establishments	Jobs per Establishment	Industry Share of Establishments	Jobs per Establishment
11	Agriculture	1.00%	10.3	0.30%	19.1
21-23	Mining, Utilities, Construction	12.70%	11.2	4.90%	17
31-33	Manufacturing	4.40%	34	5.90%	62.6
42, 44-45	Wholesale/Retail Trade, Transportation, Warehousing	24.90%	13.3	27.20%	20.8
51-56	Information, Finance, Real Estate, Management	30.10%	11.4	28.50%	16.7
61-62	Educational Services, Healthcare	9.60%	24.5	9.20%	24.4
71-72	Entertainment, Food Services	9.30%	16.8	16.70%	20.5
81	Other Services	7.90%	10.3	7.30%	11.5
92	Public Administration	0.10%	33.2	0.10%	16.5
TOTAL		100%		100%	

TABLE 5: Logit Estimation Results of TIF Adoption (1st Stage of Propensity Score)

	Est.	z-value	Marginal effect	z-value
Fiscal				
Log(change in AV)	0.0142 ***	27.3500	0.0002 ***	27.1200
Log(change in effective tax rate)	0.0204 ***	36.4300	0.0002 ***	35.8800
Economic				
Log(change in income)	0.0417 ***	33.1000	0.0005 ***	32.8500
Unemployment	0.0370 ***	14.0500	0.0004 ***	14.0100
Log(change in population)	-0.0204 ***	-23.7500	-0.0002 ***	-23.6100
Population density (1,000s)	0.1844 ***	43.9100	0.0022 ***	42.4800
Structural				
Parcel-TIF distance	-0.3397 ***	-147.0800	-0.0041 ***	-190.2900
Agricultural property	-1.1995 ***	-34.3500	-0.0146 ***	-34.4700
Exempt property	0.3975 ***	12.6100	0.0048 ***	12.5500
Industrial property	1.3138 ***	39.1800	0.0160 ***	38.0000
Residential property	-0.9900 ***	-32.3000	-0.0120 ***	-32.1300
Commercial property	0.9985 ***	32.1500	0.0121 ***	31.4200
EZ	0.3081	1.3000	0.0037	1.3000
Abatement	0.9367 ***	18.1600	0.0114 ***	18.0600
Land (acres)	-8.1E-05	-1.4000	-9.9E-07	-1.4000
Neighborhood				
Nonwhite	1.5301 ***	52.3600	0.0186 ***	50.7300
65+	4.9709 ***	29.8400	0.0604 ***	29.5300
Bachelor's+	2.6579 ***	35.8100	0.0323 ***	35.5600
Employed in agriculture	-7.2227 ***	-22.3900	-0.0878 ***	-22.5300
Employed in construction	7.0786 ***	23.0500	0.0860 ***	22.9600
Employed in manufacturing	4.8854 ***	56.8000	0.0594 ***	55.3300
Employed in retail	6.6508 ***	26.2000	0.0808 ***	26.1700
Employed in services	6.6036 ***	68.1800	0.0802 ***	64.9400
Intercept	-7.0595 ***	-79.9700		
Akaike Information Criterion	0.229			
N	3,476,237			

Notes.

1. *** p<0.001 ** p<0.05 * p<0.01 for test on significantly different from zero.
2. The treatment observations were matched to control observations based on their local taxing district number.
3. The coefficients derived from a logit regression are not directly interpretable. Rather, we calculate and interpret marginal effects, which give the value change in the outcome variable as a function of a value change in the independent variable, holding all other independent variables constant.
4. These models were re-estimated using only cohorts that adopted TIF prior to and including 2004 when examining its effect on AV and jobs from 2004–13.

TABLE 6: OLS Estimation Results of Economic Development Outcomes (2nd Stage of Propensity Score)

