TAX INCREMENT FINANCING AND ECONOMIC DEVELOPMENT

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ABSTRACT

Municipal governments use tax increment financing (TIF) as a strategy for attracting investment and promoting economic development. While research has examined the impacts of TIF, empirical evidence is mixed as findings show both positive and negative impacts of TIF on growth in property values and property tax revenue and there is not much consensus about TIF impacts on business activity and employment. This paper weighs into the scholarly debate on TIF by examining its potential impact on property tax revenue growth and job creation in neighborhoods, beyond what would have occurred without TIF. The paper is a prospective analysis that uses Monte Carlo simulation techniques and neighborhood data on employment, property values, and socioeconomic characteristics to obtain potential outcome scenarios. Results show that TIF is associated with significant growth in property values and tax revenue in TIF neighborhoods, but it has very little impact on growth in employment.

Keywords: tax increment financing; property tax revenue; employment; Monte Carlo simulation

1. Introduction

Tax increment financing (TIF) is an innovative market-based strategy for attracting investment and promoting economic development in municipalities. TIF designates an area for development and uses potential future growth in tax revenue as collateral to finance current costs of capital projects in the area. In a TIF designated area, property values are specified as "base property values" and the municipality (e.g., city) continues to receive property tax revenue from the base property values, however revenue from growth in property values above the base values (that is, the tax increment) is diverted solely towards TIF project spending and investment to promote economic development. Also, other local governments (e.g., school districts) whose tax boundaries overlap the TIF district continue to receive property taxes on the base property values, and do not receive tax increment dollars, but in the long-term after termination of the TIF project, these overlapping jurisdictions may benefit from higher property values, increased tax revenues, and new job creation in the TIF district. Appendix A illustrates how TIF works.

Proponents of TIF highlight several benefits of the financing strategy (Man 2001; Johnson). They state that TIF promotes public-private partnership as real estate developers, neighborhood groups, and local government officials work together to deal with fiscal and structural problems in the community and restructure otherwise deteriorating neighborhoods. Advocates also note that TIF is useful for correcting market failures. Market failure is the inability of private markets to achieve economic efficiency on their own, which results in suboptimal provision of capital in certain sectors or jurisdictions, but the tax incentives TIF offers may induce private capital investment and create new jobs that otherwise would not have occurred. Supporters of TIF also emphasize its self-financing mechanism as an important benefit. A TIF-adopting municipality (e.g., city) spends money on projects only after enough tax

revenues have accumulated over time in a TIF fund, and in the case of debt issuance, the municipality uses project revenues to pay off debt, therefore supporters argue that TIF does not place a fiscal burden on other governments (e.g., school districts) whose tax boundaries overlap the TIF jurisdiction.

On the other hand, critics argue that TIF is complex and costly. The TIF implementation process requires many complex steps, including redevelopment planning, site inspection, and financial feasibility assessment (Paetsch and Dahlstrom, 1990), and in the case of TIF bond issuance, projects are more expensive because interest costs on these projects embed the risk and uncertainty of future revenues, whereas other types of debt, such as general obligation debt backed by the full faith and credit of the municipality, are less expensive. Critics also note that TIF is a zero-sum game because it incentivizes businesses to relocate from other jurisdictions into the TIF jurisdiction, therefore TIF does not increase the number of new jobs available nationwide. Finally, critics argue that municipalities' use of TIF unduly constrains other local governments whose tax boundaries overlap the TIF jurisdiction (Anderson 1990). During the time that TIF projects are active, these overlapping jurisdictions receive property tax revenues on the base property values only, they do not receive tax increment dollars, yet they must spend more to cover local service costs because of redevelopment projects in the TIF jurisdiction, and while they might benefit from TIF ultimately, these benefits tend to be many years into the future.

Research on the impact of TIF on economic development outcomes is mixed. The empirical evidence shows both positive and negative impacts of TIF on property values and property tax revenue, and there is not much agreement on whether and to what extent TIF influences business activity and employment. This paper weighs into the scholarly debate about

TIF. It explores the impact of TIF on property tax revenue growth and job creation in neighborhoods, beyond the impact that would have occurred without TIF. The paper is a prospective (or *ex ante*) rather than retrospective (or *ex post*) analysis of TIF impacts. Unlike retrospective analyses, a prospective analysis specifies a range of policy parameters and alternatives and evaluates potential outcome scenarios prior to taking policy actions (Dunn 2016).

A prospective analytic frame is suitable for the study's focus on Broome County, New York. The Municipal Redevelopment Law of 1984 is the enabling law for TIF in New York. It authorizes municipalities to use future property tax revenues as collateral to finance (re)development projects but requires that municipalities demonstrate the existence of blight and show that development would not be plausible without TIF (Municipal Redevelopment Law of 1984). Despite major legal and statutory refinements in 2012 and 2016 aimed at encouraging TIF in the state, New York municipalities have been reluctant to embrace TIF, and since the establishment of the enabling law in 1984, only two municipalities (Elmsford in Westchester County; and Victor in Ontario County) have created TIF districts (Citizens Budget Commission, 2018).

We focus our prospective analysis on Broome County and present two interrelated research questions. First, which neighborhoods are more likely to adopt TIF based on criteria such as unemployment, poverty, income, and home value? Secondly, what is the likely impact of TIF on growth in property tax revenue and job creation over time in neighborhoods, beyond what would have occurred without TIF?

To address the first question, we create an index of TIF probability using neighborhood data on unemployment, poverty, income, and home value and use a threshold of the index to

assign neighborhoods as potential TIF neighborhoods and non-TIF neighborhoods. We use Monte Carlo simulation techniques to address the second research question. The technique is a probability-based scenario analysis that specifies a deterministic model of outcomes, enters parameters drawn from specified probability distributions into the model, and simulates the model under various scenarios to predict potential future outcomes.

The study uses census block group data on Broome County to gauge TIF probability and track potential impacts of TIF on property tax revenue growth and job creation. The unit of analysis is the neighborhood or block group, which is smallest unit at which data on socioeconomic variables are available (Lester 2014). Results from the prospective analysis show that TIF is associated with significant growth in property values and tax revenue in potential TIF neighborhoods, but it has very little impact on growth in employment over time beyond the impacts that would have occurred without TIF. The next section of the paper describes economic development in Broome County. Section 3 gives a brief review of the literature on TIF. Section 4 outlines the study methodology. Section 5 presents empirical results and Section 6 discusses policy implications.

2. Economic Development in Broome County, New York

Broome County is in the southern tier of the State of New York. It is close to several major metropolitan areas, including New York City and Albany in New York and Philadelphia in Pennsylvania. Broome's major city is Binghamton. The county population was 191.6 million in 2018, which is a decrease of about 4.5 percent compared to the population in 2010. As with many other municipalities in the north-eastern and mid-western states and the Great Lakes area, shrinkage of the industrial sector in the post-World War II period caused economic

decline, population loss, and urban decay in Broome County. Urban renewal efforts in the 1960s and 1970s did not sufficiently revitalize the county's economy. During the 1990s, major industrial firms such as IBM closed and laid off thousands of workers, plunging the local economy into depression.

[Table 1 here]

Table 1 shows recent economic and demographic data on Broome County. Recent efforts at revitalizing the county economy have focused on providing tax incentives to encourage capital investments and create new jobs. The county under the Start-Up NY program offers new and expanding businesses the opportunity to operate tax-free for several years on or near Binghamton University. This partnership between the state, county, university, and the private sector gives businesses direct access to university research laboratories and other technical resources and supports business innovation and expansion (Francis, 2016).

Broome County also actively engages the private sector under the Opportunity Zones Incentive. This is a community investment tool that Congress established under the Tax Cuts and Jobs Act of 2017 to promote long-term investments in low-income urban and rural neighborhoods nationwide. The investment tool targets private investors and gives them the opportunity to re-invest unrealized capital gains into dedicated opportunity funds that are linked to specific projects in the opportunity zones. Low-income census tracts with poverty rates greater than or equal to 20 percent and median family income no greater than 80 percent of the county median qualify as opportunity zones. Municipalities currently utilizing opportunity zone projects in Broome County include the City of Binghamton, Village of Endicott, and Johnson City (Broome Economic Development Agency 2018).

