The Economic and Fiscal Impacts of Property Tax Abatement in a Large County

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We analyze the economic and fiscal effects of two major property tax abatement programs – Community Reinvestment Areas (CRAs) and Enterprise Zones (EZs) – in Franklin County, Ohio. Using panel-data regression analysis, we find that a one percentage point increase in a school district's CRA or EZ abatement intensity correlates with: (1) a 2.7 percent decrease in a school district's mill rate for real property, (2) a 0.9 (0.7) percent decrease in effective residential (non-residential) property tax rates, and (3) a 1.6 percent increase in the total market value of property in the school district. While small, any reduction is arguably a positive outcome since tax incentives have generated enough growth in property values to offset the immediate drop in the tax base from an abatement, and thus avoid a tax shift to non-abated properties. We detail the restrictions and oversight used in these abatement programs that are greater than what used in most other places in the United States. We posit that this may be the reason for the desired outcome found.

Keywords: property tax abatement, tax incentive, economic development, property tax

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Introduction

State and local governments in the United States use a variety of tax incentives to attract and retain business investment, create jobs, reduce blight, and pursue other economic and fiscal goals. Bartik (2017) estimates that throughout the United States in 2015, these incentives totaled about $45 billion. Given this extensive use, evaluating their efficacy is important. While a tax incentive offered by a jurisdiction has the potential to promote or retain economic development within a jurisdiction, if in fact the economic development would have occurred without the tax incentive, the jurisdiction has given away tax revenue unnecessarily. Such foregone revenue reduces local funds available for public services or requires their replacement with increased taxes or fees. To mitigate the degree of foregone revenue due to tax incentives, most states now require some form of state-level review of their use (Pew Charitable Trusts 2017). The work of Good Jobs First – a self-described watchdog group – is an example of this trend toward increased public scrutiny of tax incentives for economic development (Tarczynska 2017).

When a business expands in a jurisdiction and receives a tax incentive, would it have done so without the incentive? The challenge for evaluating the effectiveness of tax incentives is that the counterfactual cannot be observed. This study is an attempt to answer the question just posed through regression analysis using recent panel data from two Franklin County (OH) geographical units (school districts and Census tracts).[1] Specifically, we test whether the greater use of property tax abatement within one of these geographic units increased the market value of property (a desired economic impact) and/or decreased its property tax rate (a desired fiscal impact).

Although previous research exists on the economic and fiscal impacts of local economic development incentives, the evidence remains less than decisive. Much of that research has focused on tax increment finance, enterprise zones, or federal empowerment zones (e.g., Greenbaum and Landers 2014, Bondonio and Greenbaum 2007, Hanson and Rohlin 2011, Hanson and Rohlin 2017). Our research offers another contribution to this policy-relevant literature. Our focus is on determining the influence of

[1] In 2017, Census estimates placed Franklin County as the most populous county in Ohio. Franklin County is home to Columbus, which is the capitol of Ohio.

property tax abatements, but we also control for the separate influence of Job Creation Tax Credits (JCTC). Property tax abatements and JCTCs made up more than 70 percent of total state and local government incentive costs in 2015 (Bartik, 2017).

The remainder of this paper contains sections devoted to background information on property tax abatement in Ohio and Franklin County, the expected economic and fiscal impacts of abatement, a summary of some of the previous empirical research on the efficacy of abatement, a description of the regression model and data used, panel-data regression results, and policy implications from our findings.

Property Tax Abatement in Ohio and Franklin County

Although both states and localities in the United States have made strides in recent years to fuller transparency on their use of tax incentives, evaluation and disclosure practices vary considerably. Connolly and Bell (2011) found only 18 states that included property tax expenditures in their tax expenditure budgets, with Ohio not being one of them. Ohio does, however, subject local property tax abatements to annual evaluation and it is one of only two states (along with New York) in which a state agency discloses data on local property tax incentives online. For each Enterprise Zone (EZ) and Community Reinvestment Area (CRA) abatement, the Ohio Development Services Agency (ODSA) publishes performance data, cost data, and an annual report by Tax Incentive Review Councils (TIRCs). TIRCs are state-authorized, local commissions that annually evaluate each property tax abatement offered and make a recommendation for or against its continuance (Tarczynska 2017, Kenyon *et al.* 2017). ODSA's disclosure of data, and TIRC findings for local property tax abatements, earned Ohio a fourth-place ranking for disclosure among the states studied by Good Jobs First (Tarczynska 2017).

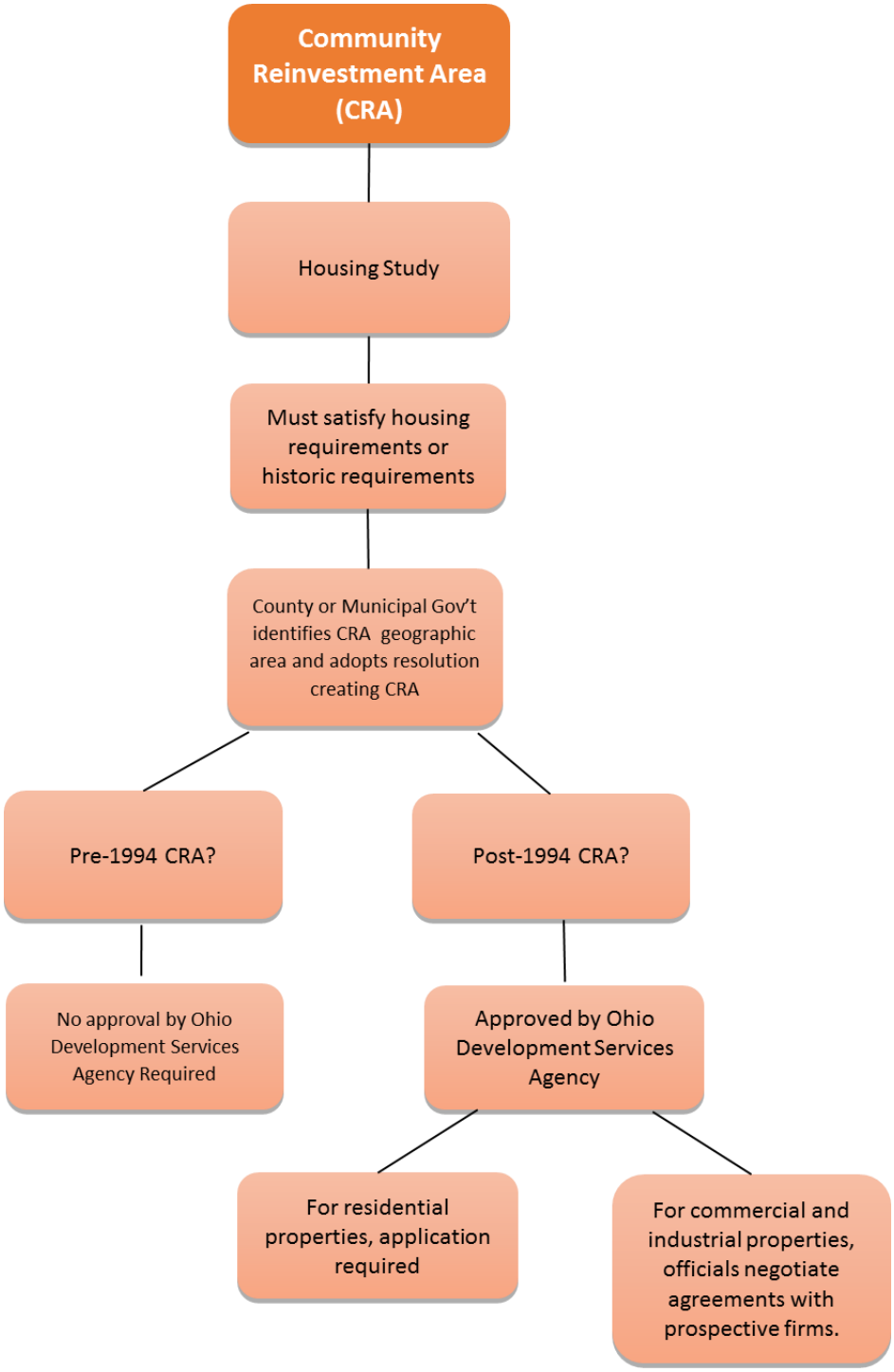
Community Reinvestment Areas (CRAs)[2] in Ohio provide tax exemptions to property owners who construct or make improvements to their residential, commercial, or industrial property in specific geographic areas. After public notification of intent, a city council or county commission may adopt a resolution establishing a CRA within its boundaries. To establish a CRA, the municipality or county must

[2] See Ohio Rev. Code § 3735.65 through 3735.70.

find that "the area included in the description is one in which housing facilities or structures of historical significance are located and new housing construction and repair of existing facilities or structures are discouraged" (Ohio Rev. Code §3735.65 (B)). The original intent of CRA abatement was property tax relief for construction or remodeling of housing, but most of the current tax savings under CRA now goes to industrial and commercial development.

