

The Economic Impact of TIFs:
Jobs and Taxable Sales

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Executive Summary

In the spring of 2009, the East-West Gateway Council of Governments (EWGCOG) contracted with the Public Policy Research Center of UM St. Louis (PPRC) to undertake a comprehensive review of local tax-increment financing districts (TIFs) in the St. Louis region¹. This report summarizes results regarding the impact of TIFs on employment levels within local zip codes and taxable sales within municipalities.

Description of Research Agenda

The degree to which TIFs produce economic outcomes for the areas in which they are located is a key concern to local policy-makers and the focus of much popular commentary. The authorizing language for TIFs² requires their use for economic development in the face of demonstrated blight and in the cases where development would not happen “but for” the use of public incentives. Conventionally, TIFs operate as public investments into projects, either in the form of TIF bonds/notes as a part of construction of the project or through “pay-as-you-go” schemes for multiple projects during the life of the TIF district. In either case, the TIF district authorizes financing of public improvements using a portion of the increased public funds outflow—either property taxes or other economic activity—that occurs after the inception of the project. Under state authorization, TIF districts expire at some point in the future—the length of the TIF can be further defined by local statute—at which point the intent is that the full extent of the public investment in the project is fully paid off.

Advocates of TIFs conventionally note the ability of TIFs to transform blighted areas³, although the law in neither Missouri nor Illinois contains specific performance or accountability standards. Reporting on TIFs regularly includes documentation of the number of temporary and permanent employment associated with the TIF⁴. Even including the small number of TIFs that never get past the planning stages, very few TIFs “fail”—either through a failure to complete the intended project, fulfill the intended uses or fail to gather the projected public

¹ The analysis defines the St. Louis metropolitan region to be East West Gateway’s service area, namely St. Clair County, Madison County and Monroe County in Illinois, and the City of St. Louis, St. Louis County, St. Charles County, Jefferson County and Franklin County in Missouri.

² For Missouri, RSMO Chapter 99, and for Illinois, 65 ILCS 5/11-74.4.1 et. seq. See Gardner and Theising (2008) for a brief summary of TIF programs in the two states.

³ See, for example, Geisman (2004).

⁴ Among the more transparent systems for tracking TIFs is a system managed by the Missouri Department of Economic Development (DED). Although it is entirely self-reported, this annual inventory of active TIFs includes data on about 90% of the TIFs in Missouri, including their name, the developer, the status of the project, total amount of public funds diverted to date, project TIF investment costs and the estimated total project costs. (<http://www.missouridevelopment.org/Community20Services/Financial20and20Incentive20Programs/Local20Finance20Initiatives/Local20TIF.html>). There is no equivalent reporting system for Illinois TIFs.

fund outflow to pay off initial TIF investments. While there are indeed some well-known cases of failed TIFs⁵, the fact that some TIFs have failed on their own does not on itself indicate that TIFs in general have a negative economic impact. Whatever the overall utility or desirability from a local public policy perspective, most TIF projects successfully complete construction, have some degree of occupancy and use after construction, and meet critical benchmarks in terms of economic performance and public tax outflows⁶.

This analysis investigates the impact that TIFs have across a much broader area than just the project site over the number of years the TIF has been active. The report summarizes findings of the impact of TIFs on two types of economic outcomes: retail employment levels within local zips and taxable sales within local municipalities. The source of employment data is the U.S. Census Bureau (County Business Patterns); municipal taxable sales data is available from the Missouri Department of Revenue. While TIF data is available from the inception of the program (1986), employment and municipal taxable sales data is restricted to 1994 and 1993 onward. For each outcome variable, the analysis tests two models—one that tests the impact of all TIFs and a second that tests the impact of just retail-oriented TIFs, which make up the bulk of TIFs in the St. Louis region. Included as predictors in each model are past and current TIF investments, as well as other relevant predictors associated with the outcome variable of interest. Both models include a measure of the retail-TIF activity outside the zip code/municipality to address the question of whether the use of TIFs is moving economic activity from one area to another. Finally, given the fact that more comprehensive TIF data is available on the Missouri side, the models utilize only Missouri data.

More information on the data and method used in the analysis, including some of the limitations of the analysis, are included in Section 3 of the report.

Summary of Findings

While Section 4 of the report presents the full findings of the model, they can be summarized briefly here. Like past studies, this analysis finds that TIFs have a significant effect on economic activity, with the effect on jobs small and the impact on taxable sales more substantial. On average, each \$1 million of TIF investment is associated with about 6 to 7 jobs added in the ZIP code of the TIF for each year the TIF is in effect. This effect is slightly higher for retail TIFs. In terms of taxable sales, each \$1 million dollars of TIF investment is associated with

⁵ A recent update (Whittington, 2008) of one of the more infamous failed TIFs—the St. Louis Marketplace—details its transition from a retail project to other sorts of commercial uses.

⁶ See Robert Caplan & Associates (2008) for an example of the sort of impact study conventionally used to justify positive TIF outcomes, relying upon project based employment increases, net increases in property taxes and increases in sales tax revenue.

an annual increase of \$400,000 - \$500,000 in municipal receipts for the municipality in which the TIF project occurs.