Like many other municipalities in New York, Broome County has been reluctant to use TIF as an economic development tool, despite the state government's efforts to encourage TIF among municipalities. The Municipal Redevelopment Law authorizes municipalities to use TIF for an array of (re)development projects, including acquisition of land, demolition and removal of structures and site preparation, construction of streets and walkways, and other public works related to drainage, parking, flood control, water and sewer, and parks and playgrounds.

3. Brief Review of the Literature

Research on TIF is not conclusive about its impacts on economic development outcomes such as property value appreciation and tax revenue growth and job creation. While some studies found that TIF has positive impacts (e.g., Anderson 1990; Smith 2006) other studies find negative impacts (e.g., Dye and Merriman 2006), but most studies find mixed results and are inconclusive (e.g., Weber, Bhatta, and Merriman 2003; Byrne 2010; Lester 2014). Earlier studies analyzed TIF at the level of the municipality, but later studies analyzed TIF at smaller levels of aggregation such as the TIF district, census tract, block group, and parcel.

Anderson (1990) studied the impacts of TIF in Michigan with the municipality as unit of analysis. The study found that cities that adopted TIF experienced more growth in property value than cities that did not adopt TIF. Similarly, Man and Rosentraub (1998) investigated TIF in Indiana at the level of the city. They found that TIF had a positive impact on growth in property values over time. Dye and Merriman (2003) shifted the unit of analysis to the TIF. They analyzed TIF districts in Chicago, Illinois and found that TIF did not have any impacts on growth in property values. Their study noted that any growth in property values in a TIF district was offset by a decline in another district, therefore there was no positive impact on growth in

property value citywide. Byrne (2010) similarly analyzed TIF impacts at the level of TIF districts and found no significant impact of TIF on economic development. The author investigated TIF districts in Illinois and showed that TIF did not significantly impact employment but TIF districts that support industrial development experience higher growth in employment compared to TIF districts that support retail development. Smith (2009) also analyzed TIF at the level of TIF districts in Chicago and found that TIF designation, along with anticipated or actual public or private investment, was associated with faster growth in the value of commercial properties.

Lester (2014) analyzed TIF at the block group level in Chicago. Because the block group is the smallest unit at which census data on socioeconomic variables are available, the study offered a unique way to track economic impacts of TIF in neighborhoods. Lester found that TIF does not influence job creation, business development, or real estate activity in a neighborhood beyond what would have occurred without TIF. In another study, Lester (2017) examined TIF impacts in Missouri neighborhoods and found more support for the evidence that TIF does not impact employment. Similarly, Stewart (2016) analyzed block groups in Baltimore City and did not find any evidence that TIF is associated with an increase in jobs. (Stewart, 2016)

Weber, Bhatta and Merriman (2003) analyzed TIF effects at the level of parcels. They analyzed industrial parcels in Chicago and found that parcels in TIF districts did not have higher property value than parcels outside TIF districts. In contrast, Smith's (2006) analysis of Chicago parcels (2006) showed a positive relationship between TIF and the value of residential property. In a similar vein, Carroll's (2008) study of parcels in Milwaukee, Wisconsin showed that infrastructure investment within a TIF district is capitalized into business property value over time. Yadavalli and Landers (2017) also examined parcel-level data and found that property values in both TIF and non-TIF districts tend to grow over time but property values in TIF

districts may grow slightly more than property values in non-TIF districts. The authors also found that TIF does not significantly influence employment growth over time. Finally, Funderberg (2018) used parcel data to estimate the impact of TIF on economic activity over time in Polk County, Iowa. The author found that TIF is associated with a significant decrease in employment.

Kriz (2001) studied TIF in Minneapolis, Minnesota using a prospective rather than retrospective analysis. The author used Monte Carlo simulation to examine the likely effect of TIF on local government financial condition. The study found that under a realistic set of assumptions about growth in property values in TIF and non-TIF districts, TIF most likely produces a net financial loss to the local government. It is only when pre-TIF growth rate of TIF properties becomes very large, and there is very low probability that development would occur without the use of TIF, that the simulations show a modest financial gain.

The present study is a prospective analysis of TIF in Broome County, New York. It contributes to the existing literature on TIF in two main ways. First, it provides a simple index-based measure of TIF probability that municipal managers can use as one of several instruments for identifying which neighborhoods are potential candidates for TIF based on characteristics such as unemployment, poverty, income, and home values. Second, our prospective analysis sheds more light on the longstanding debate about the impacts of TIF on economic development. Specifically, this paper analyzes the impact of TIF on employment, as well as the impact of TIF on property values and property tax revenue in the neighborhood. We test two research hypotheses on TIF and economic development outcomes:

H1: Tax increment financing is associated with a significant growth in tax revenue in TIF neighborhoods over time beyond what would have occurred without TIF.

H2: Tax increment financing is associated with a significant increase in employment in TIF neighborhoods over time beyond what would have occurred without TIF.

4. Data and Methodology

Data are from the US Census Bureau and Broome County financial records. The Census data cover neighborhood level information on employment, property values, and socioeconomic characteristics, whereas the Broome County financial records give information on effective tax rates and other fiscal characteristics. We also rely on previous studies to gather suitable parameters for simulation and scenario analysis. The methodology consists of two parts.

4.1 TIF Probability Index

This first part of the methodology is motivated by our first research question which seeks to determine the neighborhoods that are more likely to adopt TIF based on criteria such as unemployment, poverty, income, and home value. We derive an index of TIF probability using a linear combination of neighborhood level data on unemployment, poverty, income, and home values. We use the principal components method to compute the index. Principal component analysis (PCA) uses an orthogonal transformation to convert observations of possibly correlated variables into a single variable that depicts a linear combination of uncorrelated variables. PCA reduces the number of variables in a dataset by describing a series of uncorrelated linear combinations–or principal components–of variables that contain most of the variance in the dataset. In this orthogonal transformation, the first principal component has the largest variance, each subsequent component in turn has the next largest variance, and all the principal components combine to give a single index variable (Jackson 2003).

Equation 1 shows the basic form of the principal component method for computing the TIF Probability Index. y_{ij} are elements or index scores in the matrix **Y**. The vector $\boldsymbol{a}_i$ is a list of eigenvalues corresponding to each variable $\boldsymbol{x}_j$. In this case, $\boldsymbol{x}_j$ is a function of four variables, namely unemployment, poverty, income, and median home value. Unlike the unemployment and poverty variables, the variables measuring income and home value are expressed in their inverse forms in the linear combination of the four variables, therefore higher values of the index reflect higher levels of need and TIF probability. The number of observations is listed as *i* and the number of linearly combined variables is listed as *j*. Also, *T* depicts the orthogonal transformation of $\boldsymbol{a}_i$. The index values range between 1 and 100.

$$y_{ij} = \boldsymbol{a}_i^T \boldsymbol{x}_j + \varepsilon_{ij} \qquad i = 1, \dots, n \quad j = 1, \dots, p \tag{1}$$

We can use a specified threshold of the index to determine which neighborhoods are potential TIF neighborhoods. As an example, if we use the median value (50th percentile) of the index as a threshold, 50 percent (*f*=0.5) of the neighborhoods in the municipality will be assigned as potential TIF neighborhoods and the remaining fraction will be non-TIF neighborhoods. It is also possible to use a higher index threshold (e.g., 75th percentile)– reflecting greater need–and assign 25 percent (*f*=0.25) of neighborhoods as potential TIF neighborhoods. We analyze the likely impacts of different index thresholds in our probabilistic model of property tax revenue growth.

4.2 TIF and Economic Development Outcomes

The second part of our methodology analyzes the likely impacts of TIF on economic development outcomes. It uses Monte Carlo simulation to assess the potential impacts of TIF on property tax revenue and employment. The Monte Carlo approach is a probability-based

scenario analysis. It involves specifying a deterministic model of an outcome variable, entering random inputs sampled according to their probability distributions into the model, and simulating the model using many iterations to predict potential future outcomes. Accordingly, the outputs from Monte Carlo simulations are expressed as probability distributions, which give a better picture of potential risk scenarios and outcomes compared to point estimates.

