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Benefits and Costs of Regional Development: Evidence from Ohio's Enterprise Zone Program

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Abstract: Enterprise zones are a tool of regional development policy, relying on tax incentives. The objective of the paper is to answer the questions: Are enterprise zones efficient? Are they efficient if adopted by high-unemployment areas? The research applies the questions to Ohio's enterprise zone program because of the policy debate it has generated. The net benefits from employment created in the program are compared to program costs making different assumptions about employment. I find that the net benefits of regional development can be expected to be greater than their costs. However, because of their efficiency implications, I find that it could be beneficial for high unemployment areas to adopt tax incentive policies.

1. Introduction

Enterprise zones are a tool of regional development policy. Enterprise zones are geographically targeted areas chosen for development and are designated on the basis of certain criteria including unemployment rate, poverty, median income and other criteria. Firms that locate in these areas are given tax and various other incentives for making investment and creating employment. The challenge that has been raised against such policies in the literature and policy circles is that they are frequently adopted as a means of lobbying to get appropriate designation and the associated benefits of being able to offer incentives even though they do not deserve to be doing so. This results in the proliferation of such programs ending in the "pirating" of jobs and firms from

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one place to another, that eventually become zero-sum in their effects. This challenge provides the motivation for this research.

The objective of this paper is to answer the questions: Are enterprise zones (EZs) efficient? Are they efficient if adopted by high-unemployment areas? In this paper, I evaluate Ohio's enterprise zone program and perform a benefit-cost analysis of employment created in these zones. One of the ideas underlying the evaluation of such programs is to estimate whether the program is successful in having an impact on the area's employment through its job creation. The standard approach to this question is to estimate an econometric model of employment for small areas and include a variable that characterizes the program of interest. Taking this approach, Sridhar (2000) estimates the unemployment rate of Ohio's census block groups as a function of the tax incentive program and other variables that labor economics shows determine unemployment rate of an area. Sridhar finds that tax incentive programs (primarily the enterprise zone program) have a significant impact in reducing the unemployment rate of areas adopting them. This finding forms the counterfactual check for the benefit-cost analysis performed of Ohio's enterprise zone program in this paper.

In this paper, I also test a hypothesis that Bartik (1991) developed regarding the relationship between net benefits from employment and the local unemployment rate. Net benefit is defined as the difference between the wages paid minus the wage at which a person is willing to accept a job (or the reservation wage). Bartik argued that the reservation wage would be lower in high unemployment areas because of the high value the unemployed in a high unemployment area place on the importance of having a job versus leisure. Thus the net benefit from a job would be higher in high unemployment areas.

In the benefit-cost analysis that takes into account net benefits and costs, I find that the net benefits of regional development can be expected to be greater than their costs. Specifically, I find that it could be beneficial for high unemployment areas to adopt tax incentive policies because of their efficiency implications.

Overview of Paper

The next section presents a brief review of the literature. Section 3 describes Ohio's enterprise zone program. Sections 4 and 5 describe the data and methodology adopted to perform benefit-cost analyses. There I describe how I impute reservation wages for Ohio's enterprise zones to estimate net benefits from employment, and how I arrive at measures of program costs. I then present the benefit-cost analysis of Ohio's enterprise zones making different assumptions about employment in the zones, in Section 6. The policy implications follow in Section 7.

2. Review of Literature

There is a vast body of policy and empirical literature that evaluates enterprise zones. These studies have evaluated enterprise zones in the various states -- Indiana, Illinois, Ohio, Kentucky, New Jersey and California (see Rubin & Armstrong 1989; Erickson & Friedman 1989; Seyfried 1990; Elling & Sheldon 1991; Redfield and McDonald 1991; Papke 1994; Landers 1996; Sridhar 1996; Dowall 1996; Boarnet & Bogart 1996; McDonald 1997; Sridhar 2000). Other studies have focused on case studies of specific enterprise zones (US Department of HUD 1986; US GAO 1988; Rubin & Wilder 1989; Dabney 1991).