Additionally, the analysis finds there is a statistically significant leakage effect in the use of TIFs. For \$1 million of TIF activity outside a municipality leads to an average annual loss of about \$14,000 in taxable sales for all types of TIFs and \$25,000 for retail TIFs. For employment, the effect is small—1 job for every \$10 million of retail TIF investment elsewhere.

Review of Literature

Research into the economic impact of TIFs fits within a general econometric literature on the impacts of public incentives on business location and activity. While there is voluminous literature on the general topic of the latter, with economists being relatively skeptical of a substantive impact⁷, there has been relatively little research in the former. Even with the near universality of TIFs as a tool of local economic development in most metropolitan regions, the number of relevant peer-reviewed⁸ studies dealing with the local economic impacts of TIFs number only eight. Additionally, the most significant research has only been completed in the last two years. That public policy researchers have not consistently and adequately documented the impact of TIFs is not just a concern to the scholarly community. It means that much of the popular commentary on TIFs—both negative and positive—comes with little reference to documented impacts and effects, introducing a level of speculation into local debates around TIFs.

Description of Past TIF Research

Past TIF research comprises a small set of articles produced by scholars working mostly from datasets of Chicago and Indiana, including Dye and Merriman (2000 and 2003), Man (1999) and Man and Rosentraub (1998), Smith (2006 and 2009) and Weber, et. al., (2003 and 2007). The field is largely divided into the direction of TIF impacts. Dye and Merriman's series of articles found no impacts of TIFs on assessed property values and interpret one of their findings as a proof that TIFs are associated with declining values in non-TIF areas of cities. By contrast, Man, Man and Rosentraub and Smith find positive impacts of TIFs on a variety of outcome measures. Weber, et. al. (2003), find positive impacts of TIFs on industrial parcels within mixed use TIFs, but report evidence of negative impacts on parcels located in homogenous TIFs, a finding attributed to the desirability of industrial parcels in mixed areas for retail development. By extension, Weber, et. al. (2007), find positive spillover effects of mixed use industrial TIFs on nearby residential properties, but lower residential values associated with homogenous TIFs. As Smith (2006) notes, the heterogeneity of these findings is related to the limitation of data available on TIFs and local market conditions and the variety of methods scholars have used to estimate the economic impacts of TIFs. In general, TIF research has attempted to determine whether the use of a TIF has significantly impacted economic

⁷ See Peters and Fisher (2003) for a review of this literature. The authors suggest most of the sub-literatures on specific types of incentives, including that dealing with TIFs, offer almost no support to the new position that lower taxes or more incentives are likely to result in greater economic growth.

⁸ The discussion here is mostly restricted to contemporary studies that have fully utilized econometric techniques to capture the impact of TIFs and control for other endogenous issues. Other relevant research includes scholarly papers and reports, including Byrne (2002) and Dardella (1998), and an older literature on TIFs, including Anderson (1990) and Wassmer (1994) that the most recent research has superseded.

outcomes, with the majority of studies utilizing property values as the main impact variable across a variety of units of analysis.

For Dye and Merriman, the main impact of interest is changes in municipal property growth rates utilizing the assessed value of property. By contrast, Weber, et. al., estimate the impact of TIFs on individual industrial property values (2003) and, by extension, the spillover effects on single family housing sales values (2007). Smith is primarily interested in the impact on residential sales values, including multifamily housing (2006) and single family (2009). Like Weber, et. al., Smith estimates the impact on individual sales values. Man and Rosentraub utilize median single family housing values to investigate the impact of TIFs across municipalities. Only Man investigates the impact of TIFs on another economic outcome variables—local employment levels.

Following these differences in the main type of economic variable, past research can be divided into two methodological groups—those who use hedonic modeling (Smith, 2006 and 2009; Weber, et. al., 2003 and 2007) and those who use panel or cross-sectional data in regression analysis (Dye and Merriman, 2000 and 2003; Man, 1999 and Man and Rosentraub, 1998). Hedonic analysis uses property and location characteristics to estimate the property sales, including a number of controls for the location and time of the sale. The analyses utilizing panel and cross-sectional data variously predict impact based upon models that attempt to explain the main variables of interest. Man and Rosentraub, for example, predict the change in single family housing values as a function of not just whether municipalities have adopted TIFs but also changes in overall housing characteristics, municipal fiscal and economic conditions. Dye and Merriman similarly use municipal fiscal and economic conditions as well as a variety of TIF-related indicators.

Many of the methodological choices of scholars are made by the availability of data as much as the appropriate method of study. While the assessed value of property is generally widely available, there may be differences across jurisdictions in the assessment process that makes market sales prices a better outcome measure. Hedonic modeling requires extensive actual and verifiable sales values, as well as detailed property characteristics; while some relaxation of the latter constraint is possible (see Smith, 2006), much of the data on commercial properties are not publicly available. In some respects, given the largely commercial nature of many TIF districts, the emphasis on residential property values may be somewhat inappropriate.

In their analysis on individual values at specific points in time and space, hedonic models allow for specific tests of causation. By contrast, cross-sectional and panel data models have additional complications that constrain their use and interpretation. As Smith (2009) notes, the

approach of analyzing tax differences across neighborhoods or jurisdictions assumes a level of comparability that may not be present and requires modeling of externalities that are not related to TIF policy.