Using the Monte Carlo method, we first simulate the impacts of TIF on growth in property tax revenues in the municipality. Equation 2 depicts the deterministic model of tax revenue growth. The model draws from Kriz (2001). Specifically, it measures the likely impact of TIF on growth in tax revenue over time beyond what would have occurred without TIF.

$$\Delta R = f\left[qV_T r_i\left(1 + g_{T,i}^{NT}\right) - q(V_D + V_{D'})\left(1 + g_{D,i}^{D}\right)\right] + (1 - f)V_T r_i\left(g_{T,i}^{T} + g_{T,i}^{NT}\right) + V_T r_i\left(g_{T,i}^{T} + g_{T,i}^{NT}\right) \quad (2)$$

R: county tax revenue resulting from changes in property values

f: fraction of the assessed value of the county that are within the TIF district

V: median assessed value (inflation-adjusted) of properties in the county

r: effective property tax rate of the county

i: index of a period

g: growth rate of assessed valuation

g_T: growth rate of properties in a TIF district if the TIF district is operational

g_{NT}: growth rate of properties that are not in a TIF district, or are in a TIF district when the TIF district is not operational

g_D: growth rate of properties that are in a TIF district that would have been developed without the use of TIF

q: probability that the properties in a TIF district would have been developed without the use of TIF.

Second, we use the Monte Carlo method to simulate the likely impact of TIF on employment. Specifically, we measure the potential impact of TIF on employment in the neighborhood beyond what would have occurred without TIF. Equation 3 shows the deterministic model of the likely impacts of TIF on employment. The model is based on Lester (2014) and Byrne (2010).

$$\ln(y_{it}) = \alpha + \beta_1 TIF_{it} + \beta_2 MTR_{it} + \delta_t + \gamma_i + \mu_{it} \quad (3)$$

y_i : employment

TIF_{it}: indicator variable distinguishing between TIF block group and non-TIF block group

MTR: municipal tax rate associated with the neighborhood

α: initial level of the outcome variable in the neighborhood

δ_t: fixed effect for each year (t)

γ_i: fixed effect for each block group (i)

5. Results

5.1 TIF Probability Index

Table 2 shows descriptive statistics of the TIF probability index and its components. The median value of the index is 17.37 which is the threshold (f=0.5) that assigns neighborhoods as TIF neighborhoods and non-TIF neighborhoods. Table 3 shows the statistical difference in means between index variables in TIF (n=102) and non-TIF (n=102) block groups. Finally, Chart 1 describes the TIF Probability Index.

[Table 2 here]

[Table 3 here]

[Chart 1 here]

5.2 TIF and Economic Development Outcomes

Monte Carlo simulations of the property tax revenue model in Equation 2, after 100,000 iterations, reveals that TIF is potentially associated with significant growth in tax revenue over time for the county. Chart 2 shows the probability curve for the likely tax revenue outcome. Specifically, the mean increase in tax revenue growth over time is 9.5 percent and there is a 95 percent probability that the mean growth in tax revenue will lie between 7.5 and 12.2 percent This result is based on the median index threshold that assigns 50 percent of neighborhoods in the county as potential TIF neighborhoods.

In Chart 3, we show the model input parameters ranked by their impact on the output mean. The chart shows that the parameter q, which gauges the probability that the properties in a TIF district would have been developed without the use of TIF, has the largest impact on the output mean. This is followed by the parameter f, which is the fraction of the assessed value of the county that are within the TIF district, and the parameter $g_{T,}$ which represents the growth rate of properties in a TIF district if the TIF district is operational. Chart 4 shows the potential response of property tax revenue if the index threshold changes from the median value (f=0.5) to the level of the 75th percentile (f=0.25). Charts 5 and 6 show the potential response of property tax revenue when there are shocks arising from a change to q and g_T, respectively.

[Chart 2 here]

[Chart 3 here]

[Chart 4 here]

[Chart 5 here]

[Chart 6 here]

Monte Carlo simulation of the employment model in Equation 3 shows that TIF has very little impact on potential growth in employment in neighborhoods beyond what would have occurred without TIF. Chart 7 shows the probability curve associated with potential employment effects. The mean growth in employment is 0.57 percent and there is a 95 percent probability that the mean growth in employment will lie between -0.99 and 1.76 percent. Chart 8 shows the model input parameters ranked by their impact on mean growth in employment. The chart shows that the model input with the largest impact is the initial level of employment, followed by the marginal difference in growth between TIF and non-TIF neighborhoods, and the municipal tax rate, respectively. Charts 9 and 10 describe the potential response of employment to shocks emanating from the marginal difference in growth between TIF and non-TIF neighborhoods and the marginal tax rate, respectively.

[Chart 7 here]

[Chart 8 here]

[Chart 9 here]

[Chart 10 here]

6. Conclusions and Policy Dimensions

This paper is a prospective analysis on TIF in Broome County, NY. The analysis examined two research issues. First, it analyzed which neighborhoods are more likely to adopt TIF based on

factors such as unemployment, poverty, income, and home value. By generating an index of TIF probability, the paper presents a simple quantitative instrument for gauging potential for TIF use in neighborhoods. More importantly, the paper analyzed the likely impacts of TIF on economic development outcomes. We find that TIF is associated with significant growth in property values and tax revenue in TIF neighborhoods, beyond what would have occurred without TIF, however, TIF has very little impact on growth in employment over time. These findings support earlier work that find limited impacts of TIF on business activity and employment creation over time. Our analyses present a prospective framework for municipal policymakers to consider effective ways to combine tax increment financing with supportive property tax policy–such as changing municipal tax rates and/or providing subsidies to private investors–to boost economic development over time.

Selected References

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TABLE 1
Economic and Demographic Data on Broome County, 2018

	Broome County	NY	US
Population (per square mile)	284.2	411.2	87.4
Population (percent change, 2010-2018)	-4.5	0.8	6.0
Total employment (annual percent change)	-0.3	2.2	2.1
Unemployment rate (%)	4.2	4.0	4.1
Persons in poverty (%)	17.5	14.1	12.3
Median household income ($)	49,064	62,765	57,652
Median home value ($), owner occupied	113,000	293,000	193,500

Source: US Census Bureau (2019)

TABLE 2
Block Group Data on Broome County, 2018

	Mean	SD	MED	MIN	MAX
Unemployment rate (%)	4.36	3.78	3.77	0.00	21.74
Poverty rate (%)	17.23	3.20	17.10	11.78	23.14
Median Income ($)	49,166.72	9,312.55	50,162.80	32,984.55	65,126.69
Median Home Value ($)	113,159	21,982	113,957	76,200	149,996
TIF Probability Index	20.06	17.37	17.36	0.00	100.00

Note. Number of block groups is 204. TIF Index is calculated using information on unemployment rate, poverty rate, median income, and median home value in the neighborhood or block group. Block group data is from the U.S. Census Bureau.

TABLE 3
Descriptive Statistics for TIF and Non-TIF Block Groups

Variable	TIF Block Groups		Non-TIF Block Groups		t-test for equality of means	
	Mean	*SD*	*Mean*	*SD*	*Mean Diff*	*SE Diff*
Unemployment rate (%)	7.18	3.35	1.54	1.19	5.63***	0.35
Poverty rate (%)	19.96	1.70	14.50	1.60	5.46***	0.23
Median Income (%)	41204	5030	57129	4577	-15925***	673
Median Home Value (%)	93936	10739	132382	10462	-38447***	1484
TIF Potential Index (%)	33.01	15.40	7.10	5.49	25.92***	1.62

Note. Number of TIF block groups is 102 and number of non-TIF block groups is 102.
*** $p<0.01$, ** $p<0.05$, * $p<0.1$