Ohio offers two distinct types of CRAs (see Figure 1). CRAs granted before 1994 required no Ohio Development Services Agency (ODSA) approval and still exist. The individual tax abatements offered under these are time-limited and will eventually run out, although in 2015 most tax savings from CRA abatements in Franklin County still occurred in pre-1994 zones. For CRAs established after 1994, the state must approve establishment of a CRA zone. If the desired project is residential, the property owners can apply for an abatement, and a housing officer, chosen for the specific CRA, then determines if the property meets specified requirements. If property granted abatement under a post-1994 CRA is for commercial or industrial use, the municipality or county must enter into a written agreement with the business entity that requires approval by its legislative authority, and in some cases, overlying school districts (Ohio Development

Figure 1: Approval Processes for Community Reinvestment Areas



Note: Although pre-1994 CRAs still exist, it is no longer possible to create pre-1994 CRAs.

Sources: Ohio Rev. Code § 3735.65 ~ § 3735.70; Ohio Rev. Code § 5709.61 ~ § 5709.69; County Commissioners Association of Ohio (2016); and DeWine (2014).

Services Agency 2012). The starting requirement for the granting of a business CRA is a promise from the firm receiving it to generate new or retained jobs, increased payroll, and/or new investment.

Enterprise zones (EZs)[3] offer non-residential property tax exemption on new real property inside the zone's perimeter, and allow a firm to qualify for a reduction in the corporate franchise tax.[4] In practice, Ohio's EZs are not geographically targeted and often encompass nearly an entire city. Once a zone is certified, a municipality or county can enter into agreements with qualifying enterprises for incentives tied to investment and hiring. Inside a municipality, the maximum exemption from property taxation is three-quarters of the assessed value for up to 10 years, or an average of 60 percent over the term of the enterprise zone agreement. In the unincorporated area of the county, the maximum exemption is 60 percent of the assessed value of the property for up to ten years, or an average of 50 percent over the term of the enterprise zone agreement. EZs have provided exemption from taxation on both real and tangible personal property, and a reduction in the corporate franchise tax. However, Ohio's 2005 tax reform eliminated the tangible personal property tax and included a phase out of the corporate franchise tax. These changes have likely contributed to the slowdown in EZ adoption (County Commissioners Association of Ohio 2016). Of the $65.4 million in tax savings from Franklin County CRA and EZ abatements in 2015, 52 percent were in pre-1994 CRA zones, 38 percent were in post-1994 CRA zones, and only 10 percent were in EZs. Although most abated properties are residential, most of the tax savings from CRAs and EZs go to industrial properties, which on average receive annual tax savings of $228,675 per parcel.

Table 1 offers a concise summary of the differences between Ohio's residential and non-residential CRA abatement programs, and abatements granted through its EZ Program. An important feature of Ohio's property tax abatement program – which may contribute to the empirical findings recorded here – is the statutory requirement for using local Tax Incentive Review Councils (TIRCs).

[3] See Ohio Rev. Code § 5709.61 through 5709.69.
[4] The only exception to the requirement of exemption for new construction is for large manufacturing facilities or properties in a brownfield site (County Commissioners Association of Ohio 2016, 33).

Given the recent greater push for transparency and review of tax incentives throughout the United States, it is notable that all agreements for commercial and industrial property tax abatements for post-94 CRAs or EZs are subject to annual TIRC review. The TIRC annually audits the companies receiving property tax abatements in the jurisdiction it oversees to evaluate success at reaching their job, payroll, and/or investment promises established at the beginning of the agreements. These councils then recommend continuation, modification, or cancellation to the local government body originally approving the tax incentive agreement. Although this seems reasonable, it is not something widely practiced in other states.

Figure 2 shows the value of property abated through Community Reinvestment Areas (CRAs), Enterprise Zones (EZs), and Tax Increment Finance (TIFs) as a percent of total assessed property value in Franklin County from 1986 to 2015. CRA exempt value, as a percent of total assessed value, rose from 1986 to 2009, and then fell – equaling less than two percent in 2015. The value of property abated through "EZs and other" was well under one percent of total assessed value in the county for all years. Tax increment finance (TIF) is the most used form of property tax abatement in Franklin County. Until 1997, TIF accounted for a very small proportion of total assessed value; after that year, it increased markedly. In Franklin County, about two-thirds of all property tax revenue collected flows to school districts. Thus, in the absence of school compensation agreements, school districts bear much of the burden from any declines in property tax revenues due to tax abatements.[5,6]

[5] Both CRA and EZ legislation have complex language authorizing city or county officials to enter into agreements that compensate school districts for lost revenue from the granting of tax abatements.
[6] Ohio does not classify TIF as a tax exemption. Ohio documents often refer to TIF in Ohio as an abatement, but in practice TIF does not work like an abatement since the business still pays "service fees" that are equal to what they would have paid in property taxes.

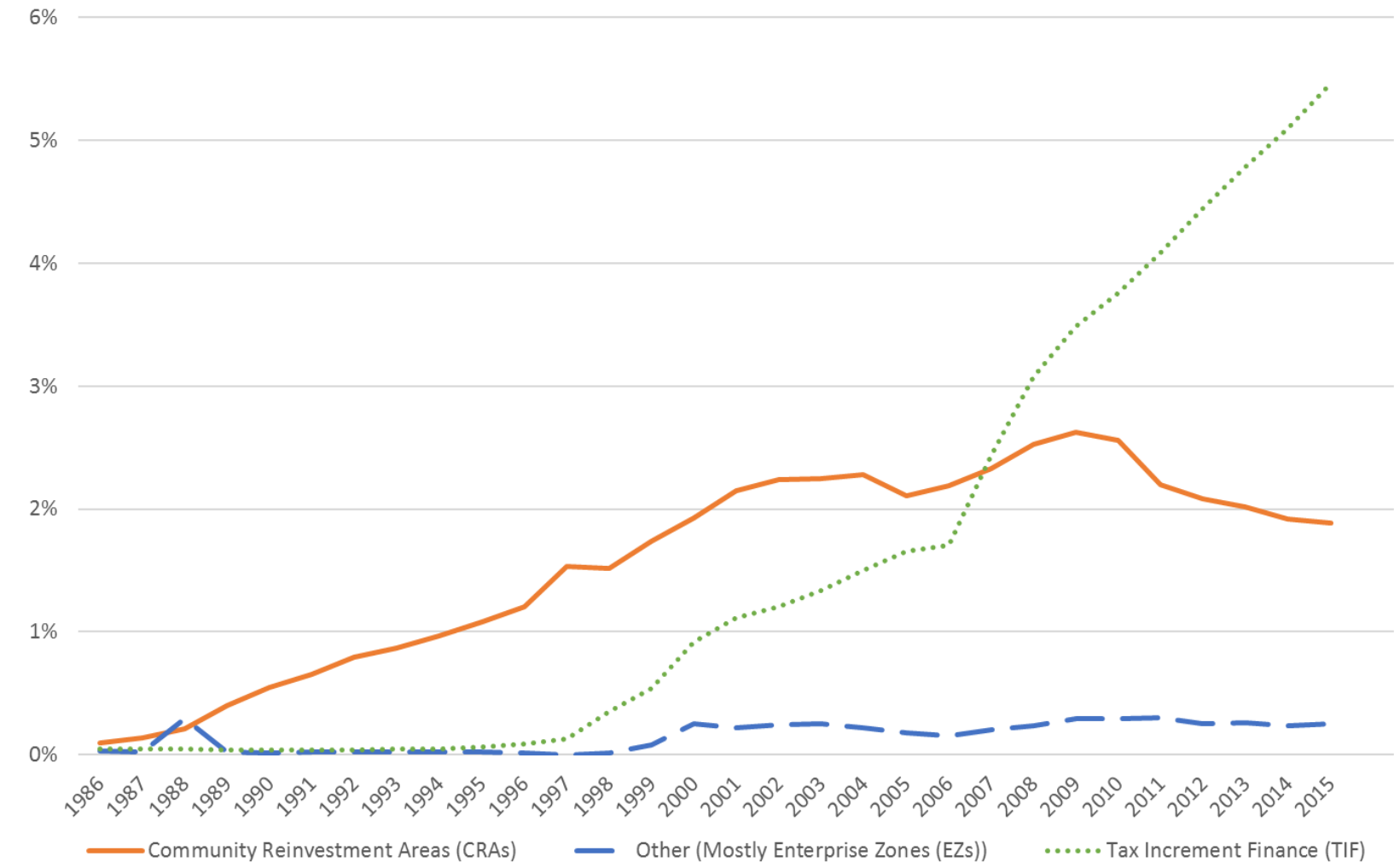
Table 1: Property Tax Abatement Program Comparison