The evidence is mixed with some of the studies (US Department of HUD 1986; Erickson & Friedman 1989; Rubin & Armstrong 1989; Papke 1994; Sridhar 2000) being more optimistic and others (Seyfried 1990; Dabney 1991; Boarnet and Bogart 1996; Dowall 1996) pessimistic with regard to enterprise zone effects.

Rubin & Armstrong (1989) evaluate the New Jersey Urban Enterprise Zone program. They use the input-output model (developed by the Bureau of Economic Analysis (BEA) for New Jersey) in order to estimate the direct and indirect benefits from the enterprise zone program. In doing this, they use their survey of employers whose primary reason for expanding/locating in the Urban Enterprise Zones (UEZs) was the program, as their most plausible assumption. However, there is a problem with using a survey of employers who indicate that incentives in the enterprise zone program were primarily responsible for their location there, as Bartik (1994) points out. The problem is that such employers may have their own interests in stating that the incentives are important to them even when they are not, to ensure their continuation.

In an approach that is quite different from Rubin's survey approach, Boarnet and Bogart (1996) present econometric evidence on the effectiveness of New Jersey's UEZ. They find no evidence that the program had a positive effect on total municipal employment, on employment in various sectors, or on municipal property values. They conclude, quite contrary to Rubin and Armstrong (1989), that the UEZ program in New Jersey was ineffective in achieving its goal of improving the economic conditions in and around the zones. However, as Boarnet and Bogart themselves point out, if the New Jersey program increased investment without increasing employment or property values, their data do not permit them to identify this effect. Thus the effectiveness of enterprise zones in New Jersey appears to be an unresolved issue.

Papke's 1994 study of Indiana's EZ program estimates the impact of the EZ on unemployment. Papke (1994) finds significant reduction in the unemployment claims due to Indiana's EZ program (to the extent of

19 percent). However, the study uses data on unemployment claims the limitations of which are clear. Data on unemployment compensation claims exclude persons who have exhausted their benefit rights, new workers who have not earned rights to unemployment insurance, and persons losing jobs not covered by unemployment insurance systems (including some workers in agriculture, domestic services, and religious organizations, and self-employed and unpaid family workers). Considering this, Papke's estimates overstate the impact of the EZ on actual unemployment.

Ge (1995) develops a theoretical model to evaluate the impact of the EZ that takes into account direct and indirect employment effects. Ge finds that opening the UEZ creates jobs both directly and indirectly in the host region. These are because of vertical linkages that exist between the UEZ and the rest of the economy. Thus Ge shows that with the UEZ, the region as a whole would be better off since the rate of urban unemployment decreases. Ge however presents no empirical evidence. Sridhar (1998) develops an analytical framework to understand the impact of the enterprise zone on the economy and the general equilibrium response of the tax abatement given to firms in the enterprise zone. This model in Sridhar (1998) provides a framework for performing benefit-cost analysis in the empirical work in this paper.

Sridhar (1996) takes into account net benefits from employment, and performs a B-C analysis of enterprise zones in Illinois. The study finds that the net benefits from employment can be expected to be several times the costs, even if it were assumed that all employment relocated to the Illinois EZs from elsewhere, assuming that the relocation took place from low to high unemployment areas. However this result has to be viewed with caution since the reservation wage estimates (and hence the net benefit estimates) are based on only a single cross-section of the 1987 panel of the Panel Study of Income Dynamics.

McDonald (1997) argued that there were problems with Sridhar's 1996 computation of benefits. First, the counterfactual (the effect on employment in the absence of the program) is not taken into account. Second, job creation is not a valid measure of gain from the program. This is because job creation is coincident with a firm obtaining a building permit to qualify for the sales tax exemption on building materials (as shown in Redfield and McDonald 1991), whereas building permits are continually issued and jobs created in the local economy. McDonald argues that it is not clear if this can be attributed to the existence of the EZ or the tax incentives. The problems McDonald discusses with Sridhar's 1996 result relate to the counterfactual.