Modeling of TIF Impact

One element shared across all past studies is how they operationalize the impact of TIFs in their econometric models. As Smith (2009) notes,

“designating an area as a TIF district does not guarantee a specific level of public investment, but designation does indicate that the local government has created a plan for possible future investment... The focus here is on the signals of potential public investment provided by the announcement. For this reason the model is testing the speculative reaction of market participants to the announcement of a TIF district and the perceived potential for public and private investment in a TIF district.”

Accordingly, each of the studies conceives TIF adoption as the critical element of impact and the TIF measures included in the models are generally expressed as whether a sale, in the case of studies that focus on the impact on sales values, is within or without a TIF district and whether the sale occurred before or after the adoption of a TIF. A number of studies refine the impact of TIFs through additional factors. Weber, et. al., includes the distance of the industrial sale to the nearest TIF and, in one model (2007), the amount of investment in the TIF. Weber, et. al., and Dye and Merriman both add variables relating to the main property uses in the TIF. For Weber, et. al., the interest is whether the TIF district is specified as industrial, commercial or mixed-use; Dye and Merriman’s intention is to add variables indicating the main property characteristics of TIFs in order to determine if there are significant differences in rates of appreciation in various types of TIF districts.

Problem of Selection Bias

One concern for all of the studies, regardless of their variable of interest or method, is selection bias. As Dye and Merriman (2000) note,

“a municipality’s decision to adopt TIF may be made for a variety of reasons. TIF might be adopted because the municipality recognizes that the area is likely to be developed and wishes to capture the revenue increment from overlying governments. On the other hand, TIF might be used in an area that is hopelessly blighted on the theory that TIF designation does not risk any revenue. In the first case, a comparison of the growth rates of TIF districts with the growth rate of other areas will tend to *overstate* the impact of TIF on growth—these areas were selected specifically because they were expected to grow. But in the second case, a comparison

of the growth rates of TIF districts with the growth rate of other areas will tend to *understate* the impact of TIF on growth—these areas were selected specifically because they were less likely to grow.”

In methodological terms, because the decision to use a TIF is not made randomly, estimation of the effect of TIFs may be biased (Smith, 2009). Thus most of the studies correct for selection bias by using instrumental variables to estimate municipal TIF adoption and then using this correction term as a predictor in the main stage of the analysis. As Weber, et. al., (2003) note, the choice of these instrument terms must be made carefully; while they can influence TIF adoption, they cannot be predictors of the main variable of interest (property values, property sales, etc). In practice, the selection of instrumental variables can be very difficult, and, in the case of this analysis, means selection bias remains a significant methodological limitation of the study.

Data and Methods

Three relevant issues emerge from the preceding review of past scholarship. First, the main emphasis of scholarship on impact on sales prices requires a level of data generally not available from public sources, particularly concerning commercial data. Additionally, the reliance on residential sales values may not be an appropriate manner to measure the impact of substantially commercial and retail TIFs and the sort of loft/condo residential TIFs that predominate in the City of St. Louis. Further, there may be good analytical reasons to be more interested in impacts such as jobs and employment rather than residential property values and market sales. To a large extent, the variability of findings on property values between Dye and Merriman on the one hand and Man and Rosentraub and Smith on the other relate to their use of different outcome variables and different types of analysis.

The record of TIFs on broader economic outcomes like employment and taxable sales is much less clear, with only one previous study (Man, 1999). To a large degree, the impact of TIFs on these types of measures may be much more important for local and regional policy-makers, given the large level of investment TIFs provide for retail and commercial uses. Additionally, the fact that employment data and taxable sales data are generally available at a low level of analysis provides the opportunity to retest Man's analysis and conduct new types of analyses.

The second main issue revolves around how analysts have conceptualized the impact of TIFs. For all past studies, TIFs function as a "yes/no" signal to market actors that the area is of interest to local government and soon to receive public investment. While this is a good conceptual concession to the lack of meaningful data on investments in TIF districts, it may not be an accurate assessment of how TIFs are created. Examination of the TIF creation process in the St. Louis region suggests that TIFs usually result not from public-sector planning initiatives but from specific development proposals negotiated between the market and government, typically developers and public officials. This means that many districts are usually geographically distinct, comprise a small number of parcels, and contain a named project with start and end construction dates with pre-determined TIF investment costs and total project costs.

Thus, in contrast to the view of TIFs promoted by Smith (2006), this analysis considers that TIF adoption is not just a symbolic event that flags the interest of entrepreneurial public officials seeking private market investment; it is additionally part of a complicated pre-development process around a specific project. This second meaning is important in two regards. First, the fact that TIFs result in increased property values for parcels directly impacted by the designation and funding may have as much to do with actual public and private

investments as much as a process of private market actors correctly reading the prompts of local government. Secondly, there is significant data about the scale, timing and use of the TIF process that is not being incorporated in the analysis and that may provide a great deal of clarity about the impact of specific types of TIFs at specific times and of specific amounts. This means focusing not just on the date of TIF adoption but also the level and timing of TIF investment. In practical terms, this more expansive concept of TIF impact restricts the analysis to Missouri cases, where TIF data is more comprehensive and where local governments are more likely to use TIFs for specific projects, as opposed to Illinois districts containing a number of large and small projects.