CHART I
TIF Probability Index

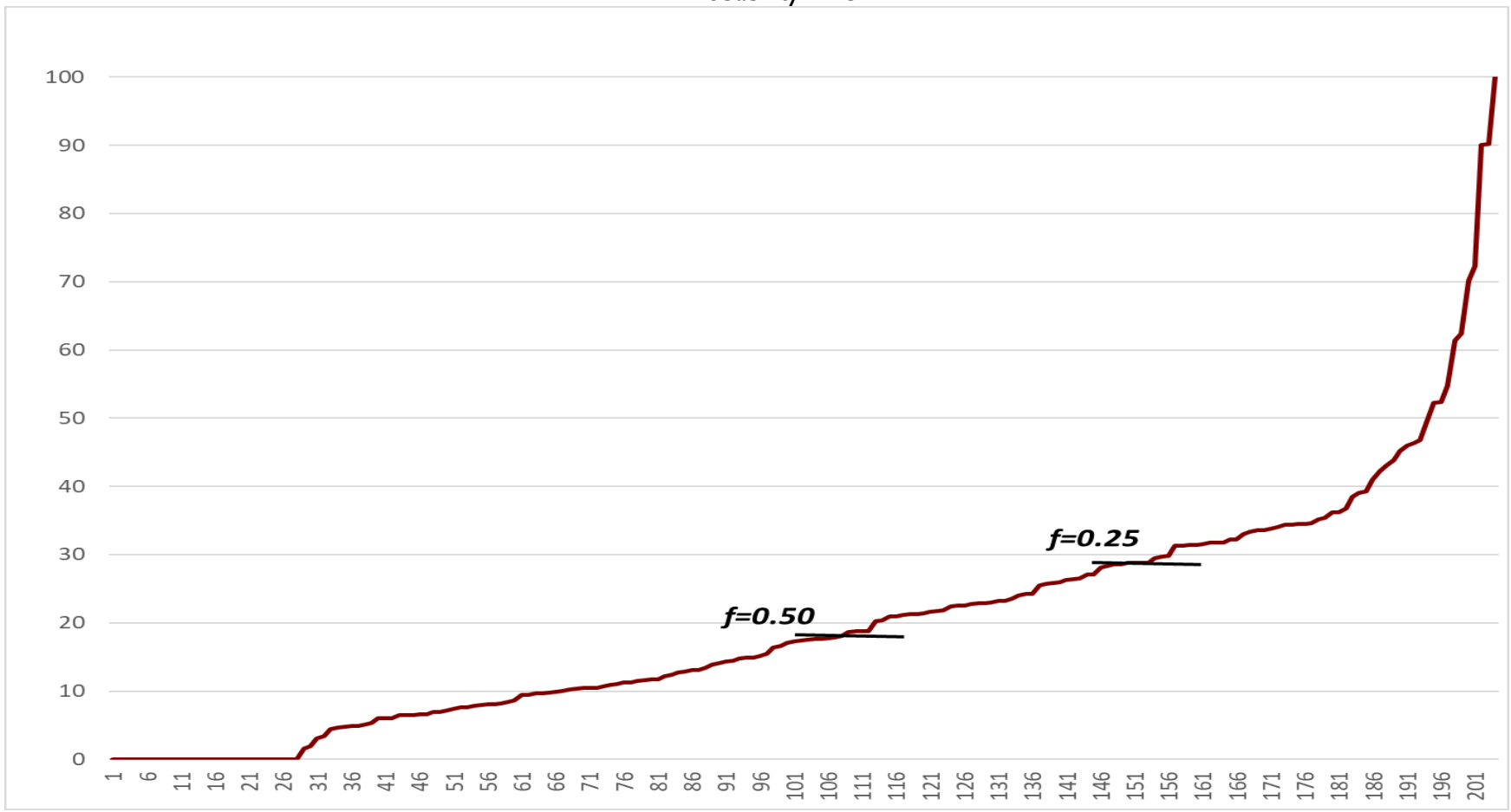


CHART 2

Potential Impact of TIF on Real Tax Revenue Over Time

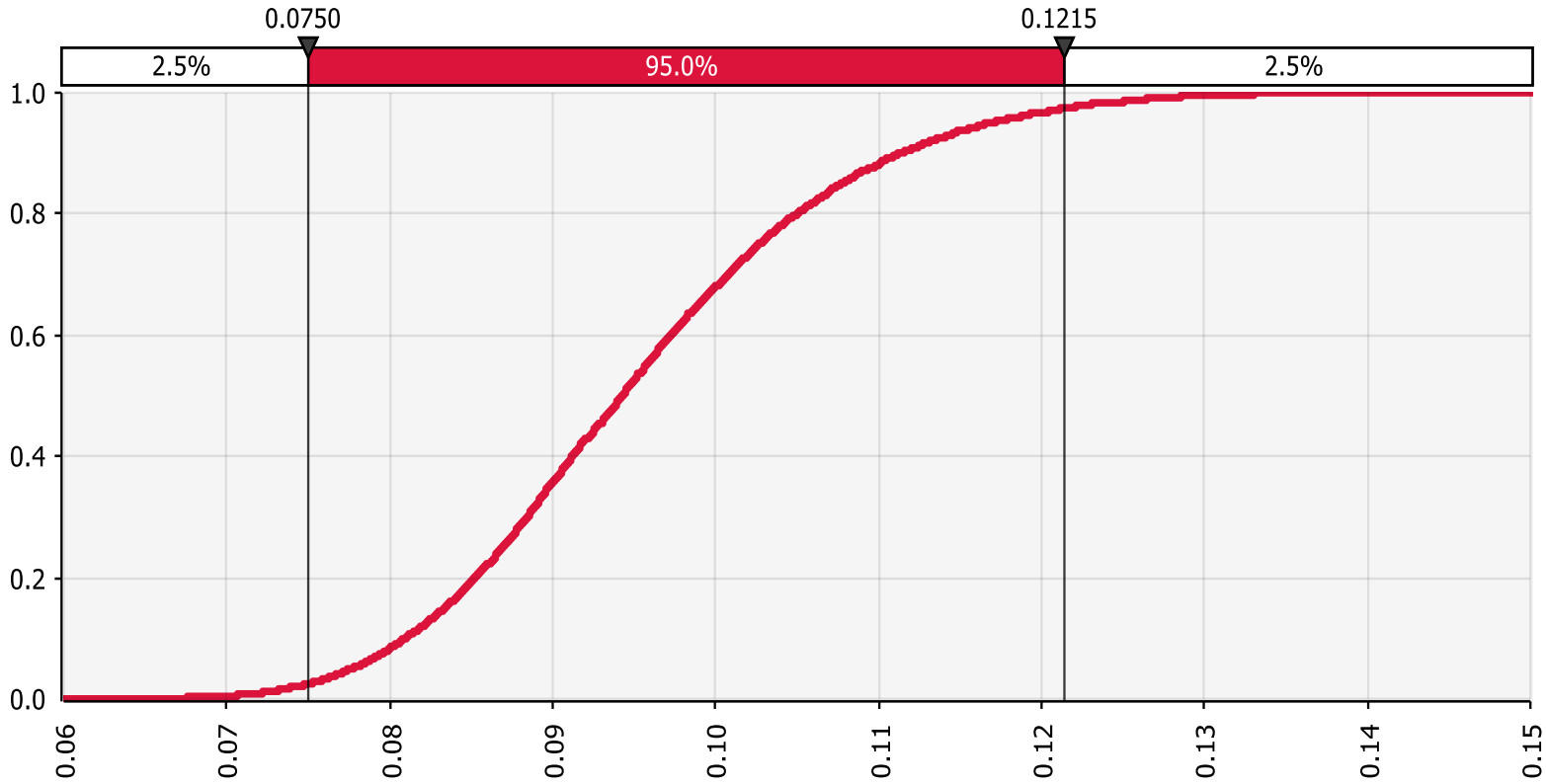


CHART 3