	Community Reinvestment Areas (CRAs)		Enterprise Zones (EZs)
	Residential	Commercial or Industrial	
Purpose	Revitalize housing stock, construct new housing	Retain or attract companies which generate investment and/or provide jobs	Retain or attract companies which generate investment and/or provide jobs
Industry Focus	Housing	Commercial or Industrial	Commercial or Industrial
Requirements	Housing structures or structures of historic significance are located; new housing construction and housing repair are discouraged		Minimum population (all EZs); satisfy distress criteria (full authority EZs only)
Local Government Authority	Established by municipalities or counties	Established by municipalities or counties	Established by municipalities or counties
Incentive Granted	Tax abatement of assessed value of newly remodeled or constructed property; always 100% abatement for pre-1994 CRA, up to 100% abatement for post-1994 CRA	Tax abatement of assessed value of newly remodeled or constructed real property; always 100% abatement for pre-1994 CRA, up to 100% abatement for post-1994 CRA, depending upon school board approval	Up to 100% abatement of assessed value of real property first used at project site because of agreement; abatement of personal property and reduction in corporate franchise tax liability much reduced by 2005 OH tax reform.
Term of Incentive	Up to 15 years	Up to 15 years	Up to 15 Years
Administered by	Housing officer and housing council (designated by local legislative authority)	Same as for residential CRA but approval of written agreement required if post-94 zone	Enterprise zone manager
Ongoing Monitoring by	No Tax Incentive Review Council (TIRC) review	Tax incentive review council (TIRC) which annually reviews compliance with tax exemption agreements and recommends continuation, modification, or cancellation of each agreement to municipal or county legislative body. One member of each TIRC must be from the relevant school board.	
Role of School Boards	Notice to school board required	Notice to school board required; school board approval required for post-1994 CRA if exemption > 50%	Without school board approval maximum abatement of 75%; with approval, 100%
Relocation of Jobs from Another OH Location	NA	Notice to municipality losing operations and to ODSA required	Notice to and waivers from ODSA required
Zone Amendments	Possible to amend pre-1994 CRA zones twice, but with a 3rd amendment the CRA becomes subject to post-1994 rules		Allowed, to change boundaries of EZ zone
Clawbacks	NA	Option to include clawback provision in individual agreements	Option to include clawback provision in individual agreements
Revocation of Incentive Agreements	Possible if not maintained or repaired as determined by housing officer	Possible if company has not met obligations in CRA agreement	Possible if company has not met obligations in EZ agreement

Note: Ohio Development Services Agency = ODSA. Sources: State Statute; DeWine 2015; Ohio Development Services Agency 2016; County Commissioners Association of Ohio 2016.

Figure 2:

Percentage of Franklin County Real Property Assessed Value by Class of Abatement, 1986-2015



Source: Ohio Department of Taxation

For the desired analysis, we must also consider two other forms of tax incentives available in Ohio. The first is Environmental Protection Abatements (EPA) that promote brownfield development. These are relatively minor in scale (only about one-fiftieth of the use of CRA/EZ abatements), but included here for comprehensiveness. The other is Job Creation Tax Credits (JCTCs) which allow refundable credits against state individual income tax, corporate income taxes, and/or the insurance premiums tax. The Ohio Tax Credit Authority governs the offering of a JCTC abatement. Eligible business owners must demonstrate that the project will create/retain jobs, is economically sound, and that the incentive is a major factor in the decision to go forward with the project. Agreements spell out: (1) the incentive duration (up to 15 years), (2) the requirement to operate at the location for at least seven years or three years after the end of the incentive (whichever is greater), (3) the benefit amount of the tax credit (which can vary between 50 and 75 percentage of a firm's new or retained payroll), (4) annual reporting requirements, (5) compliance requirements including a clawback provision, and (6) a provision restricting relocation of jobs within the state to meet job targets.[7]

Finally, as reported by the City of Columbus (2016), it is worth noting the annual taxes forgone for economic development purposes by Franklin County's largest jurisdiction.[8] Job Creation Tax Credits (JCTCs) accounted for the most revenue abated away ($872,172 of income taxes foregone), followed by CRAs ($827,969 of property tax revenue forgone) and EZs ($211,932 of property tax revenue forgone). Given an operating budgeting of just over $1.7 billion for the City of Columbus in 2016, these abated tax revenues are relatively small, another fact worth noting when considering the empirical finding reported here.

[7] As of March 2017, Franklin County had 114 active JCTC agreements that claimed to represent $652.5 million in investment, 12,462 new jobs, and 14,267 retained jobs (Ohio Development Services Agency 2017a and 2017b).
[8] This was in response to the new Governmental Accounting Standards Board (GASB) Statement No. 77 on Tax Abatement Disclosures, which applies to state and local financial reports for fiscal years beginning after December 2015.

Economic and Fiscal Impact of Property Tax Abatement

It is reasonable to assume that policymakers expect that granting property tax abatements results in some economic benefit to the local economy that would not have occurred without the tax incentive. Determining whether property tax abatements on balance are causing firms to locate in a certain community, and thus increase investment, employment, and/or payroll, is a question beyond the realm of the Tax Incentive Review Council (TIRC) process just described. The TIRC evaluation only checks whether the promised amount of these activities occurred, and not if they would not have occurred without the abatement.

Tax incentives for economic development can have either a positive or negative impact on the jurisdiction providing the abatements (see Wassmer 2009, and Kenyon, Langley and Paquin 2012). As just mentioned, a crucial distinction is whether the economic activity would have occurred if the abatement was not offered. If it would not have, the positive side of the abatement is the revenue gain from expanded economic activity attributable to the incentive, which yields the positive fiscal impact of a reduced rate of property taxation. If the activity attributable to an abatement would have occurred even without the abatement, then the negative side of abatement is a loss in taxable property value, subsequent loss in property tax revenue, and the negative fiscal impact of an increase in the rate of property taxation this necessitates. Multiple regression analysis is the appropriate methodology for estimating the impact of incentive programs designed to stimulate local economic development. Through this technique, we estimate whether the use of an economic development program has a statistically significant positive effect on investment, property value, employment, or wages. Next, we offer a brief review of some related regression analyses of the economic and fiscal impacts of property tax abatement.