The last issue that emerges from the literature review involves the importance of model specification and, in particular, when data is not available to make the best choices in terms of modeling, it is important to carefully identify the limitations of the findings. While cross-sectional analyses have limitations in their estimation and interpretation and require proper specification to cover differences across jurisdictions, specification of hedonic models is beyond the scope of this analysis, particularly regarding commercial parcels. For a number of reasons, local governments do not provide good estimates of the value of commercial properties and lack good property characteristic data. Acquisition of proprietary sources of these data would be beyond the scope of this study. Additionally, given the relatively small geographic scope of TIFs, there is good reason to believe that there are relatively few open sales of commercial properties within TIFs, making accurate sales indices hard to estimate.

Finally, selection bias remains an issue hard to overcome. While the literature provides clear methods for handling it, this study has failed to identify an adequate instrumental variable that meets the criteria of predicting municipal TIF adoption while at the same time having no impact on employment levels. **This fact means that the findings presented here should be taken as an indication of an association between phenomenon and not as an indicator of causation.**

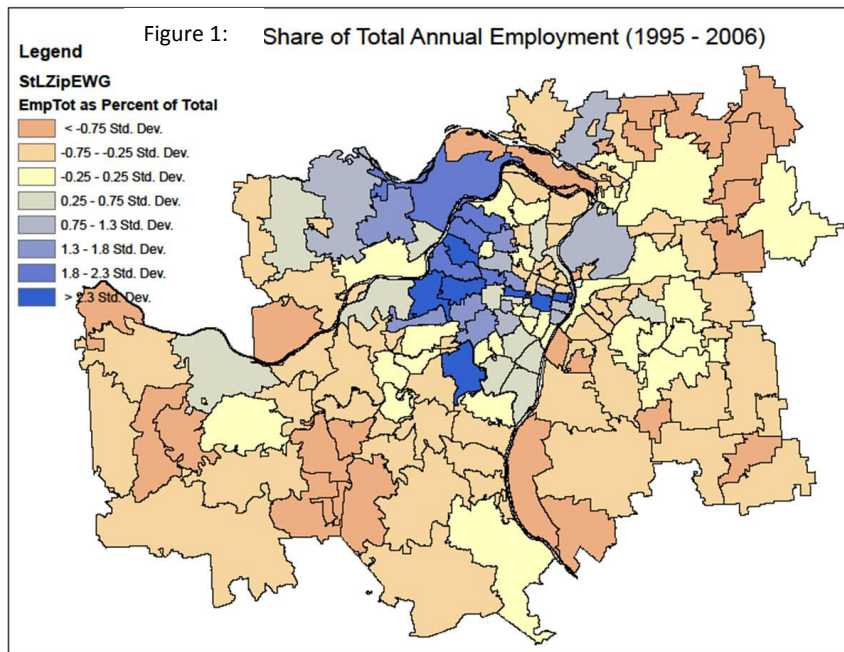
Description of Data

This study uses local employment data, local taxable sales data and data on TIF districts and projects. Employment data for all zip codes in the St. Louis region for the period of 1994 through 2006 comes from the U.S. Census Bureau's County Business Patterns. Taxable sales data come from the Missouri Department of Revenue for 1993 through 2007. Employment data includes total employment as well as employment within specific industry categories including retail, industrial, leisure and wholesale.⁹ The TIF data used for the analysis comes

⁹ For a small number of cases, the number of employees was missing where the number of establishments was very small and the release of employment numbers would have compromised business' privacy concerns. For

from a database compiled by East-West Gateway staff, whose primary sources were local governments and state-level departments of economic development and revenue. The university research team made additions to the database, including merging duplicated entries, identifying TIF locations on a parcel map and adding other characteristics of local TIFs. In total, there are 338 TIF districts in the region, with adoption dates spanning from 1988 through 2008; the analysis determined parcel boundaries for 93% of them.

Mapping of the relevant data provides some initial information about economic change in the region and its overlap with TIFs. Figure 1 shows the zip code level change in total



regional share of employment between 1995 and 2006. The map reflects conventional narratives about the long term decline of St. Louis' central city, as well as evidence of a diverse pattern of employment share increases and decreases across the region. Areas of overall employment decline include as expected portions of the region that have seen significant

population decline, not only in the City of St. Louis and northern St. Louis County, but also more stable, middle class residential neighborhoods in St. Louis County and booming residential areas on the eastern portion of the region. Areas with increased employment shares over the period

those cases, the analysis imputed a value. Although, County Business Pattern data suppress some employment totals, establishment counts are always provided. Establishments are coded within a standardized range of employee sizes. We created an estimate of total employment by regressing establishment counts by size on total employment. The resulting coefficients provided a mean value of employees per establishment for each employee-size category. Since the distribution of employee size is highly skewed to the left, simply using the mid-point of the range would lead to an upward bias. The top-coded employee size (1000+ employees) was dealt with in a two-step process. First, the aforementioned regression was conducted without zip codes with top-coded establishments. The coefficients were used to estimate the employee count for all zip codes with top-coded establishments, and residuals were calculated. Second, for all zip codes with top-coded establishments, the count of top-coded establishments was regressed on the residuals from the first step. The coefficients from both steps were then used to estimate employment of all zip codes. This approach lead to very accurate estimates for zip

include a central corridor of zip codes from downtown to West County, large areas of St. Charles County and some areas of Madison and St. Clair County. Put together, these trends reflect both a regional restructuring of population and business activity, as well as industry-specific patterns, including the continuing decline of portions of the region’s manufacturing sector and restructuring of retail establishments from smaller stores to “big boxes.”