Ranking of Revenue Model Inputs Based on their Effect on Output Mean

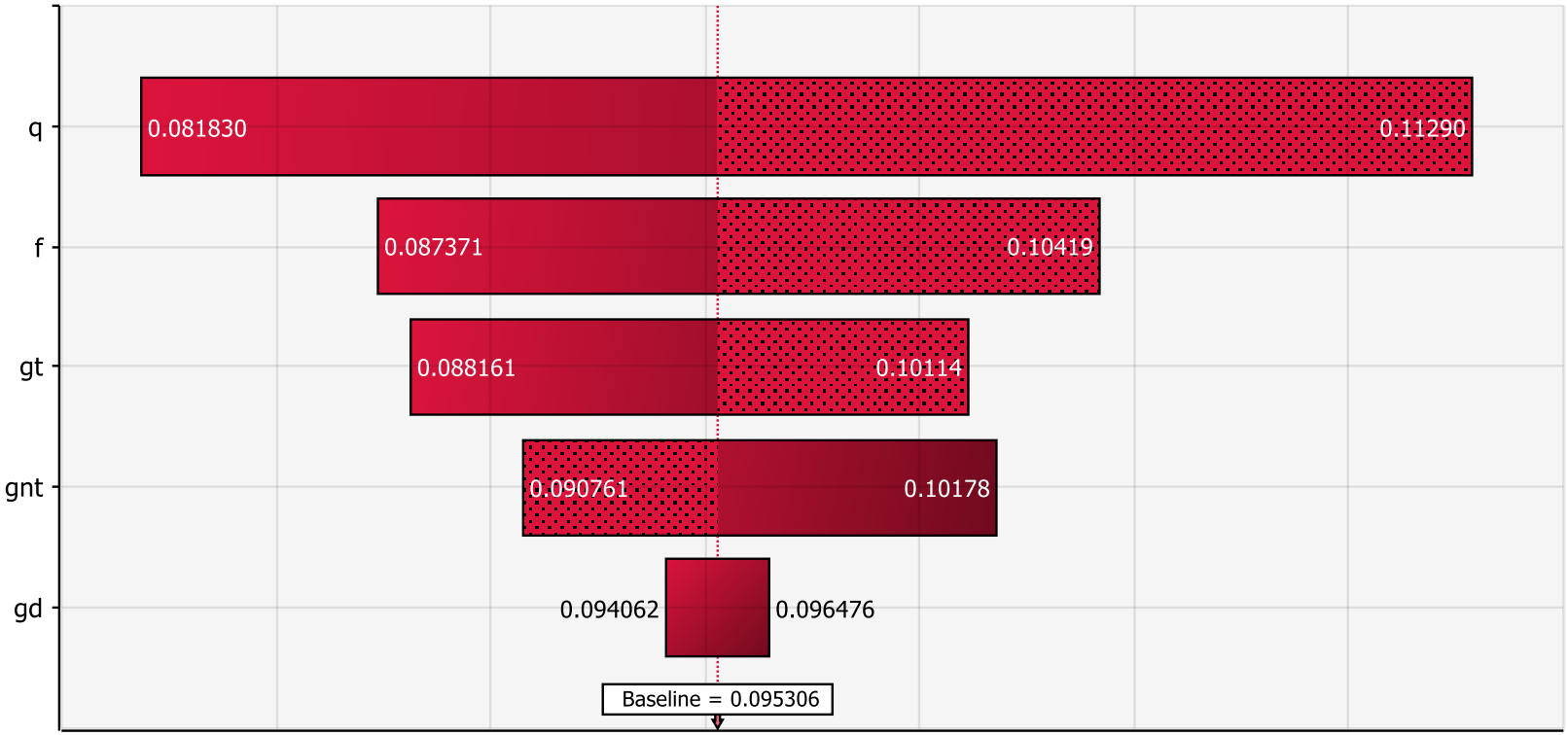


CHART 4

Potential Impact of a Change in the Fraction of Assessed Value of the County that are within the TIF District