Sridhar (2000) addresses the counterfactual question with respect to Ohio's enterprise zone program. Before I proceed to an examination of the results in Sridhar (2000), it may be useful to note that property tax abatements, not sales tax exemption, are used as program costs in the

benefit-cost analysis of Ohio's program in this paper. Moreover, in Ohio's program, job creation is not tied to the issuance of building permits as it is in the Illinois program. The laws that guide the program and eligibility in Ohio are tied to the commencement of physical construction. The law speaks of the increase in assessed value of real property. A company will discuss its proposed new employment positions at the time it makes its application for the enterprise zone program (again, an application that has nothing to do with the building permit). The company then is allowed a period of time to create these jobs - typically three years from the date it enters into the enterprise zone agreement. Thus, while the problems with job creation being coincident with building permits McDonald (1997) points out are certainly applicable to Illinois' program, they do not affect Ohio's program. A similar argument to physical construction can be made as one can make regarding building permits, i.e., a business that can "establish," "expand," "renovate," or "occupy" would have done so even without the tax abatement. So even here an examination of the counterfactual is instructive.

Sridhar (2000) studies what would happen in areas without tax incentive programs and whether such incentives influence the unemployment rate through their effect on job creation. This is examined using data for the 11,445 census block groups of Ohio by overlaying a map of Ohio's tax incentive areas (enterprise zones) over that of its census block groups. After accounting for the endogeneity of the tax incentive program,[1] Sridhar finds that tax incentive programs have a significant impact in reducing the unemployment rate of areas. These findings are robust to several specifications of the model. The finding of interest is that the net impact on the unemployment rate of being an EZ area versus not being one for periods of 1, 2, 3, 4, 5, 6 and 7 years is -2.92, -1.76, -1.03, -0.73, -0.87, -1.44, and -2.45 percentage points respectively. These are not impacts that can be ignored because they imply that unemployment in EZs is reduced quite rapidly, when compared to areas that do not have them. These findings have interesting implications for the benefit-cost analyses performed in this paper. It implies that since enterprise zones are successful in reducing the unemployment rate of the areas adopting them, it might be necessary to take a step further and examine what are the net benefits from employment that result from this program.

Thus, while some of these studies are more robust than others, the effectiveness of EZs appears to be an unresolved issue in the literature. In this paper, I address some gaps in the literature. I perform benefit-

[1] All tax incentive programs in Ohio that could potentially affect job creation – enterprise zones and Community Reinvestment Area, are taken into account, in the tax incentive dummy. The tax incentive dummy is endogenous because the unemployment rate is a factor that influences an area's designation as a tax incentive area.

cost analysis of Ohio's enterprise zone program using more comprehensive measures of net benefits and costs than the literature has used, making different assumptions about employment at the firm-level and zone-level. I find results that are robust to several different assumptions.

3. Ohio's Enterprise Zone Program

Ohio's enterprise zone program is chosen to perform benefit-cost analysis in the empirical work because of two reasons.

First, Ohio is one of the few states in the United States having more than 100 zones in its territory. This was one reason why recent legislative discussions surrounding the Enterprise Zone program in Ohio contained instances of "pirating" of businesses from neighboring areas within Ohio (see Hill 1994; Byrnes, Marvel and Sridhar 1999). The advantages to local control of these programs both in terms of effective targeting of incentives and the importance of meeting the competition of other states have also been cited in the debates.

Second, Ohio's program is one of probably few programs that involve negotiation of terms between local government and individual firms (see Byrnes, Marvel and Sridhar 1999, for a model of the bargaining between firms and local governments in Ohio). Usually, in other state programs, the qualified activities are determined when the program is designed, as in the case of New Jersey's Urban Enterprise Zone (UEZ) program.

Thus, since Ohio's program has generated lot of heated debate in the policy circles, it is chosen for the empirical work.

In the state of Ohio, in order for an area to be designated as an enterprise zone, local communities must identify the EZ's geographic area. The defined area must meet minimum population requirements and have a single continuous boundary. In addition, the area may also fulfil certain other distress criteria that are relevant. I elaborate on these criteria specified by state's Department of Development, below.