Figure 2: Percent Change Taxable Sales
1993 to 2007
Municipalities in St. Louis Metropolitan Region

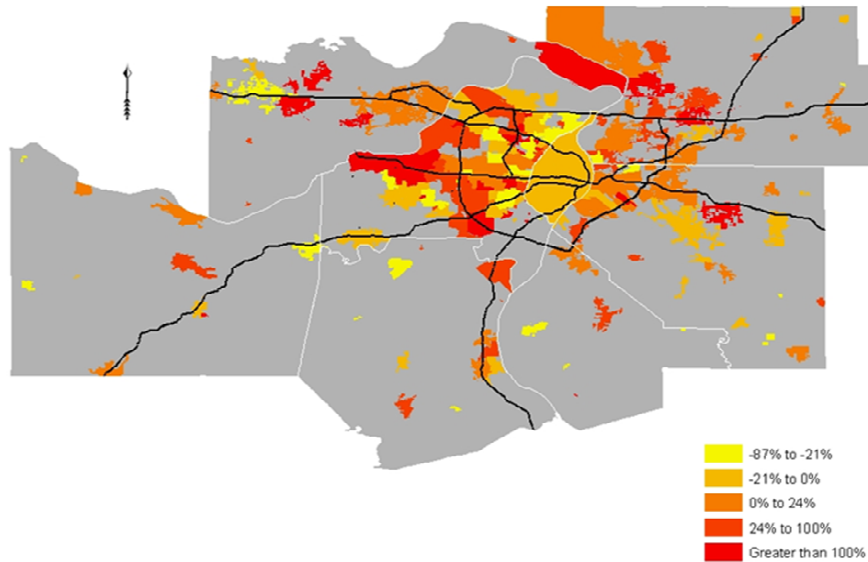


Figure 2 shows change in municipal taxable sales from 1993 through 2007. The scale runs from municipalities that have lost sales—in yellow and light orange—to those places that have seen modest growth—medium and darker orange—to cities that have seen significant growth—red. Similar to Figure 1, this map shows both typical urban—suburban poles,

with the city and other close in suburbs showing significant losses, but also trends of loss and gains in other parts of the region.

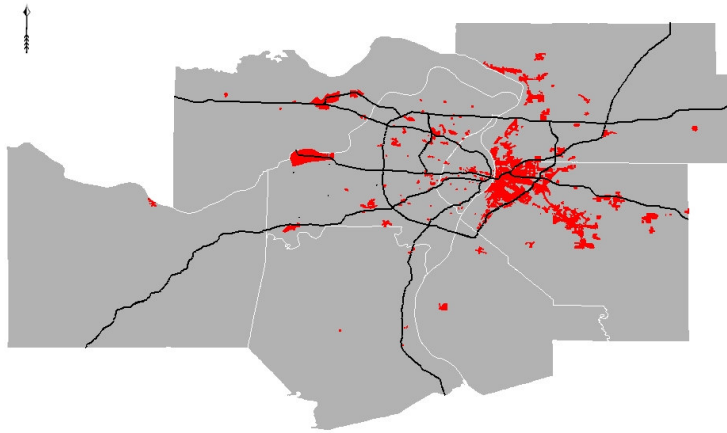
Finally, Figure 3 shows the geographic location of TIF districts in the region. The City of St. Louis has the most TIF districts (114), followed by St. Louis County (92), St. Clair County (71), Madison County (91) and St. Charles County (13); there are very few TIF districts in Jefferson County, Franklin County or Monroe County. The location of TIF districts was linked in their zip code in a straight-forward manner; for those TIFs that spanned multiple zip codes, they were allocated according the percent of total parcel area within each zip.

In general, TIFs on the Illinois side of the region are geographically larger than those in Missouri, indicating differences in how TIFs are used by local governments. By and large, the practice for Missouri TIFs is for their adoption to precede a specific redevelopment proposal, with known TIF investment and project costs. This analysis used a variety of secondary

code without a top-coded establishment, but, due to the large range of sizes in the top-code, employment estimates in other zip codes are less accurate.

sources—local governmental records, newspaper and internet searches and other local economic development material—to verify the status of Missouri projects, the developer, main use, when the project started construction and ended, the dollar amount of TIF investment and how the TIF investment was used. By contrast, the documentation to determine total TIF dollar investment amount and project type was not available for Illinois TIFs during the analytical time frame afforded the UMSL researchers, the end result being no statistical analysis of TIF use in Illinois.