Literature Review

Hultquist's (2014) research is an example of the use of multiple regression analysis to detect the economic impact of incentives. It is highly relevant to this study due to its examination of the impact of Ohio's Enterprise Zone (EZ) and Job Creation Tax Credit (JCTC) programs on employment and wage

growth in Ohio zip codes between the years of 2000 to 2004.[9] He finds that the cumulative value of both JCTC and EZ incentives exerts no influence on aggregate employment in a zip code, and only a very modest positive influence on wages. One of Hultquist's regression findings show that a $1 million increase in total incentive value (which includes both Job Creation Tax Credits and Enterprise Zone incentive agreements) in an Ohio zip code, in both the previous year and current year, increased total wages in that zip code in the current year by a "modest" $2,000 (pp. 216-217). When disaggregating the JCTC and EZ incentives, Hultquist finds that a $1 million increase in zip-code-specific EZ abatement correlates with only a one-twentieth increase in a manufacturing job within the zip code. Alternatively, a $1 million increase in tax credits through the JCTC correlates with a $45 million increase in trade/transportation wages and nearly 900 jobs. Hultquist notes that the major difference between the influence of JCTC and EZ incentives arises because the typical JCTC firm tax credit was about $150,000, while the typical EZ firm property tax abatement was about $5.5 million. Thus, he appropriately cautions against making out-of-sample projections for the values of these incentives. Of concern to us is this study's reliance on only fixed-effect zip code dummies to control for the many factors that influence the economic outcomes observed in a zip code.[10]

Hicks and Faulk (2016) examined the fiscal impact of property tax abatements granted by local governments in the State of Indiana.[11] In Indiana, real or personal property located in an Economic Revitalization Area or Enterprise Zone receives a property tax abatement for up to 10 years. Unlike Ohio, Indiana ramps down abatement intensity over time. Using a data set based on counties for the period 2002 to 2011, Hicks and Faulk's simple regression methodology of regressing effective tax rate in a county against its abated share of property finds that each doubling of abated share increases the effective

[9] Given the quantitative importance of CRAs in Ohio, we are perplexed as to why Hultquist did not include CRAs in his analysis.

[10] We found only one study that examined the impact of CRAs, EZs, and JCTCs in Ohio. However, the focus of Greenbaum, Russell, and Petras (2010) was not the economic or fiscal impact of these tax incentives, but the degree to which these incentives were targeted.

[11] Faulk (2002) also has a study of the impact of Georgia's Jobs Tax Credit (a form of JCTC), but since she focuses on its impact on employment rather than property values we do not review that study here.

property tax rate by 12 percent. They caution the reader that this statistically significant finding can either mean that property tax abatements lead to higher effective property tax rates, or that counties with higher property tax rates provide a greater amount of property tax abatements. They suggest that a more thorough regression analysis, with the inclusion of appropriate control variables, is necessary to sort this out. We take this suggestion seriously in our own choice of a regression analysis of the fiscal impact of abatement that purposefully includes more control variables.

The analysis offered here broadly follows the Hultquist approach, and previous regression-based studies of the economic impact of property tax abatement. The economic variable we investigate is the market value of property. We could not, unfortunately, obtain employment or payroll data to use as a dependent variable because it is not widely available for the smaller units of geography used in this analysis of only Franklin County.

Regression Model, Methodology, and Data

Simple Model of What Determines a School District's Property Tax Rate

Since we want to understand the fiscal and economic impacts of property tax abatement and other forms of economic development incentives on a school district, we first think about the overall relationship between a school district's rate of annual property taxation, the dollar value of annual education expenditures its residents desire, and the market value of the property tax base used to raise the dollars needed for education expenditure. For jurisdiction "i" we represent this as:

(1) Property Tax Rate$_i$ = Local Education Expenditure$_i$ / Taxable Property Value$_i$.

The assumption is that residents first decide upon an annual expenditure for their school district and then they tax property within the district at an annual rate that yields the necessary revenue.

Upon seeing the relationship just described, it becomes clear that all three of the measures in equation (1) are endogenous. To turn equation (1) into a viable reduced-form regression model, we need to describe the exogenous factors expected to influence differences in the two endogenous variables listed on its right side:

(2) Local Education Expenditure$_i$ = f (Resident Characteristics that Influence Demand$_i$);

(3) Taxable Property Value$_i$ = f (Property Tax Abatement$_i$, Other Property Relevant Incentives$_i$, Property Exempt from Taxation$_i$, Property Base Characteristics$_i$).

As described in equation (2), residential characteristics expected to create greater demand for K-12 education in a school district can also increase the expected amount of observed education expenditures. As noted in equation (3), a school district's taxable property value changes with the degree of property tax abatements and other relevant incentives offered within the district. A key question examined is whether the use of abatement and other incentives causes an increase in taxable property value that would not have occurred without them. In other words, do they just give away taxable property value, and thus reduce taxable property value? The degree of property that is exempt from taxation, furthermore, decreases total property value. Characteristics of a school district's property tax base can also change its value.

The next step in obtaining a viable regression model is specifying the available explanatory variables that represent the exogenous factors specified on the right side of equations (2) and (3). These are:

(4) Resident Characteristics that Influence Demand$_i$ = f (Bachelor_Plus_Percent$_i$[12], Age19_Less_Percent$_i$, Enrollment$_i$);

(5) Property Tax Abatement$_i$ = f (CRA/EZ_Abate_Percent$_i$, CRA_Pre94_Percent$_i$);

(6) Other Property Relevant Incentives$_i$ = f (TIF_Abate_Percent$_i$, EPA_Abate_Percent$_i$, JCTC_Jobs_Per_100M_MarketVal$_i$);

(7) Property Exempt from Taxation$_i$ = f (Tax_Exempt_Property_Percent$_i$);

(8) Property Base Characteristics$_i$ = f (Number_Parcels$_i$, Parcels_NonResidential_Percent$_i$).

As noted in equation (4), we expect that demand for K-12 education expenditure will be greater, the larger the percentage of the adult population over age 25 holding at least a bachelor's degree. The enrollment and percentage of the population of school age in a school district should also exert a positive influence on demand for K-12 public education, while enrollment will also raise the cost of providing it.

[12] We also gathered data on median household income in a school district, but exclude it here because of its partial correlation coefficient of 0.93 with bachelor degree holders. When we include both as explanatory variables in these regression analyses, neither exhibited statistical significance due to multicollinearity.

In Equation (5), we account for the use of property tax abatements by measuring "abatement intensity" – the value abated through CRA or EZ abatements as a percent of total market value in a school district, and the percentage of CRA abatement using pre-1994 rules. The latter explanatory variable offers a test of whether type of CRA abatement matters. Equation (6) accounts for the two other types of property tax abatement used in Franklin County. We measure both EPA and TIF abatement as the value abated through these respective abatements as a percent of total market value in a school district. Equation (6) also accounts for the other major tax incentive program of Job Creation Tax Credits (JCTCs).

Beginning in 2007, the State of Ohio Development Services Agency (ODSA) estimated the annual tax credit value of a JCTC to a specific firm if all promised jobs occurred. For use in this research, this is unfortunate since our school district data begins in 1998, and Census tract data begins in 2002. To overcome this, we must instead use the contracted value of retained or new jobs that ODSA has on file for all JCTC agreements negotiated since the program's inception in 1993. The ODSA also has on file the number of years that the JCTC was awarded based upon an approved annual report documenting their existence. Of course, the use of a retained or created job can only act as an approximate measure of the exact value of the JCTC to the firm because the actual credit varies by the earnings of the job and the negotiated percentage (between 50 and 75 percent) of the tax credit. This could be a concern if we needed to know the value of the JCTC to a specific firm, but instead we only need a measure of the value of JCTCs to all firms receiving them in a Franklin County zip code or Census tract. We thus aggregate this job information, provided because of an email request to ODSA, for all firms whose address falls in each Franklin County school district or Census tract, for the years that the JCTC is granted, and for the years under consideration in this analysis. Given this aggregation, and the effect of averaging, we believe the number of jobs becomes a good proxy for the dollar value of the JCTC offered in a geographic unit. Across zip codes and Census tracts of widely varying sizes and economic activity, we normalize the variable by dividing by the market value of taxable property in the geographic entity measured in $100 million.