In Ohio's enterprise zone program, there are two types of zones that are allowed: *Full-authority zones* and *limited authority* zones. *Full authority zones* are distress-based. They have to satisfy at least one of 6 distress criteria. The six distress criteria qualifying a distress-based zone are:

1. 125% of the state's average unemployment during the most recent 12 months
2. At least 10% population loss between 1980 and 1990
3. Prevalence (minimum of 5%) of vacant or demolished commercial or industrial facilities
4. 51% of the population is below 80% of the area's median income
5. Specific vacant industrial facilities (zone incentives apply only to those facilities)

6. Income weighted tax capacity of the school district is below 70% of the state average.

It is just sufficient for the *limited authority zones* to demonstrate minimum population requirements to be designated as zones. The population requirements are that EZs proposed within counties of a population greater than 300,000 must have a minimum population of 4,000. EZs proposed within counties of a population less than 300,000 must have a minimum population of 1,000.

As of December 1997, there were 44 distress-based zones and 278 limited authority zones in Ohio, being one of the few states with a large number of zones in its territory.

Once a community receives Enterprise Zone Certification, state law permits local officials to *negotiate* a tax incentive agreement with a prospective firm. Once an area is certified as an enterprise zone, firms can enter into agreements with the local governments (having jurisdiction over the zones) and make commitments regarding investment, job creation, retention and payroll. Ohio law states that the amount and term of the tax exemption are to be negotiated between local officials and the firm. However, the law states the limits of the incentives. It permits municipalities to exempt real[2] and/or personal property[3] assessed values of up to 75 percent for up to 10 years, or an average of 60 percent over the term of the agreement. The exemption can be provided to new investments in buildings, machinery/equipment and inventory and improvements to existing land and buildings for a specific project. The state's Enterprise Zone law permits unincorporated areas to exempt real and/or personal property assessed values of up to 60 percent for up to 10 years or an average of 50 percent over the term of the agreement. The exemption is allowed on new investments in buildings, machinery/equipment and inventory and improvements to existing land and buildings for a specific project. However, maximum exemption levels may be exceeded with approval by the affected Board of Education.

4. Data

In Ohio, the Department of Development administers the enterprise zone program. Data files from the Ohio Department of Development contain data regarding zone number, agreement number, agreement date, expiration date, company name, and SIC code. The data also contain information on firms' actual performance with respect to jobs cre-

[2] Real property refers to any real estate, and buildings on it.
[3] Personal property refers to all tangible personal property such as machinery, equipment, and inventory.

ated, retained, payroll from employment created and retained, investment, amount of investment granted exemption, terms (period) of the exemption, property (real and personal property) taxes paid and foregone, and corporation taxes paid. All these performance data which are available are cumulative and include information on all projects from 1982 as of the end of 1995. So while these data are themselves obtained from the 1995 annual report compiled by the Ohio Department of Development, it includes information on all active prior projects.

This is thus a rich database that allows me to test the hypotheses of the research by permitting me to perform benefit-cost analysis of the program.

5. Benefit-cost Methodology

Measures of Benefits

Measures of program benefits that are chosen are net benefits from employment defined as actual wages minus the reservation wage. Given that EZs are government-sponsored, one might ask whether benefits to the government such as increased income tax revenue and/or decreased unemployment insurance payments are relevant to be taken into account. However, we have to remember that any increases in income tax revenue or decreases in unemployment insurance are merely distributional in their effects, merely transferring income from taxpayers to government. They do not represent real benefits. On the other hand, net benefit from a job is similar to consumer's surplus (in a goods market) which is the difference between the actual price and that the consumer would have been willing to pay for the good, and so is a measure of increase in welfare.

In order to compute net benefits from employment (since net benefits are defined as actual wages minus reservation wage), data on reservation wages for Ohio labor force are necessary. Reservation wages estimated from the Panel Study for Income Dynamics (PSID) (from Sridhar 1998) are used to impute reservation wages for Ohio's enterprise zones.[4]

The PSID is a national panel data set of about 6,000 American families, published by the Survey Research Center at the University of Michigan, Ann Arbor, since 1969. In the PSID, responses to the question, "What is the lowest wage you would be willing to take home as pay?" is measured as the reservation wage of the individual in a new job. This

[4] But for this national panel data set, I have found that no secondary data exists on reservation wages, with the exception of the National Longitudinal Survey (NLS). NLS data are reported in various panels for various cohorts making it difficult to generalize for labor force in all age groups. Secondary data on reservation wages were even more difficult to find exclusively for Ohio labor force. So I used panel data from the PSID to impute reservation wages for Ohio.

question is asked of respondents in the PSID consecutively for 8 years from 1980-87. Table 1 from Sridhar 1998 shows a model of the reservation wage. The model shows the elasticity of the reservation wage with respect to individual demographic characteristics, labor market characteristics (primarily the unemployment rate) and other job search characteristics (including the duration of job search) for the United States.