Figure 3: Location of TIF Project Parcels
St. Louis Metropolitan Region



In terms of Missouri TIFs, further research determined that 60 TIFs had either never started—i.e., the project never got past the planning stages—or had not yet started due to continuing predevelopment work. For 95% of the remaining 154 active TIFs—those either completed or under construction—data on the timing and amount of TIF investment also was available, as well as the main use of the TIF—commercial

(office), industrial (including warehousing), leisure (hotel, gaming and recreation), mixed use, residential and retail¹⁰. From 1998 through 2008, public investment in active Missouri TIF projects—the vast majority of which were infrastructure and other sorts of supporting investments made during the construction phase of the project—totaled \$1.4 billion. Retail projects comprise 67% of those investments—\$971 million over the period—followed by commercial developments at 17% (\$247 million) and residential development at 9% (\$131 million). There are also differences in the use of TIFs by geographic area. The inclusion of these various types reflects the fact that there is significant variation in the types of projects that local governments pursue. In the City of St. Louis, for example, 54 of the 82 active TIFs—those either completed or under construction in some form—are residential TIFs, with the overwhelming majority of these being loft developments downtown or elsewhere in the central corridor. Only sixteen of the city’s TIFs are commercial/office projects, six retail developments and five hotels.

¹⁰ Mixed use projects were defined as such if they included significant portions of any two types. Thus, large loft buildings with one floor of retail or commercial were defined as residential, not mixed use. Only five projects met this stronger criterion: The Boulevard (Richmond Heights), Hanley Crossing (Brentwood) and three infrastructure improvement projects that impact both residential, retail and commercial uses.

In St. Louis County, however, 43 of the 68 active TIFs relate to retail development, another thirteen are commercial developments, 5 are industrial and only two are residential projects.

The key result of the differences in data availability across the two states was that the analysis of economic impact was restricted to Missouri TIFs only. For both jobs and taxable sales, the analysis breaks out the impact of TIF investments as a function of total investments and investment within the retail sector.

Model Specification

The employment analysis uses a linear fixed effects model. The panel data set contains information on employment and TIF utilization for each of the 104 ZIP codes in the Missouri portion of the East-West Gateway region. For each ZIP there are 12 observations, one for each year from 1995 to 2006. The pooled data set has a sample size of 1,248 ZIP-year observations.

The fixed-effects model is specified as follows:

$$\begin{aligned}
 E_{i,z,y} = \alpha_m & + \beta_{1,i}T_y + \beta_{2,i}P_{z,y} \\
 & + \beta_{3,i}PreTIF_{i,z,y} + \beta_{4,i}PreTIFTrend_{i,z,y} \\
 & + \beta_{5,i}PostTIF_{i,z,y} + \beta_{6,i}PostTIFTrend_{i,z,y} \\
 & + \beta_{7,i}OutsideTIFTrend_{i,z,y} \\
 & + \varepsilon_{i,z,y}
 \end{aligned}$$

where

- E is total employment of industry i in zip code z in year y .
- α is a set of fixed effects for each zip code.
- T is total employment in the East-West Gateway region for year y ;
- P is the population within the zip code z for year y .
- $PreTIF$ is a dummy variable that is coded as 0 for ZIPs that either did not have a TIF during the study period (1995-2006) or that had a TIF at the beginning of the study period. For ZIP codes that got their first TIFs during the study period, $PreTIF$ is coded as 1 for the years prior to the first TIF, and 0 for all years after the introduction of the first TIF. Thus, the $PreTIF$ variable represents the intercept difference in employment between zip codes that do not have a TIF at the beginning of 1995 but will receive one during the study period, and zip codes that either already have a TIF or never receive a TIF.
- $PreTIFTrend$ represents the number of years that elapsed between 1995 and the introduction of the first TIF. $PreTIFTrend$ is coded as 0 for all years following the introduction of a TIF. $PreTIFTrend$ is also coded as 0 in all years for ZIP codes that did not have a TIF during the study

period, or that had a TIF in 1995. For example, if a ZIP gets its first TIF in 1998, *PreTIFTrend* would be coded as 0 for 1995, 1 for 1996, 2 for 1997 and 0 thereafter. *PreTIFTrend*, then, measures the trend difference between the two groups of zip codes before TIF initiation.

- *PostTIF* equals the real stock (in millions) of TIF dollars allocated to a ZIP code. *PostTIF* represents the intercept difference between the two groups of zip codes in the first year after initiation of the TIF.
- *PostTIFTrend* measures the differences in the slope of employment changes per year after initiation of the TIF. *POSTTIFTREND* is an interaction variable of *POSTTIF* and the age (in years) of the TIF stock. Thus, *POSTTIFTREND* measures the "dollar investment age" of each area. The *POSTTIFTREND* can be interpreted as the additional value (measured in levels, not percent change) as \$1 million of TIF investment ages for one year.
- *OutsideTIFTrend* measures the per year impact of TIFs outside a particular zip code, in effect the "leakage" from one zip code to another. This field is coded by adding all TIF activity in the entire region. For any year *y*, the *OUTSIDETIFTREND* will be coded the same way across all ZIP codes. [QUESTION--WR TOLD ME THAT THE *OUTSIDETIFTREND* VARIABLE IN THE SPREADSHEET IS CALLED *TIFRESRIDRT*. Every ZIP has the same value in these fields (e.g., 553.78 for 1995, 1730.88 for 1998, etc. Wouldn't it make more sense to calculate this field by subtracting ZIP code *z* TIF amounts from *OUTSIDETIFTREND*? If *POSTTIF* is a component of *OUTSIDETIFTREND*, could this bias the estimators? I certainly don't know, but it seems funny to me.]
- ε is the error term for each case in the model.

The employment model is run twice. In the first run, the five last variables of the equation represent all TIF investments. In the second run, the TIF impact variables represent just investments in the retail sector.