In equation (7), we account directly for the percentage of a school district's property tax base exempt from taxation. Finally, equation (8) controls for differences in the number of parcels in a Franklin County school district, and the percentage of these parcels which are non-residential. There are two points to highlight about our key explanatory variable measure of CRA/EZ_Abate_Percent. First, it includes both CRA and EZ abatements. Enterprise zone abatements were too small in quantity to run regressions using that variable alone and the two abatement programs work very similarly in practice. Second, this variable and other measure of incentives (TIF, EPA, JCTC) account for the percent of property value abated at a given time, not the new abatements approved in that year.

The data sets used here contain observations from 16 school districts where more than half of their land area is in Franklin County. For these 16 school districts, we use data gathered from the 18 years between 1998 and 2015.[13] Details on where the data used in this analysis comes from, and how we transformed it into the final forms used here, are in the Data Appendix.

Using Regression Analysis to Detect the Fiscal Impact of Property Tax Abatement

We define the fiscal impact of property tax abatement in a school district as the effect it has on the district's property tax rate. Using the equations specified above, and substituting in the exogenous factors in equations (4) through (8) that influence the endogenous measures of education expenditures and taxable property value in equation (1), yields the regression specification:

(9) Property Tax Rate = f (Bachelor_Plus_Percent, Enrollment, CRA/EZ_Abate_Percent, CRA_Pre94_Percent, TIF_Abate_Percent, EPA_Abate_Percent, Exempt_Percent, JCTC_Jobs_Per_100M_MarketVal, Parcels_Number, Parcels_NonResidential_Percent).

This is a reduced-form regression specification because we include only exogenous and independent variables in equation (9) as causal right-side variables. The dependent variables used to detect the fiscal impact of property tax abatements are the actual mills assessed on real property in a school district, the effective rate of property taxation on residential property, and the effective rate of property taxation on non-residential property. Ohio has a complex property tax system which includes the use of tax reduction

[13] Later, for the 284 Census tracts that we also analyze, we use data from the 14 years between 2002 and 2015.

factors that reduce the growth in taxes due to valuation increases. Property tax mills do not account for those tax reduction factors, whereas effective property tax rates do. Since tax reduction factors are computed separately for residential property (Class 1) and non-residential property (Class 2), effective property tax rates for residential and non-residential properties are typically different.[14]

Our analysis of property tax abatement uses a pooled data set and thus allows for the calculation of school district specific fixed effects after controlling for other general factors driving differences in the dependent variables. Our use of fixed effects (controlling for both year and school district or Census tract specific influences) panel data regression analysis to estimate the impact of CRAs and EZs on property values and property tax rates is a "difference-in-differences method." It controls for factors that could exert a fiscal or economic impact, besides abatement, fixed in a jurisdiction over time. Thus, it allows greater confidence that when the regression analysis finds a fiscal or economic impact from abatement, it is a causal relationship rather than just a correlation.

For the regression analysis, we transform all the dependent variables in the regression analysis by taking their natural log. We do this to account for the fact that the relationship between the dependent and independent variables is not likely to be linear. Instead, we model this relationship as a one-unit change in an explanatory variable resulting in a percentage change in a dependent variable. Thus, a statistically significant regression coefficient indicates the expected influence of a one-unit change in the respective explanatory variable on the dependent variable in percentage terms. The exceptions to this occur where we transform the explanatory variables (enrollment and parcels) meant to account for differences in scale across zip codes or Census tracts into natural log form. We do this because the regression coefficient will then measure the percentage change in the dependent variable due to a one-percentage point increase in the log-transformed explanatory variable.

[14] What Ohio terms "effective property tax rates" for residential and non-residential properties are not the same as what public finance economists usually refer to as an effective property tax rate (revenue raised divided by market value). The reason is that Ohio effective property tax rates do not account for other programs which reduce property tax liability for residential property: the homestead exemption, ten percent rollback credit, and 2.5 percent rollback credit. See Lang (2016) and Sullivan and Sobul (2010).

As described by Hoechle (2007), and Cameron and Trivedi (2010, Chapter 8), there are specific tests to perform before deciding upon the optimal form of regression estimation for a panel data set. The first is to test whether the use of fixed or random effects is appropriate. The appropriate Hausman test indicates fixed effects at the 99 percent confidence level. Next, we used Pesaran's test of cross sectional independence and found with 99.9 percent confidence that it was not an issue. Finally, we tested for the presence of autocorrelation in the regression using the Wooldridge test and found it present with greater than 99 percent confidence. Therefore, the appropriate regression process to use in STATA is "xtreg" with robust standard error estimation clustered on each school district. According to Hoechle (p. 4), this controls for autocorrelation specific to each panel and for heteroscedasticity. A control for school district (or Census tract) fixed effects exists in this STATA estimation by specifying it as the group variable. The addition of a set of year specific dummies account for year fixed effects.

Table 2 offers descriptive statistics for all variables used in the regression analyses based upon 288 observations drawn from the 16 school districts with at least half of their area in Franklin County during the 18-year span of 1998 to 2015. Details on the four sources of the variables used in this analysis are in the Data Appendix. Table 3 reports the School_Mills_Real regression result. A concern is the possibility that the explanatory variables used to measure different forms of abatement (CRA/EZ_Abate_Percent, TIF_Abate_Percent, EPA_Abate_Percent) are highly correlated and could lead to multicollinearity. We checked for this by calculating the pairwise correlation coefficients between these three variables and found them at levels low enough (in absolute value, less than 0.20) to not likely yield concerns.

As noted in Table 3, a one percentage point increase in the value abated through CRA or EZ abatement, as a percentage of a total market value in a school district, results in a statistically significant 2.7 percent decrease in a school district's property tax millage rate.[15] **If expressed instead in terms of the impact of a one standard deviation increase in CRA/EZ abatement of about 4.6 percent, this**

[15] As also noted in the last column of Table 3, the regression finding indicates with 90 percent confidence this effect falls within a 3.4 to 2.1 percent decrease.

decrease in school district mill rate jumps to about a 12.4 percent decrease. The regression analysis indicates that the use of Job Creation Tax Credits (JCTC) also reduces the school millage rate. One job created or retained through the granting of this tax credit to a firm per $100 million in inflation-adjusted market property value results in a 0.019 percent decrease in the school district's millage rate. **If the measurement of the effect is in terms of a standard deviation increase of 67.5 more jobs created or retained through a JCTC offering, the percentage reduction in school millage rate is about 1.3 percent**. Finally, the use of TIF abatement exhibited a statistically significant influence on school millage rate. A one percentage point increase in the value abated through TIF as a percentage of a total market value in a school district results in about a 1.9 percent decrease in a school district's property tax millage rate. **If expressed instead in terms of the impact of a one standard deviation increase in TIF abatement of about 2.0 percent, this decrease in school district mill rate jumps to about a 3.8 percent decrease.**

When the dependent variable is an effective property tax rate instead of a mill rate, there is still a statistically significant impact of the CRA/EZ abatement on the property tax rate, but that effect is smaller for the non-residential rate than for the residential rate. As shown in Table 4, a one percentage point increase in the value abated through CRA or EZ abatement as a percentage of total market value in a school district results in about a 0.9 percent decrease in a school district's residential effective property tax rate. **If expressed instead in terms of the impact of a one standard deviation increase in CRA/EZ abatement of about 4.6 percentage points, this decrease in residential effective property tax rate grows to about 4 percent.** To put this result in dollar terms, the regression analysis predicts that a one standard deviation increase in CRA/EZ abatement as a percent of a school district's total property value lowers the average residential property tax bill in that school district for that year by about $77 for the median property tax bill, and about $100 for the average tax bill.[16] For this regression, neither the TIF nor the JCTC variables are statistically significant.

[16] To do this computation it is important to know that Ohio uses a 35 percent assessment ratio and mill rates are tax rates per $1,000 of property. Using the parcel data collected from all Franklin County for the years 1998-2015, we

Table 5 presents the results for the regression where the dependent variable is the effective property tax rate for non-residential property. Again, the CRA/EZ variable is statistically significant. A one percentage point increase in the value abated through CRA or EZ abatement as a percentage of total market value in a school district results in about a 0.7 percent decrease in a school district's non-residential effective property tax rate. If expressed instead in terms of a one standard deviation increase in CRA/EZ abatement, this decrease in non-residential effective property tax rate grows to about 3 percent. Neither the TIF nor the JCTC variables are statistically significant. Interestingly, the CRA_Pre94_Percent variable becomes statistically significant. Although the coefficient is small, this may suggest that tax abatements under the rules of the early CRA program may be slightly more effective in reducing the effective property tax rate for non-residential property.