Table 1. Switching Regression Model of Reservation Wage with Sample Selection Dependent Variable: Log of Reservation Wage

Variable	Coefficient (Std.Error)	Means (Std.Dev)
Constant	-13.973 (12.71)	
Age	0.0709 (0.0624)	39.82 (11.05)
Grades completed	-0.1559 (0.1428)	11.76 (2.47)
Work experience	-0.1119 (0.0899)	12.43 (13.82)
Whether African American (1=Yes; 0=No)	1.4125 (1.254)	0.31 (0.46)
Male (1) / Female (0)	0.6344 (0.6223)	0.71 (0.45)
Marital status	-0.9112 (0.9353)	0.46 (0.50)
Number of children	0.1602 (0.1825)	1.15 (1.33)
Predicted value of duration of search	-0.1353 (0.0798)*	1.92 (1.67)
Predicted value of duration of search squared	-0.0012 (0.0082)	6.46 (8.32)
Unemployment rate of county of residence	-0.0324 (0.0543)	7.10 (2.80)
Log of past wage	0.5502 (0.0397)***	$3.17 (2.71)
Log of weekly minimum unemployment benefits allowable under state law	-0.1108 (0.1189)	$23.91 (1.60)
Log of weekly maximum unemployment benefits	1.6533 (1.227)	$169.13 (1.26)
Waiting (0 or 1 week) for unemployment benefits	0.7234 (0.8183)	0.91 (0.29)
λ_r	-2.7901 (2.713)	-2.14 (0.49)
Dependent Variable		**$3.25 (2.36)**
R^2	**0.40**	
N	**737**	

***Statistically significant at the 1 percent level
* Statistically significant at the 10 percent level
Source: Sridhar(1998).

Since the PSID is a nationally representative sample (see Sridhar 1998) for a description of the weighting scheme employed in the PSID to ensure representativeness), it is assumed that the elasticities based on United States data represent the responsiveness of reservation wages in Ohio to analogous socio-economic characteristics. These estimates are applied to the various characteristics of persons in Ohio's enterprise zones to impute reservation wages for them. This is possible because I overlay a map of Ohio's census block groups over that of its enterprise zones.[5] This enables me to determine the census block groups that each enterprise zone in Ohio is comprised of, and to apply the block groups' characteristics to the zones. This is especially useful because no data on socio-demographic characteristics are available by zone in Ohio.

Profile of Zones and Non-Zones

Socio-demographic characteristics on which data are available for persons at the census block group level for Ohio are whether / not unemployed, whether African American, age, education (grades completed), marital status, number of children, and whether male / female. I compute the unemployment rate (based on employment status of persons), average age (of persons), mean number of children per family, mean grades completed, and mean proportion African American, married, and male, for Ohio's census block groups. I use the geographical overlaying to estimate these characteristics for Ohio's zones. The overlaying enables me to impute reservation wages for Ohio based on the zones' characteristics.

Before I demonstrate how the imputation is done, I summarize profiles of the socio-economic characteristics for Ohio's zones and non-zone areas. Table 2 summarizes the profile for the zones. Table 2 shows that the 280 enterprise zones in Ohio have substantial variability in their unemployment rate,[6] have middle-aged population,[7] with high school (about 12 grades of school) completed on average, the distribution of women and men being equal and majority of them married.

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[5] I do this with the help of GIS (Geographic Information Systems) software, ARCVIEW.