The taxable sales model is similar to the employment model, with the exception of additional predictors. There were 125 municipalities in the data set, each with 12 observations, for a sample size of 1,500 municipal-years.

The model is:

$$\begin{aligned}
 T_{m,y} = \alpha_m & + \beta_1 M T_{m,y} + \beta_2 P_{m,y} \\
 & + \beta_3 \text{OutsideSales}_y + \beta_4 \text{OutsidePop}_y + \beta_5 \text{TotalIncome}_y \\
 & + \beta_6 \text{PreTIF}_{m,y} + \beta_7 \text{PreTIFTrend}_{m,y} \\
 & + \beta_8 \text{PostTIF}_{m,y} + \beta_9 \text{PostTIFTrend}_{m,y} \\
 & + \beta_{10} \text{OutsideTIFTrend}_{m,y}
 \end{aligned}$$

$$+ \varepsilon_{m,y}$$

where

- T is total taxable sales in municipality m in year y ;
- α is a set of fixed effects for each municipality m ;
- MT represents the municipal tax rate for each municipality m in year y ;
- P is the population in the municipality m in year y ;
- $OutsideSales$ is the total amount of sales receipts outside the municipality m in year y ;
- $OutsidePop$ measures the total population outside the municipality m in year y ;
- $TotalIncome$ is the total income for the region in year y ;
- $PreTIF$ variable represents the intercept difference in taxable sales between municipalities that do not have a TIF at the beginning of 1995 but will receive one during the study period, and municipalities that either already have a TIF or never receive a TIF;
- $PreTIFTrend$ measures the trend difference in taxable sales between the two groups of municipalities before TIF initiation;
- $PostTIF$ represents the intercept difference between the two groups of municipalities in the first year after initiation of the TIF;
- $PostTIFTrend$ measures the differences in the slope of change in taxable sales per year between the two groups of municipalities after initiation of the TIF;
- $OutsideTIFTrend$ measures the impact of TIFs outside a particular municipality per year, in effect the “leakage” from one zip code to another; and
- ε is the error term for each case in the model.

The sales receipt model is also run twice, the first time using all TIF investments and the second time just investments in the retail sector.

The models used are fixed effect models in the sense that they assume unexplained variance in the dependent variables based upon the units of analysis (zip codes and municipalities). In practical terms, this means adding a dummy variable for each case.

Both models use TIF investments measured in millions of 2005 dollars.¹¹ For the jobs models, the coefficients represent differences and change per job; for the sales, coefficients measure differences and changes per million dollars of taxable sales.

¹¹ We used the GDP deflator as our measure of inflation primarily because the deflator is updated when new information is collected by the Bureau of Economic Analysis, unlike the CPI.

Presentation of Findings

Table 1 presents results for the two zip code level employment models.¹² Overall, the models account for a significant percent of the variation in the outcome variables. However this is largely due to the fact that the fixed effects model controls for the time invariant features of each zip code. The table does not include fixed effects for the zip codes, but just a mean fixed effect for all cases.

The two control variables Employment and Population are significant and in the order expected. Additionally, there are few differences in the TIF impact variables between Model 1 and Model 2. To reiterate the *PreTIF* and *PreTIFTrend* variables indicate the intercept and annual slope differences between zip codes that have not used TIFs prior to 1995 but will use them in the study period and all

other zip codes; by contrast, the *TIF* and *TIFTrend* variables indicate the first year intercept and per year slope differences between the two groups of zip codes after the initiation of TIFs. All the coefficients can be interpreted as differences in the number of jobs; the *TIF Trend* variable additionally measures change in jobs per million dollar of TIF investment.

Both models suggest that there is little difference between the two groups of zip codes before the adoption of TIFs, either in the level of employment or the trend. Additionally, there is little difference in the “first year” performance of the groups of zip codes in terms of the

	Model 1		Model 2	
	Coefficient	t-ratio	Coefficient	t-ratio
Mean Fixed Effect	-4700.0000	-1.81 *	-5528.0900	-2.08 **
Total Employment	0.0001	2.22 **	0.0001	2.30 **
Population	0.4208	7.18 ***	0.4401	7.97 ***
Pre TIF	504.6410	0.65		
Pre TIF Trend	-17.8788	-0.25		
TIF	-18.0519	-1.04		
TIF Trend	6.1474	6.52 ***		
Outside TIF Trend	-0.1197	-1.76		
Pre Retail TIF			1273.4700	1.41
Pre Retail TIF Trend			-39.0051	-0.51
Retail TIF			11.3086	0.32
Retail TIF Trend			6.7920	10.85 ***
Outside Retail TIF Trend			-0.1776	-1.79 *
Mean dependent var	9282.481		9282.481	
S.D. dependent var	10049.37		10049.37	
Adjusted R-squared	0.970726		0.97114	
F(110, 1137)	309.319		382.466	

Notes: Data included Missouri zip codes only.

¹² As discussed above, the fact that there is missing employment data means that there is moderate amount of potential error in the employment data. The analysis reran the regressions excluding six zip codes with suspect employment data (data that showed very large increases or volatility from year to year). There is very little difference in the regression results; the coefficients that change the most also had very low t-ratios—i.e., contributed the least significance to the findings.

number of jobs in the first year after the adoption of TIFs. However, there is positive post-TIF trend for both all TIFs and retail-TIFs of about 6 to 7 jobs per each \$1 million in TIF investment.