Using Regression Analysis to Detect the Economic Impact of Property Tax Abatement

We define the economic impact of property tax abatement in a Franklin County school district or Census tract as the effect it has on the market value of property. For a school district (i) that sets its own property tax rate, an algebraic manipulation of equation (1) yields:

(10) $\text{Taxable Property Value}_i = \text{Local Education Expenditures}_i / \text{Property Tax Rate}_i$.

From this, the reduced form regression, resulting after the appropriate substitutions from equations (2) and (3), is:

(11) $\text{Taxable Property Value}_i = f$ (Bachelor_Plus_Percent$_i$, Age19_Less_Percent, Enrollment$_i$, CRA/EZ Abate_Percent$_i$, CRA_Pre94_Percent$_i$, TIF_Abate_Percent$_i$, EPA_Abate_Percent$_i$, JCTC_Jobs_Per_100M_MarketVal$_i$, Tax_Exempt_Property_Percent$_i$, Parcels_Number$_i$, Parcels_NonResidential_Percent$_i$).

We measure taxable property for both school districts and Census tracts in Franklin County as the market value of property in the relevant entity. The data used to estimate equation (11) for school districts is the same as described in Table 2.

find a median tax bill of $1,960, while the average is $2,547. In 2013 the median real estate taxes paid by an owner-occupied home in Ohio were $1,982.

Testing for the presence of fixed over random effects, cross section independence, and autocorrelation, we again find their presence in this regression with a different dependent variable, but the same set of explanatory variables. Thus, we employ the same regression technique as earlier. Table 6 contains the school district based results for our economic impact analysis. Regarding the economic impact of property tax abatement on school districts in Franklin County, we find that a one percentage point increase in the value abated through CRA or EZ abatement as a percentage of a total market value in a school district results in about a 1.6 percent increase in the market value of property in a school district. **A one standard deviation percentage point increase of 4.6 in the percentage of school district's property tax base granted a CRA or EZ abatement results in about a 7.4 percent increase in the value of a school district's real property tax base.**

As an additional test of the economic impact of property tax abatement, we also gathered annual data from the 284 Census tracts in Franklin County from 2002 to 2015. These are not governmental jurisdictions, and thus levy no property taxes. Their inclusion offers a unit of observation that results in many observations within Franklin County, and thus are ideal as an additional way to examine the economic impact of property tax abatement on the market value of property. Referring to the earlier set of equations, we can only estimate the taxable property value relationship in equation (3) and check how property tax abatement, other property relevant incentives, property exempt from taxation, and other property base characteristics influence it. Table 7 contains descriptive statistics for the variables included in Census tract estimation of equation (3).

We find the presence of fixed over random effects, cross section independence, and autocorrelation, making it necessary again to use the same regression technique. The Census tract based results for our economic impact analysis are in Table 8. Like the regression using school district data, we again discovered that CRA or EZ abatement exerts a statistically significant positive influence on the market value of property, just not as large. A one percentage point increase in abatement intensity in a Census tract yields about a 0.4 percent increase in the market value of property. **If measured in terms of a one standard deviation 5.2 percentage point increase in CRA or EZ abatement intensity, the**

associated increase in Census tract property value rises to 2.1 percent. As found for a school district, TIF abatement also yields a positive influence on the market value of property in a Census tract. A one percentage point increase in value earmarked for TIF as a percentage of total market value results in about a 1.4 percent increase in the market value of property in a Census tract. **If measured in terms of a one standard deviation 5.4 percentage point increase in TIF abatement, the associated increase in Census tract property value rises to 7.6 percent.**

For a Census tract, unlike for a school district, jobs created or retained through a JCTC tax credit increase the market value of property. One job created or retained per $100 million of market value property in the Census tract raises the tract's market value by 0.0086 percent. That is small. **However, when measured in terms of the standard deviation of 103.4 more jobs created or retained of this JCTC measure for all school districts over the years observed, the effect on Franklin County Census tract's market value of property rises to about a 0.9 percent increase.**[17]

[17] Hanson (2009) also finds that a wage tax credit (in this case the federal Empowerment Zone) has a statistically significant positive impact on property value.

Table 2: Descriptive Statistics for Variables Used in School District Fiscal/Economic Impact Regression Analysis (16 Franklin County School Districts drawn from 18 years between 1998 and 2015)

Variable	Mean	Standard Deviation	Minimum	Maximum	Source*
Dependent					
School_Mills_Real	38.29	7.89	22.95	55.76	FRANKLIN_CO
Real_Property_Market_Value	5,403,483,191	8,365,531,220	436,216,672	43,867,590,656	FRANKLIN_CO
Residential_Effective_Real_Rate	66.34	11.30	42.33	95.91	FRANKLIN_CO
Non-Residential_Effective_Real_Rate	76.46	12.27	53.41	103.37	FRANKLIN_CO
Explanatory					
Bachelor_Plus_Percent	41.21	20.66	7.80	74.20	CENSUS
Age19_Less_Percent	27.70	3.06	20.70	35.00	CENSUS
Enrollment	11,331	15,090	1,069	70,720	STATE
CRA/EZ_Abate_Percent	3.01	4.55	0.00	18.33	FRANKLIN_CO
CRA_Pre94_Percent	42.27	43.24	0.00	100.00	FRANKLIN_CO
TIF_Abate_Percent	1.38	1.95	0.00	9.07	FRANKLIN_CO
EPA_Abate_Percent	0.03	0.09	0.00	0.69	FRANKLIN_CO
JCTC_Jobs_Per_100M_MarketVal	35.12	67.49	0.00	525.31	OHIO_DEV_SERVICES
Tax_Exempt_Property_Percent	10.59	7.90	2.75	43.98	FRANKLIN_CO
Parcels_Number	25,481	41,506	2,919	187,842	FRANKLIN_CO
Parcels_NonResidential_Percent	7.36	3.01	3.69	16.15	FRANKLIN_CO

*Source definitions are in Data Sources section of appendix.

Table 3: Fiscal Impact Regression Results Using Franklin County School District Data
(16 Franklin County School Districts drawn from 18 years between 1998 and 2015)

Dependent Variable: **Ln_School_Mills_Real**.
School district fixed effects and year dummy variables included, but not reported.
Heteroscedastic and autocorrelated robust standard errors through clustering on school districts.
Statistical significance measured in two-tailed test: *** > 99%, **95 to 99%, and *90 to 95%.

Explanatory Variable	Regression Coefficient	Statistical Significance	Regression Coefficient Robust Standard Error	90% Confidence Interval
Bachelor_Plus_Percent	0.0071	*	(0.0071)	0.00049 to 0.014
Age19_Less_Percent	-0.026	***	(0.0091)	-0.041 to -0.011
Ln_Enrollment	0.51	**	(0.095)	0.35 to 0.66
CRA/EZ_Abate_Percent	-0.027	***	(0.0041)	-0.034 to -0.021
CRA_Pre94_Percent	0.00027		(0.00027)	-0.00017 to 0.00071
TIF_Abate_Percent	-0.019	***	(0.0059)	-0.028 to -0.0089
EPA_Abate_Percent	-0.069		(0.081)	-0.20 to -0.064
JCTC_Jobs_Per_100M_MarketVal	-0.00019	*	(0.00011)	-0.00036 to 0.000015
Tax_Exempt_Property_Percent	-0.0013		(0.0026)	-0.0056 to 0.0029
Ln_Parcels_Number	0.12		(0.18)	-0.19 to 0.42
Parcels_NonResidential_Percent	-0.025	***	(0.0054)	-0.034 to -0.016
Within R-Squared^	0.755			
Observations	288			

^Within R-Squared measures the variance within the panel units (school districts) accounted for by the regression model.