[6] The way in which I have estimated zone unemployment rates is according to the procedure recommended by the Ohio Department of Development. According to this procedure, I first estimate the unemployment rate for all the counties based on the ratio of unemployed to total labor force aggregated in the 1990 census at the county level. I then estimate a similar ratio for the block groups comprising the zones, obtaining a raw unemployment rate for every zone. I take the ratio of zone to county unemployment rates computed in this way. I then apply the zone to county unemployment rate ratio to the county unemployment rates published by the Ohio Bureau of Employment Services (OBES) to arrive at zones' unemployment rate for 1990. Therefore, the characteristics, the reservation wages, net benefit and benefit-cost ratios that are estimated for the zones are for 1990.

[7] Since the number of persons in each age range is reported in the Census, I calculate the mean age by substituting midpoints for intervals. I calculate a weighted average for age based on number of persons in each age group. I include only adults (i.e., persons who are above 17 years of age).

Table 2. Summary of Profile for Ohio's Enterprise Zones, 1990

Characteristic	0th Percentile[a]	50th Percentile	100th Percentile	Mean (Std.Dev)
Unemployment Rate	1.73%	6.23%	16.95%	6.34% (2.44)
Age	36.57	44.45	49.53	44.43 (1.86)
Grades completed	11.27	12.08	13.73	12.17 (0.47)
Proportion African American	0	0.01	0.79	0.05 (0.10)
Proportion Male	0.44	0.49	0.56	0.49 (0.01)
Proportion Married	0.32	0.61	0.75	0.59 (0.07)
Number of children per family	0.56	0.91	1.30	0.91 (0.11)

a. The nth percentile of a distribution is the number below which n percent of observations lie.

Table 3. Summary of Profile for Ohio's Non-Zone Census Block Groups, 1990

Characteristic	0th Percentile	50th Percentile	100th Percentile	Mean (Std.Dev)
Unemployment Rate[a]	0%	3.57%	59.16%	4.66% (4.40)
Age	19.05	44.38	69.13	44.63 (5.27)
Grades completed	8.07	12.54	16.24	12.72 (1.04)
Proportion African American	0	0	1.00	0.08 (0.20)
Proportion Male	0.22	0.48	1.00	0.48 (0.05)
Proportion Married	0	0.61	1.00	0.57 (0.15)
Number of children per family	0	0.83	2.85	0.84 (0.29)

a. The unemployment rates for the census block groups is calculated in a similar manner as for the zones, using the procedure recommended by the Ohio Department of Development.

Table 3 shows the profile of characteristics for non-zone areas in Ohio. Table 3 is based on the 3,331 census block groups of the state that are not enterprise zones. It shows that some of the non-zone areas of the state have higher unemployment rates than the areas designated as zones. However it may be noted that the average unemployment rate for the non-zone areas is lower than it is for the zone areas indicating higher levels of distress in zones. It also may be noted that on average, non-zone areas in Ohio are of the same age as but slightly more educated than the zone areas.[8]

Imputation of Reservation Wages

The imputation of the reservation wage is done using the estimates in Table 1. In addition to the characteristics available and reported for Ohio's enterprise zones in Table 2, data on the duration of unemployment, past wages and work experience (see Table 1) are substituted from

[8] It may be noted from Table 3 that at least one non-EZ census block group has an educated population, with its population having completed college degree on average. This is the one with a maximum of 16.23 grades (or college degree) completed, being in Franklin county, census tract 7820 and block group number 6.

the PSID for the imputation. The minimum weekly unemployment benefit ($12.15), maximum weekly unemployment benefit ($245.44), and the waiting period for unemployment benefit (1 week) eligibility that are applied to the estimates in Table 1 for the imputation are for Ohio.

The imputed reservation wage for an average Ohio zone turns out to be about $4.88 an hour in constant dollars, with 1982-84=100 (or about $10,150 annually, assuming 40 hours a week and 52 weeks a year), which is plausible. The distribution of imputed reservation wages is shown in Table 3, with a minimum of $2.60 and a maximum of $16.98 an hour (or about $35,000 annually assuming 52 regular work weeks), depending on zone characteristics (all in constant dollars, with 1982-84=100).[9]

The next step is to estimate net benefits for employment created in Ohio's zones. Because the reservation wages imputed from the PSID are hourly, they are converted to an annual amount (this is because the Ohio Department of Development reports annual earnings from employment) assuming that persons work full-time (40 hours a week, 52 weeks a year). The earnings reported for jobs created in Ohio's zones are made net of reservation wages to arrive at an estimate of net benefit for every job.