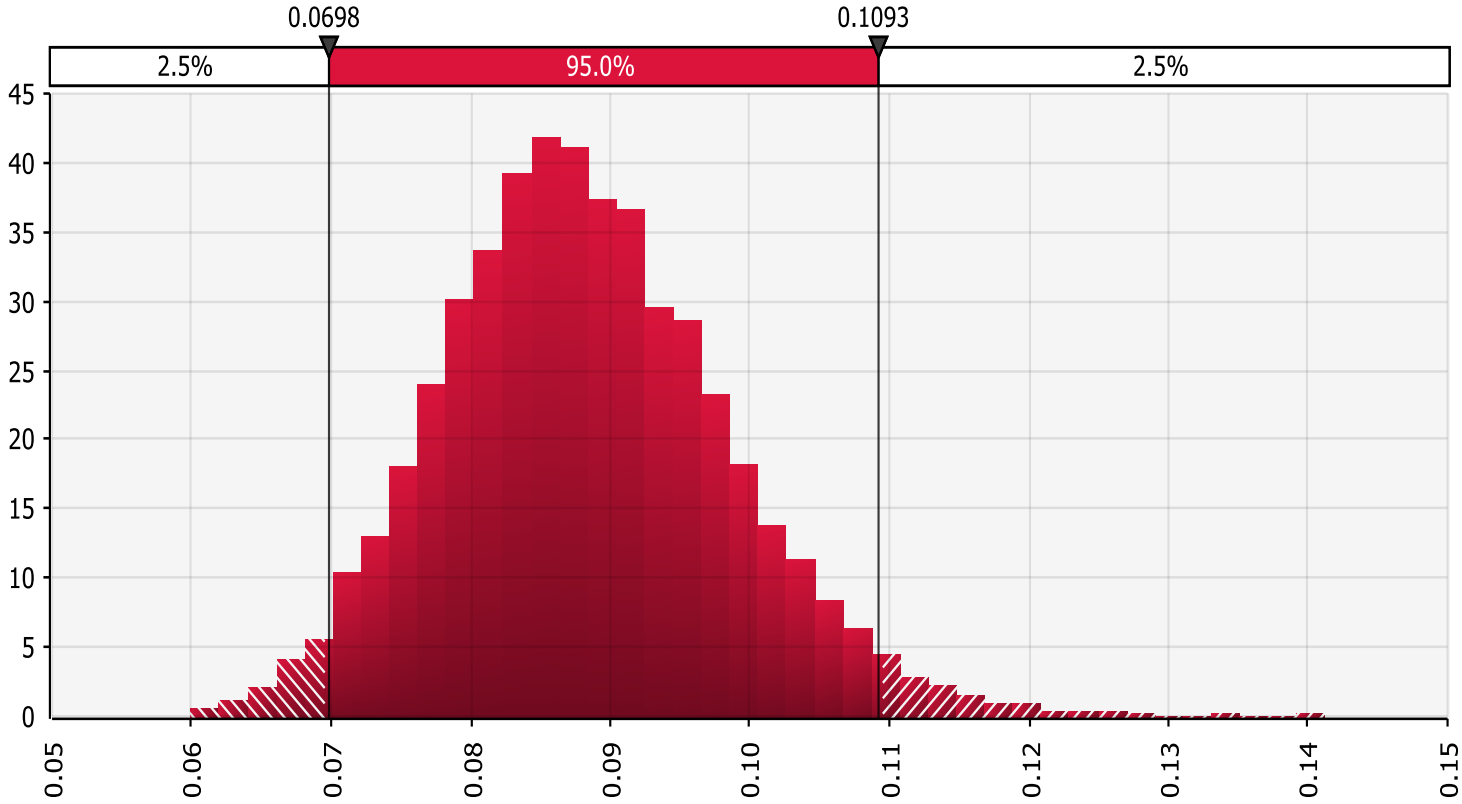


CHART 5

Sensitivity of Revenue to Model Input *q*

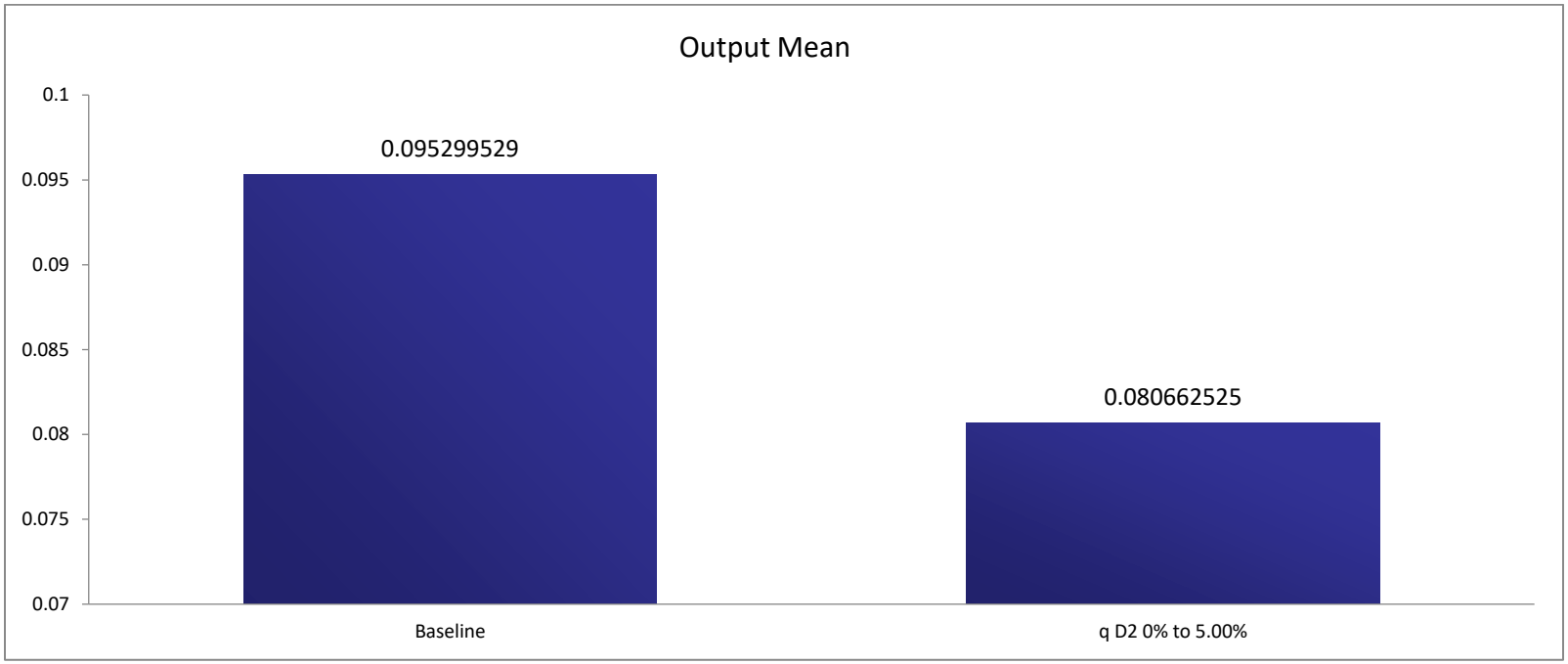


CHART 6

Sensitivity of Revenue to Model Input g_T

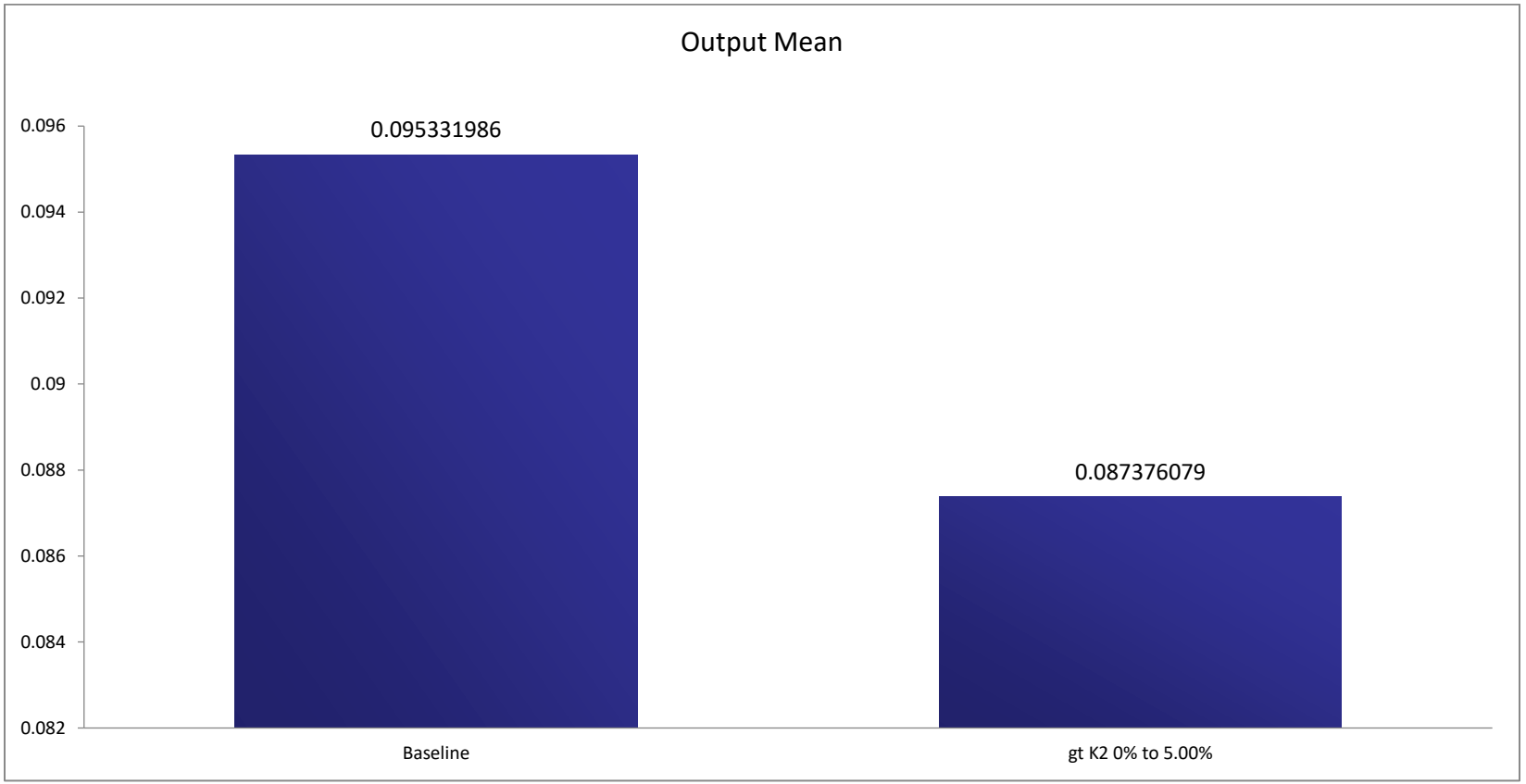


CHART 7

Potential Impact of TIF on Employment Growth Over Time