Table 4: Fiscal Impact Regression Results Using Franklin County School District Data
(16 Franklin County School Districts drawn from 18 years between 1998 and 2015)

Dependent Variable**: Ln_Residential_Effective_Real_Rate**.
School district fixed effects and year dummy variables included, but not reported.
Heteroscedastic and autocorrelated robust standard errors through clustering on school districts.
Statistical significance measured in two-tailed test: *** > 99%, **95 to 99%, and *90 to 95%.

Explanatory Variable	Regression Coefficient	Statistical Significance	Regression Coefficient Robust Standard Error	90% Confidence Interval
Bachelor_Plus_Percent	-0.0013		(0.0026)	-0.0056 to 0.0030
Age19_Less_Percent	-0.026	**	(0.0060)	-0.035 to -0.016
Ln_Enrollment	0.40	***	(0.063)	0.29 to 0.50
CRA/EZ_Abate_Percent	-0.0086	***	(0.0027)	-0.013 to -0.0041
CRA_Pre94_Percent	-0.000080		(0.00018)	-0.00037 to 0.00021
TIF_Abate_Percent	-0.0024		(0.0039)	-0.0088 to 0.0040
EPA_Abate_Percent	-0.054		(0.053)	-0.14 to 0.033
JCTC_Jobs_Per_100M_MarketVal	-0.000066		(0.000069)	-0.00018 to 0.000049
Tax_Exempt_Property_Percent	0.00090		(0.0017)	-0.0019 to 0.0037
Ln_Parcels_Number	-0.090		(0.12)	-0.29 to 0.11
Parcels_NonResidential_Percent	-0.0085	**	(0.0035)	-0.014 to -0.0027
Within R-Squared^	0.873			
Observations	288			

^Within R-Squared measures the variance within the panel units (school districts) accounted for by the regression model.

Table 5: Fiscal Impact Regression Results Using Franklin County School District Data
(16 Franklin County School Districts drawn from 18 years between 1998 and 2015)

Dependent Variable: **Ln_Non-Residential_Effective_Real_Rate**.
School district fixed effects and year dummy variables included, but not reported.
Heteroscedastic and autocorrelated robust standard errors through clustering on school districts.
Statistical significance measured in two-tailed test: *** > 99%, **95 to 99%, and *90 to 95%.

Explanatory Variable	Regression Coefficient	Statistical Significance	Regression Coefficient Robust Standard Error	90% Confidence Interval
Bachelor_Plus_Percent	0.0014		(0.0026)	-0.0029 to 0.0057
Age19_Less_Percent	-0.017	***	(0.0059)	-0.027 to -0.0075
Ln_Enrollment	0.35	**	(0.062)	0.25 to 0.46
CRA/EZ_Abate_Percent	-0.0074	***	(0.0027)	-0.011 to -0.0030
CRA_Pre94_Percent	-0.00035	**	(0.00018)	-0.00064 to -0.000056
TIF_Abate_Percent	-0.0021		(0.0039)	-0.0085 to 0.0042
EPA_Abate_Percent	-0.036		(0.053)	-0.12 to 0.051
JCTC_Jobs_Per_100M_MarketVal	-0.000098		(0.000069)	-0.00021 to 0.000016
Tax_Exempt_Property_Percent	-0.0012		(0.00017)	-0.0040 to 0.0016
Ln_Parcels_Number	-0.21	*	(0.12)	-0.41 to -0.015
Parcels_NonResidential_Percent	-0.019	***	(0.0035)	-0.025 to -0.013
Within R-Squared^	0.829			
Observations	288			

^Within R-Squared measures the variance within the panel units (school districts) accounted for by the regression model.

Table 6: Economic Impact Regression Results Using Franklin County School District Data
(16 Franklin County School Districts drawn from 18 years between 1998 and 2015)

Dependent Variable: **Ln_Real_Property_Market_Value**.
School district fixed effects and year dummy variables included, but not reported.
Heteroscedastic and autocorrelated robust standard errors through clustering on school districts.
Statistical significance measured in two-tailed test: *** > 99%, **95 to 99%, and *90 to 95%.

Explanatory Variable	Regression Coefficient	Statistical Significance	Regression Coefficient Robust Standard Error	90% Confidence Interval
Bachelor_Plus_Percent	0.010	***	(0.0019)	0.0072 to 0.013
Age19_Less_Percent	0.0052		(0.0042)	-0.0019 to 0.012
Ln_Enrollment	0.039		(0.045)	-0.035 to 0.11
CRA/EZ_Abate_Percent	0.016	***	(0.0019)	0.012 to 0.019
CRA_Pre94_Percent	0.00047	***	(0.00013)	0.00026 to 0.00068
TIF_Abate_Percent	0.011		(0.0028)	0.0061 to 0.015
EPA_Abate_Percent	-0.053		(0.038)	-0.19 to 0.08
JCTC_Jobs_Per_100M_MarketVal	0.000016		(0.000085)	-0.12 to 0.0091
Tax_Exempt_Property_Percent	0.0056	***	(0.0012)	0.0036 to 0.0076
Ln_Parcels_Number	0.71	***	(0.087)	0.57 to 0.87
Parcels_NonResidential_Percent	-0.0017		(0.0025)	-0.0058 to 0.0025
Within R-Squared^	0.970			
Observations	288			

Table 7: Descriptive Statistics for Variables Used in Census Tract Economic Impact Regression Analysis (284 Franklin County Census Tracts drawn from 14 years between 2002 and 2015)

Variable	Mean	Standard Deviation	Minimum	Maximum	Source*
Dependent					
Real_Property_Market_Value	322,522,228	343,506,916	21,659,000	4,849,540,608	FRANKLIN_CO
Explanatory					
CRA/EZ_Abate_Percent	1.42	5.18	0	49.60	FRANKLIN_CO
CRA_Pre94_Percent	7.28	25.43	0.00	100.00	FRANKLIN_CO
TIF_Abate_Percent	1.38	5.42	0.00	76.42	FRANKLIN_CO
EPA_Abate_Percent	0.049	0.48	0.00	11.61	FRANKLIN_CO
JCTC_Jobs_Per_100M_MarketVal	19.21	103.39	0.00	2,681.84	OHIO_DEV_SERVICES
Tax_Exempt_Property_Percent	12.43	15.69	0.00	99.88	FRANKLIN_CO
Parcels_Number	1,466	815	15	6,506	FRANKLIN_CO
Parcels_NonResidential_Percent	12.78	16.75	0.071	100.00	FRANKLIN_CO

Table 8: Economic Impact Regression Results Using Franklin County Census Tract Data
(284 Franklin County Census Tracts drawn from 14 years between 2002 and 2015)

Dependent Variable: **Ln_Real_Property_Market_Value**.
Census tract fixed effects and year dummy variables included, but not reported.
Heteroscedastic and autocorrelated robust standard errors through clustering on school districts.
Statistical significance measured in two-tailed test: *** > 99%, **95 to 99%, and *90 to 95%.

Explanatory Variable	Regression Coefficient	Statistical Significance	Regression Coefficient Standard Error	90% Confidence Interval
CRA/EZ_Abate_Percent	0.0042	**	(0.0021)	0.00073 to 0.0077
CRA_Pre94_Percent	0.00017		(0.00019)	-0.00014 to 0.00048
TIF_Abate_Percent	0.014	***	(0.0017)	0.011 to 0.017
EPA_Abate_Percent	-0.0024		(0.0060)	-0.012 to 0.0074
JCTC_Jobs_Per_100M_MarketVal	0.000086	**	(0.000037)	0.000025 to 0.00015
Tax_Exempt_Property_Percent	0.0086	***	(0.0024)	0.0047 to 0.013
Ln_Parcels_Number	0.44	***	(0.13)	0.24 to 0.65
Parcels_NonResidential_Percent	-0.0013	***	(0.0014)	-0.0037 to -0.0011
Within R-Squared	0.547			
Observations	3,976			

Conclusion

Tax savings from CRA and EZ abatements equaled three percent of property taxes paid in Franklin County, Ohio in 2015. Our study investigates the economic and fiscal impacts of this loss in potential revenue. We use panel-data regression analyses to estimate the impact of Community Reinvestment Areas (CRAs) and Enterprise Zones (EZs) on property value and school property tax rates in this county. We found that the use of CRAs and EZs increased property values and decreased property tax rates as intended. Thus, our regression analysis reveals that CRA or EZ property tax abatements have exerted beneficial fiscal and economic impacts in Franklin County. In school districts, a one percentage point increase in the use of CRA and EZ abatements correlates with about a 1.6 percent increase in the market value of the district's property (economic impact), about a 2.7 percent decrease in the district's property tax millage rate for schools (fiscal impact), and a 0.9 and 0.7 percent decrease in effective tax rates on residential and non-residential property respectively (also fiscal impacts). For Census tracts, the same increase in abatement correlates with a 0.4 percent increase in the market value of the tract's property (economic impact).