Measures of Program Costs

Property tax abatements provided to firms in the zones are used as the primary measure of costs of the enterprise zone program. Infrastructure costs are also real resource costs. But since these data are not routinely collected at the state level, a survey is sent to the EZ administrators of the 44 ***distressed*** Ohio EZs. The objective of the survey was to obtain an approximate idea of the costs of providing infrastructure services to firms. It was assumed that the distressed areas define the upper limit of the cost of making infrastructure improvements for a firm that locates in the zone. This is because one may expect the non-distressed areas (that are designated as (limited authority) zones in Ohio) to have the basic infrastructure such as state highways, county roads, sewer and water lines in place. Even if they do not, the cost of setting up the infrastructure in these non-distressed areas would be at the most, the same, if not higher than, that in the distressed areas.

Based on 39 of the 44 zones that responded to the survey,[10] the average cost of providing basic infrastructure services to a firm that locates in a zone turns out to be $24,200. There are several zones (17 out of 39 zones) in which the cost to the local government of providing infrastructure to firms is zero because it is either covered by federal grants or is paid for by the firm.[11]

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[9] When I apply the estimates in Table 1 to the non-EZ block groups of the state, the mean reservation wage turns out to be $5.67 per hour, which is higher than that for the zones, as we would expect.

[10] Copy of the survey questions and responses are available upon request.

[11] In such instances, local government costs are legitimately counted as being 0.

In addition to the costs of providing infrastructure to firms, respondents are also asked for any administrative costs of negotiating the EZ agreement with the firm. Most (92 percent of the respondents) reported that there is no cost to negotiating the contract with the firm. Based on those who reported administrative costs, the average cost of negotiating an agreement with a firm is around $1,000.[12]

These costs of infrastructure and administrative costs for providing services to EZ firms are taken into account along with property tax abatement costs and the cost of any other local incentives to estimate program costs in the benefit-cost analysis.

It may be noted that the measures of costs chosen here ignore commuting effects, which could be substantial, depending on the size of the zone. The large number of zones in Ohio suggests relatively small zones. Also, it is assumed that local zone residents get jobs created by zone firms. The empirical evidence is that on average about 50 percent of jobs created in the EZ go to zone residents. The U.S.Department of HUD 1986 found that 70% of jobs in the Bridgeport EZ in CT, 70 percent of jobs created in the Chicago EZ in IL, 46 percent of those created in the Macon EZ in MO, 19 percent in Michigan City, IN, and 30 percent in the Tampa zone (FL) were held by zone residents. In the Louisville (Kentucky) zone, it was found that 31 percent of the jobs created were held by persons who were either lower income or zone residents. Erickson and Friedman 1989, based on a survey of local enterprise zone coordinators conducted by the U.S. Department of HUD, found that the mean share of jobs held by zone residents was over 61 percent with a median of over 68 percent. Immergluck's 1997) data from the Chicago EZ indicated that the barriers between EZ residents and jobs are dependent on some factors. He found that local employment was much higher in Latino parts of the zone and in African American neighborhoods where there were more public sector jobs, very small firms and few manufacturers.

The small size of the state's zones along with the assumption that a majority of jobs are held by zone residents together imply that substantial commuting to get to work, does not take place. In the event that such commuting exists, we must recognize that they could reduce the imputed benefits.

The net benefits are compared to program costs to estimate the benefit-cost ratio. It may be noted that the benefit-cost ratios computed in

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[12] However it should be noted that the costs of the program that are not included here are when negotiations between the local government and firm do not result in a contract. This is because in Ohio's enterprise zone program, tax abatements are not automatic upon a firm's location in the zone. The abatements have to be negotiated with the local government. It is possible that if the affected School Board does not approve of the abatement to the firm, a contract does not result. Then it is up to the firm to decide whether or not it wants to locate in the zone.

this manner refer only to local government investment. This helps to determine in which zones local government investment is worth the net benefits from employment. Given the financial autonomy of local governments in the United States, they are the appropriate unit of analysis. Moreover, this is a program that depends quite heavily on the local government's financial resources, as may be clear from a description of Ohio's EZ program. Even if the benefits that accrue from the program are not essentially local in the long run (for example, multiplier effects that could have spillover effects on the region's employment) the local government incurs program costs. Therefore it is appropriate to perform benefit-cost analysis at the level of the local government that spends its resources on the program.