	AV (2013)		AV (2004–13)		Jobs (2013)		Jobs (2004–13)	
	Est.	t-stat	Est.	t-stat	Est.	t-stat	Est.	t-stat
TIF	0.175 **	2.150	0.077 *	1.68	0.065	0.340	0.191	0.220
Fiscal								
AV	0.147 ***	171.460	-0.159 ***	-102.200	-0.008 ***	-4.540	0.093 ***	3.310
Effective tax rate	-0.006 ***	-6.850	0.087 ***	9.930	0.039 ***	20.440	0.089	0.540
Economic								
Employment					0.086 ***	47.430	-1.510 ***	-27.920
Income	0.027 ***	13.770	0.043 ***	21.130	0.264	0.060	-0.016	-0.690
Unemployment	-0.032 ***	-6.770	0.140 ***	20.160	-0.003	-0.320	-0.100	-1.020
Population	0.003 *	1.940			-0.005	-1.560		
Population density	0.051 ***	8.310	-2E-06	-0.410	-0.038 ***	-3.200	-0.105	-1.520
Structural								
Parcel-TIF distance	0.007 **	1.980	-0.005 ***	-13.500	0.003	0.500	-0.002	-0.550
Agricultural property	4.657 ***	76.200	-0.254	-7.640				
Exempt property	-1.984 ***	-37.810	-0.350 ***	-14.020				
Industrial property	5.792 ***	104.410	-0.084 **	-3.050				
Residential property	5.066 ***	99.070	-0.724 ***	-30.690				
Commercial property	5.582 ***	107.780	-0.235 ***	-9.660				
EZ	0.980 **	3.070			0.586	1.460		
Abatement	1.913 ***	24.400	-0.735 ***	-13.140	1.046 ***	10.360	1.654 **	2.400
Land (acres)	2E-04 *	1.780	2E-04 **	2.930	0.005 ***	4.660	0.022 ***	3.540
Built 1960-90	1.053 ***	11.040	2.366***	40.73				
Built 1990+	1.415 ***	15.660	-0.926 ***	-12.390				
3+ beds	-1.458 ***	-10.710	-0.544 ***	-5.770				
Electricity	0.436 ***	7.080	0.634 ***	10.520				
Lack plumbing	-1.761	-1.350	3.366 **	2.610				
Neighborhood								
Nonwhite					0.445 ***	4.040	0.557	0.930
65+					-1.271 **	-2.380	0.933	0.290
Bachelor's+					-1.018 ***	-5.560	-0.139	-0.090
Business								
Ag, Forestry					0.191	0.590	-0.375	-0.170
Mining, Construction					-0.093	-1.350	-1.697 ***	-4.480
Manufacturing					0.830 ***	10.140	4.099 ***	9.250
Wholesale/Retail					0.075 **	1.980	-0.389 *	-1.890
Information, Finance					-0.316 ***	-8.450	-1.461 ***	-7.280
Education, Healthcare					0.373 ***	6.490	1.088 ***	3.400
Entertainment, Food					0.641 ***	12.390	1.606 ***	5.690
Other Services					-0.206 **	-3.150	-1.535 ***	-4.280
Public Administration					-0.418	-0.470	0.893	0.220
Corporation					-0.965 ***	-28.670	-1.942 ***	-10.500
Proprietorship					-0.873 ***	-23.030	-1.955 ***	-9.300
Other organization					-0.534 **	-2.190	3.303 **	2.400
Partnership					-0.769 ***	-11.600	-1.530 ***	-4.340
Intercept	6.715 ***	58.970	-1.261 ***	-20.540	3.588 ***	32.340	-5.167 ***	-6.890
R^2	0.603		0.153		0.317		0.112	
N	218,960		162,420		13,400		9,514	

Notes.

1. *** p<0.001 ** p<0.05 * p<0.01 for test on significantly different from zero.
2. The number of observations for the first column should be 219,038 (109,519*2). However, 39 observations

were dropped due to the lack of a match between treated and control observations.

TABLE 7: Estimation Results of Employment with Interaction Effects

	Non-TIF		TIF	
	Est.	t-stat	Est.	t-stat
Fiscal				
Log(change in AV)	-0.010 ***	-4.020	-0.002	-0.650
Log(change in effective tax rate)	0.050 ***	20.320	0.015 ***	4.940
Economic				
Log(change in employment)	0.077 ***	29.930	0.092 ***	36.810
Log(change in income)	-0.005	-0.970	0.001	0.170
Unemployment	0.019	1.580	-0.033 **	-2.250
Log(change in population)	-0.005	-1.200	0.002	0.420
Population density	-2E-05	-1.310	-6E-05 **	-2.990
Structural				
Parcel-TIF distance	-0.003	-0.280	0.012	1.260
EZ	0.191	0.220	0.592	1.330
Abatement	1.242 ***	6.450	0.871 ***	7.360
Land (acres)	0.009 ***	4.960	0.003 *	1.940
Neighborhood				
Nonwhite	0.089	0.640	0.730 ***	3.930
65+	-2.137 **	-3.020	0.290	0.360
Bachelor's+	-1.352 ***	-5.470	-0.088	-0.320
Firm				
Ag, Forestry	0.218	0.460	0.051	0.120
Mining, Construction	0.000	0.000	-0.203 *	-1.770
Manufacturing	0.951 ***	7.570	0.783 ***	7.330
Wholesale/Retail	0.122 **	2.200	0.052	1.010
Information, Finance	-0.298 ***	-5.760	-0.315 ***	-5.910
Education, Healthcare	0.400 ***	5.200	0.295 ***	3.470
Entertainment, Food	0.768 ***	8.840	0.536 ***	8.390
Other Services	-0.167 *	-1.840	-0.235 **	-2.550
Public Administration	-0.275	-0.220	-0.713	-0.570
Corporation	-1.205 ***	-24.480	-0.728 ***	-15.920
Proprietorship	-1.078 ***	-19.670	-0.689 ***	-13.260
Other organization	-0.515	-1.580	-0.546	-1.500
Partnership	-0.904 ***	-9.060	-0.659 ***	-7.520
Intercept	3.810 ***	25.970	-0.466	-1.570
R^2	0.329			
N	6,700		6,700	

*** p<0.001 ** p<0.05 * p<0.01 for test on significantly different from zero.

Appendix. Descriptive Statistics of Matched Outcomes

	Non-TIF		TIF	
Outcome	Mean	Std. Dev.	Mean	Std. Dev
AV	206,732	983,007.8	290,873.8	1,829,710
Change in AV	3.723	62.694	4.014	139.5188
Jobs	15.849	62.761	25.896	85.087
Change in Jobs	-0.107	2.393	0.071	2.688