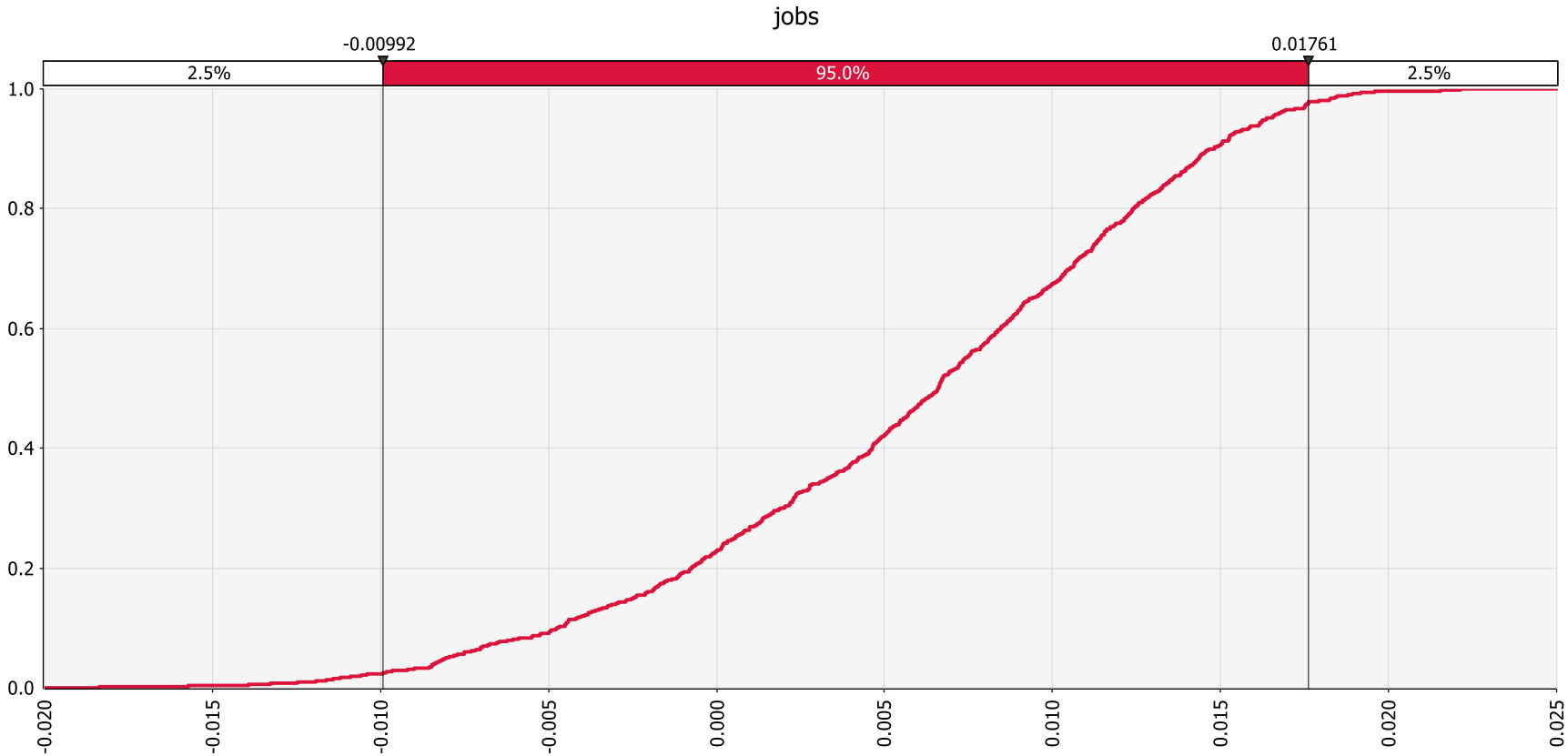


CHART 8

Ranking of Employment Model Inputs Based on their Effect on Output Mean

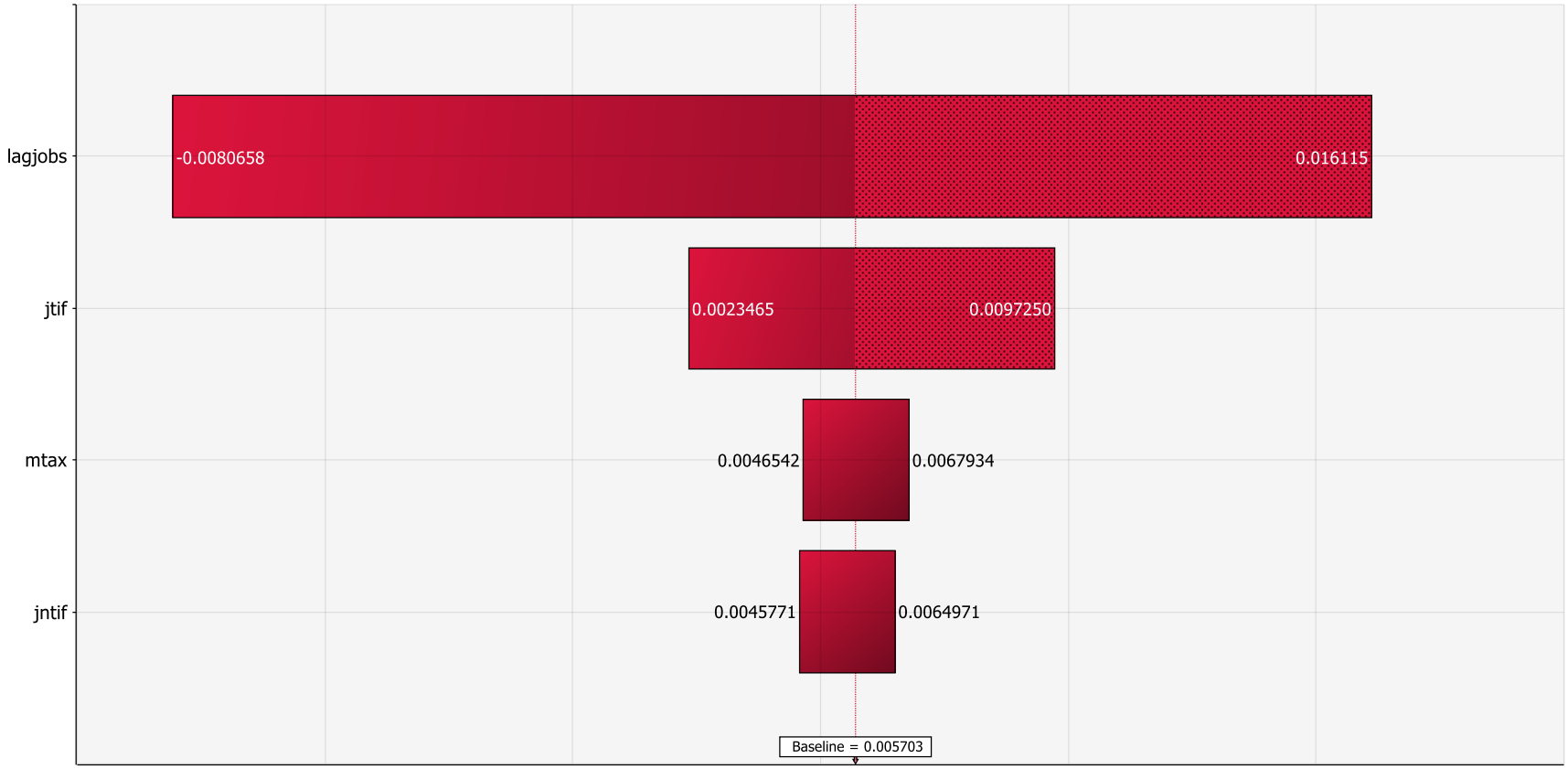


CHART 9

Sensitivity of Employment to the Marginal Difference in growth between TIF and non-TIF Neighborhoods