We also found that differences in the use of TIF abatement in Franklin County school districts over the observed decades exerted no detectable influence on a district's property tax millage rate. TIFs did have the anticipated positive impact on the market value of school district property, but no statistically significant effect on market value of Census tract property. Specifically, a one percentage point increase in TIF abatement as a percentage of property value in a school district results in about a 1.4 percent increase in property value.[18]

This study of property tax incentives and Job Creation Tax Credits in a large Ohio county found modestly beneficial effects on property values and tax rates in Franklin County's school districts. This is

[18] In an earlier version of this analysis, we did not control for JCTC use in Franklin County (see Kenyon, Langley, Paquin, and Wassmer 2017). In the regressions described here, we find that JCTC use decreases school millage rates and raises the market value of property in Census tracts. The inclusion of the JCTC variable only slightly changed the coefficients on CRA/EZ, our main explanatory variable. However, because of the inclusion of JCTC, we put greater credence in the results reported here than in our earlier working paper results.

policy relevant information, especially considering previous studies like *Protecting Public Education from Tax Giveaways to Corporations* (National Education Association, 2003) which concludes that "…today's development subsidies may be enriching corporations at the cost of the education of tomorrow's work force" (p. 2).[19] We believe there are at least two explanations for our finding of this beneficial effect. First, Ohio does not make as extensive use of business tax incentives as some other states (Bartik 2017). Second, the mandated use of annual Tax Incentive Review Councils (TIRCs) may shine the light on particularly ineffective tax incentives and lead to more discretionary, and thus more effective, use.[20] Interestingly, these reasons align with some of the key reforms suggested by Good Jobs First (2016) for promoting accountability in economic development that include: (1) requiring disclosure of subsidy spending and company compliance, (2) protecting schools from tax giveaways, and (3) increasing accountability in the subsidy approval process.

Based on the results of the research presented in this paper we suggest that policymakers consider three courses of action. First, they should aim for limited, and not aggressive, use of property tax abatements to encourage economic development. Second, they should consider requiring an annual review process like Ohio's tax incentive review councils. Through such a mechanism governments can at least determine whether businesses have generated or retained the promised jobs, payroll, or investment. Third, policymakers should add periodic reviews that go beyond tax incentive review councils to attempt to determine, as this study did, whether the jobs, payroll, or investment associated with business incentives would have materialized without the incentives.

[19] In fact, the NEA (2003, p. 2) sponsored study specifically calls out the State of Ohio for reducing or diverting $102 million in school property tax revenue that would have gone to schools in 1999, if not used for property tax abatement or tax increment finance. As described earlier, this figure was derived from a simple accounting of tax reduction under these programs, and not the more appropriate regression analyses completed here.
[20] See, for example, the description of Louisiana's Industrial Tax Exemption Program in "Incentives for Economic Development" in Significant Features of the Property Tax.

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APPENDIX

Data Sources

Franklin County Auditor's Office (FRANKLIN_CO)

For the analyses, we combined seven separate datasets to create a parcel-level annual dataset for 1998-2015. Then we summed the parcel-level data to the level of school districts and Census tracts for the analyses described in the report.

1) Historical Value Control Tables from Tax System: These annual datasets include information on market values for each parcel separated into three components: Market Value = Base Value + TIF Value + Exempt Value. These datasets also include land use codes for each parcel. We used these to separate properties into six categories—industrial (land use codes 300-399), office space (447-450 and 470), apartments (401-403), other commercial (400, 404-446, 451-469, 471-499), residential (500-599), and other (100-299, 600-999).

2) CRA, EZ, and EPA Spreadsheets: These annual spreadsheets include information for each parcel that has received an abatement, including the type of abatement (CRA, EZ, or EPA), the name of the CRA zone, market value abated, and net tax savings.

3) Historical Parcel Tables from Tax System: These tables include a school district code and city name. We used them to aggregate the parcel-level data to the level of school districts and cities.

4) Historical GIS Extract: This geodatabase includes geographic information for each parcel. It allowed us to map the data in ArcGIS and to spatially analyze. We also used the geocoded database to identify the Census tract for each parcel; we then then used the database to aggregate parcel-level data to the level of Census tracts. The historical GIS extract also includes annual data on the tax charge for each parcel, the only exception being condominiums mapped differently than other parcels.

5) Parcel Datasets from Auditor's Website: For this paper, we used these datasets to fill in tax charges for condominiums missing data in the historical GIS extract. Data from the October spreadsheets represented each year. These datasets are available on the Auditor's website, accessed on 1/15/18: ftp://apps.franklincountyauditor.com/Parcel_CSV/.

6) Tax Rate Sheets for Taxing Districts: These datasets offer effective tax rates for each taxing district. We merged the tax rate data with the parcel-level dataset by using each parcel's tax district code included in the Historical Parcel Tables from Tax System.

Census Data (CENSUS)

For school districts, our regression analysis includes several socioeconomic variables from the 2000 decennial Census and the 2006-2010 and 2011-2015 American Community Surveys. We used linear interpolation to approximate annual values based on the three data points available for each school district. We employed values from the decennial Census for 1998-99, the 2006-2010 ACS was used for 2008, and the 2011-2015 ACS was used for 2013-15, and then linear interpolations were used to approximate values for 2000-2007 and 2009-2012.

In addition, we use annual data on school district revenues from the individual unit of government files from the Census of Government Finances and the Annual Surveys of State and Local Government Finances. These data are only available up to 2014.

State Data Sources (STATE)

For school districts, our regression analysis uses some of the data available in annual SD1 spreadsheets from the Ohio Department of Taxation, including data on school mill rates, enrollment, and total real property values. Total property values reported for each school district in the SD1 spreadsheets are close to the sum of market values for all parcels in each school district that are reported in the datasets from the Franklin County Auditor's office, but not identical. To test our findings, we tried two similar regressions for school district property values: one where the dependent variable is total property value from the SD1 spreadsheets (schl_value_total), and a second where the dependent variable is the sum of market values for all parcels in each school district (market_value). The SD1 spreadsheets are available here, accessed on 1/15/18:
http://www.tax.ohio.gov/tax_analysis/tax_data_series/school_district_data/publications_tds_school.aspx

Ohio Development Services (OHIO_DEV_SERVICES)

This state agency is responsible for collecting information on all Job Creation Tax Credits (JCTC) offered in Ohio. The agency then compiles the data into annual reports like the one released for 2016 (accessed on 1/15/18) at https://development.ohio.gov/files/reports/2016DEVAnnualReport.pdf . The basis of these reports is data on expected jobs created and retained that each business must declare in their application for this credit. The agency then requires the business recipient to provide an annual report documenting the fulfillment of these job promises. Beginning in 2005, and not fully implemented until 2007, the agency also calculated and reported in aggregate, the dollar value of the JCTC to each firm. Since this value is not available for the full-time periods examined, we chose to use the total number of new and retained jobs promised. To aggregate these up to the geographic units of observation used here, we assigned the address of each JCTC recipient to its respective school district or Census tract using the Census Geocoder at https://www.census.gov/geo/maps-data/data/geocoder.html . We did this for each year that the JCTC agreement was in place. Once we created the aggregate values of JCTC jobs, we controlled for the expected relative impact by dividing each by the inflation adjusted (GDP deflator used) value of the market value of taxable real property in the respective district or tract. We derived this denominator from Franklin County data described previously.