The final coefficient in the two models represents the average leakage of jobs between zip codes based upon \$1 million of TIF investment. For Model 1, the coefficient is negative, indicating on average each \$10 million of retail TIF investment leads to the loss of 1.2 jobs from other zip codes. For Model 2, the coefficient is negative, indicating on average each \$10 million of retail TIF investment leads to the loss of 1.7 jobs from other zip codes. However, the final coefficient is in a statistical grey-area, in that many professionals don't consider t-ratios of -1.8 to be significant enough.

Table 2 presents the findings from the taxable sales models. Like the employment models, these models account for a large percentage of variation in the dependent variable. For brevity sake, the table does not include fixed effects for the municipalities, but just a mean

	Model 1		Model 2	
	Coefficient	t-ratio	Coefficient	t-ratio
Mean Fixed Effect	-444.9890	-1.96 **	-527.3550	-2.74 ***
Municipal Tax Rate	-2.5764	-0.31	-5.8349	-1.53
Population	0.0109	6.62 ***	0.0111	25.58 ***
Total Outside Sales	-0.0170	-3.01 ***	-0.0203	-5.19 ***
Total Outside Population	0.0004	2.37 **	0.0005	3.13 ***
Total Income	0.0048	3.04 ***	0.0047	4.79 ***
Pre TIF	-90.9462	-2.78 ***		
Pre TIF Trend	1.9240	0.92		
TIF	-2.6623	-2.58 **		
TIF Trend	0.3950	3.15 ***		
Outside TIF Trend	-0.0146	-3.79 ***		
Pre Retail TIF			-61.8237	-7.02 ***
Pre Retail TIF Trend			4.7964	7.05 ***
Retail TIF			-0.3761	-1.34
Retail TIF Trend			0.4899	18.17 ***
Outside Retail TIF Trend			-0.0249	-7.69 ***
Mean dependent var	137.9522			
S.D. dependent var	338.7997			
Adjusted R-squared	0.988684		0.988465	
F(124, 1740)	1222.847		1199.458	

Notes: Data included Missouri municipalities only.

fixed effect for all municipalities. For Model 1, measuring the impact of all TIF variables, most of the control variables are significant, with the exception of municipal tax rates, which is negative but insignificant. Increased taxable sales are associated with an increasing municipal population, an increasing regional population and increasing regional income. By contrast, municipal sales are negatively associated with sales elsewhere in the region.

Unlike the case of the employment models, there are significant differences between the impacts of all TIFs as opposed to retail oriented TIFs. The pre-TIF variables for Model 1 suggest that municipalities that are future TIF adopters have a significantly smaller level of taxable sales –\$90 million dollars on average—although the pre-TIF trend between the two groups is not different.

Additionally, the post-TIF coefficients for Model 1 suggest that TIF adopters see an initial negative impact immediately after the TIF—\$2.6 million on average—but a positive annual trend afterward—about \$400,000 per \$1 million of TIF invested. Finally, the results suggest that there is a small, but significant, negative relationship in the use of TIFs outside of a municipality. Each \$1 million of TIF elsewhere in the region on average will result in loss of about \$14,000 in municipal sales.

Model 2 shows the results on municipal taxable sales based upon just retail TIF investments. Like Model 1, they show significant differences both before and after TIF adoption. The control variables are similar to Model 1, with increasing municipal population, increasing regional population and increasing regional income associated with higher municipal sales and regional sales negatively associated with municipal sales. In terms of the pre-TIF experience, TIF adopters generally have lower taxable sales, but a sales trend that is higher than other municipalities. The post-TIF coefficients indicate that a negative, but statistically insignificant, decrease in taxable sales immediately following the adoption of the TIF,¹³ and a positive annual increase in taxable sales for TIF adopters thereafter—about \$500,000 for each \$1 million dollars invested in the retail sector. Finally, Model 2 indicates a significant, negative relationship between taxable sales and retail TIF investments elsewhere in the study area—with every \$1 million of TIF investment leading to an average loss of \$25,000 in taxable sales annually.

¹³ The negative, “first year” coefficients for the sales tax models could reflect some problem with the TIF data, probably that the TIF actually started one or two years after the official initiation of the TIF.

Discussion

In summary, this analysis provides a test of the association between TIFs and two types of local economic indicators, jobs and local taxable sales, and finds that the relationship is generally a positive relationship. In terms of employment impacts, the relationship is about 6 to 7 jobs for each \$1 million of TIF investment; for local taxable sales, each \$1 million of investment leads to an increase of about \$400,000 to \$500,000. **It should be stressed again that the methodological limitations of the study mean that these findings are associational and not indicators of causation between TIFs and job creation or local taxable sales.**

Additionally, the analysis is consistent with the perspective that TIF adoption might lead to leakage in economic activity from one area to the area, although the evidence is much stronger for taxable sales than for employment. Each \$1 million of TIF investment elsewhere in the region is associated with an average annual loss of about \$14,000 to \$25,000 in taxable sales; for employment, the annual job loss is significantly below 1 job, and only significant in terms of retail TIF investment. The differences between the leakage coefficients may reflect that taxable