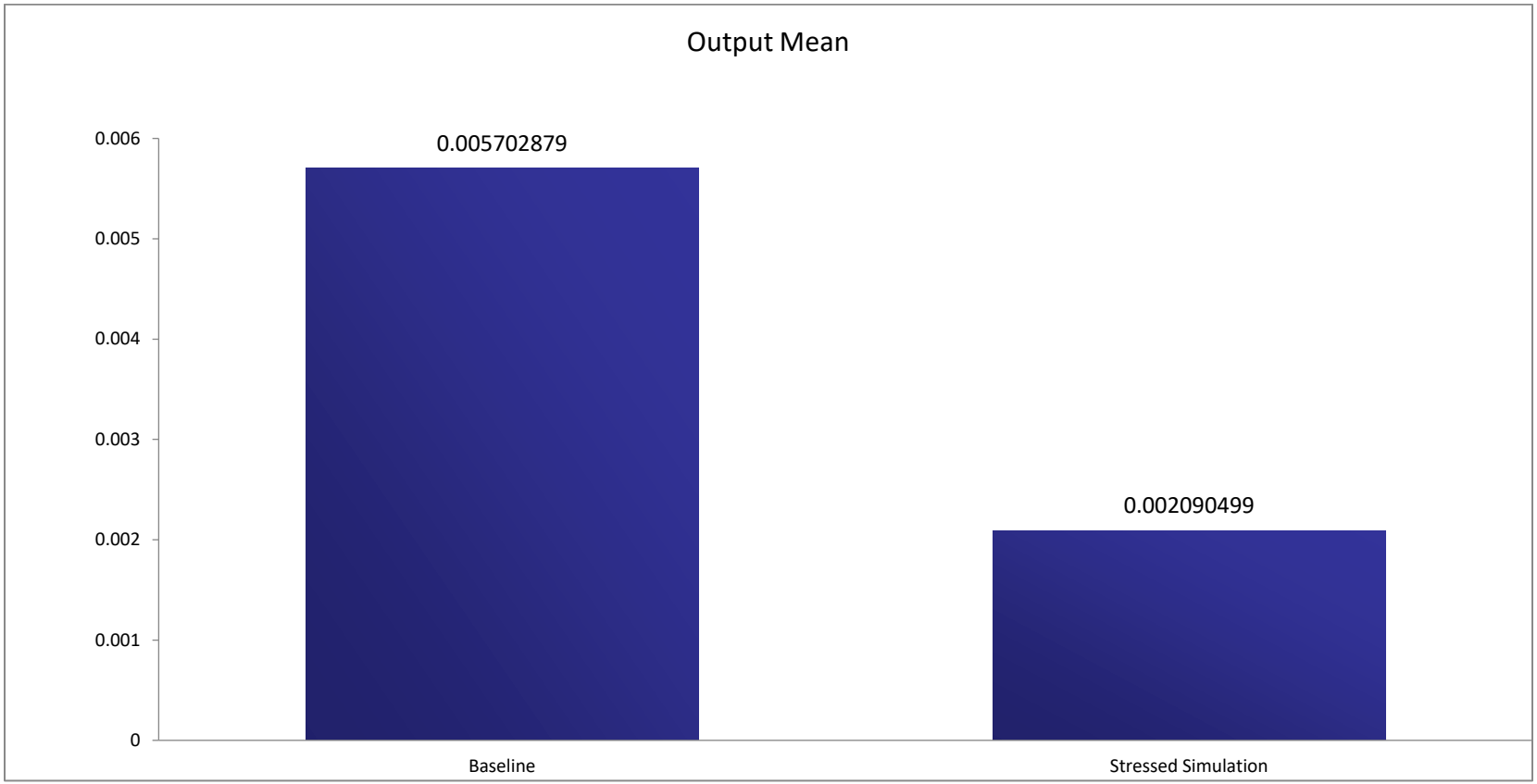
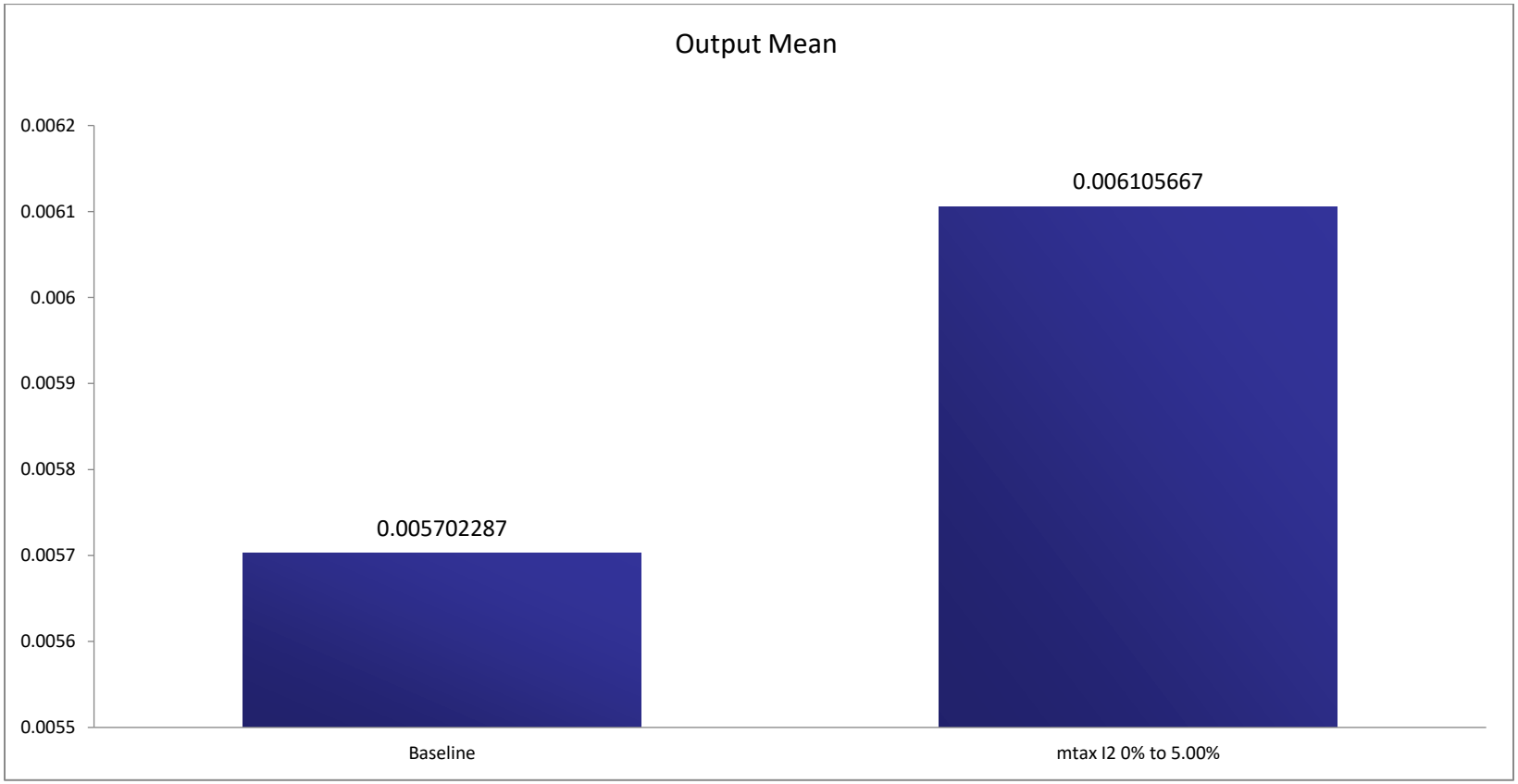


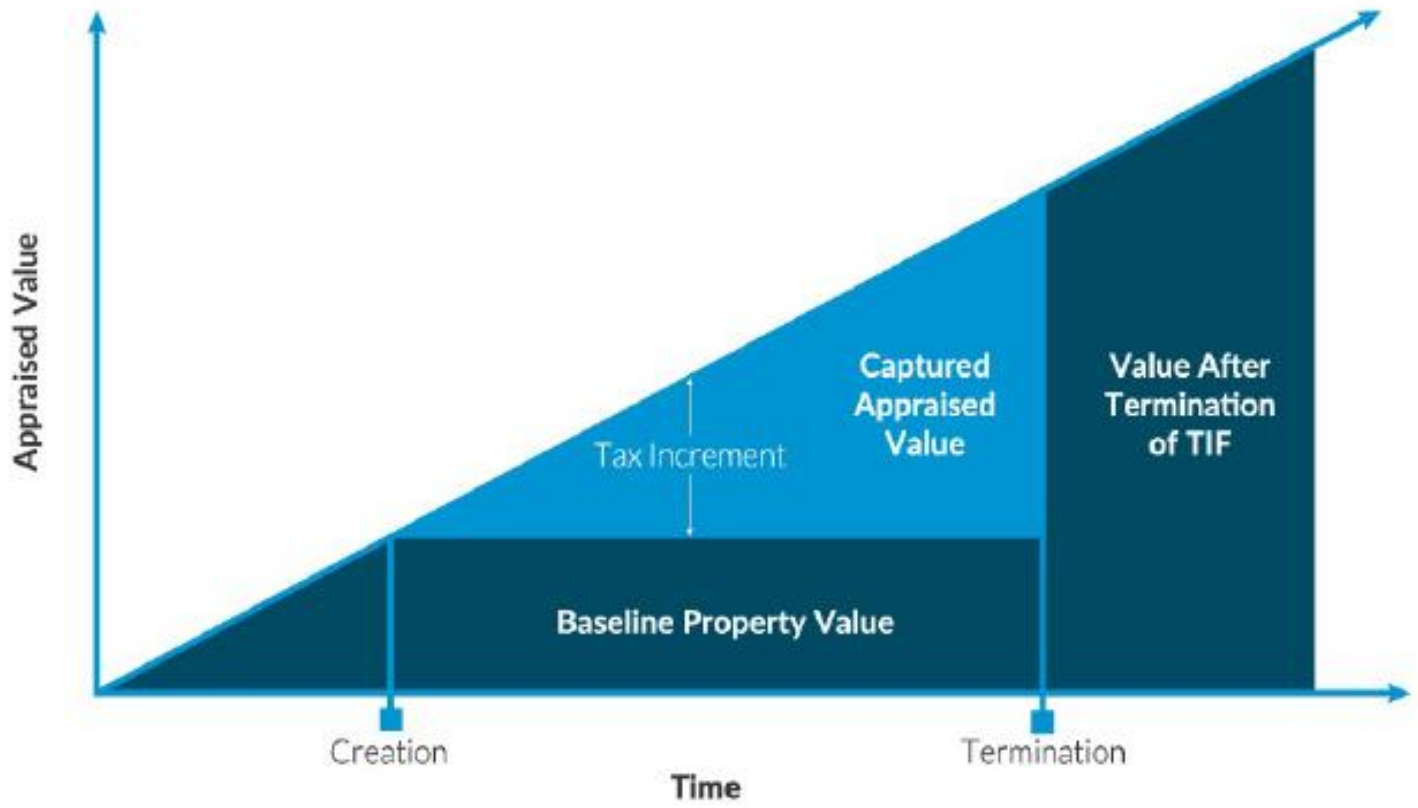
CHART 10

Sensitivity of Employment to Municipal Tax Rate



APPENDIX A

How Tax Increment Financing (TIF) Works



Source: Citizen's Budget Commission (2017)