6. Benefit-Cost Analysis

Given the finding from Sridhar (2000) regarding the effectiveness of Ohio's tax incentives, B-C analysis of the program is performed and reported in three scenarios reflecting various assumptions about employment created in the zones, because of two reasons:

1. The sensitivity or robustness of the B-C results to the various assumptions presents multiple alternatives along a range, for choice by policymakers, according to the value judgment one is willing to make.
2. Retained employment cannot be considered as being held by the unemployed, because, they are by definition, already held by someone.[13] It is important to examine the benefits and costs when the employment is held by unemployed. So when we take into account only jobs that are newly created can the assumption of the jobs being held by unemployed is plausible. The assumption in scenario 2 reflects this. In addition, we may also note that retained employment is not a very reliable measure of program impact. A preexisting firm negotiates a tax incentive with officials and claims that its jobs would have otherwise moved. However it is quite possible that the firm would have stayed where it was even in the absence of the program. Moreover, data from the Ohio Department of Development on retained jobs (and their earnings) are not very reliable, especially for the earlier years (from 1984 till the early 1990s). So, with this assumption, I am able to overcome the data and other substantive limitations with retained employment.

[13] In instances in which incentives are given to a firm that threatens to relocate out of the zone otherwise, employment that would have been otherwise lost is referred to as retained employment.

The assumptions which form the basis for the three scenarios are explained below:

1. Net benefits estimated from all employment reported as being **created and retained** by the firms.
2. Net benefits estimated from employment reported as being **created only** (excludes jobs retained). The use of employment created as a measure of program impact is supported by evidence in Sridhar 2000 regarding the effect of Ohio's tax incentive programs on unemployment rate.
3. Net benefits estimated from a **proportion of the total employment** (those created and retained) attributable to the tax incentive under two assumptions of elasticity.

The net benefits, costs per job and benefit-cost ratios (all for local government investment) are computed at two levels: at the level of the enterprise zone and at the level of the firm within the zones, in all the scenarios. The justification, from a policy perspective, for computing B-C ratios for firms and zones is that they can tell whether or not particular firms or particular zones should be targeted.

Scenario 1

In this scenario, all the jobs that are reported as being created and retained are taken into account for computation of the benefit-cost ratios. The results are reported for 531 firms that did not relocate from within or outside the state in the 143 zones and those that received some tax incentives from their local governments.[14]

Table 5 shows the distribution of total employment (that is created / retained by firms in the zones), net benefits from jobs, costs and benefit-cost ratios per job at the level of the contracts that are negotiated with 531 firms in Ohio's enterprise zones. The 531 firms in the 143 zones created and retained 104,840 jobs through 1995. Table 5 shows for firms a disaggregated distribution of employment, earnings, net benefits, costs and B-C ratio per job.

[14] Of the 1,974 firms that located in the state's 280 enterprise zones over 1983-94, there are some data missing for some firms, and for some others, the data are inconsistent. Instances of inconsistent data are observed when the earnings are either reported as 0 or as being too low or too high for some jobs. So I delete observations that have earnings less than $10,000 a year (which is around the minimum wage, i.e., $5.00*40*52), and greater than $50,000 a year. I also delete observations that have inconsistent earnings data for retained jobs (for instance, those firms that report earnings for retained jobs when no jobs are in fact retained). I also eliminate all firms that did not receive abatements. Because of these restrictions, I am left with 531 observations in the firm-level data and 143 observations in the zone-level data in this scenario.

Table 5. Distribution of Average Net benefits and Benefit-Cost Ratios for the (531) Firms in Ohio's Enterprise Zones under Scenario 1

	Mean (Min,Max) for firms: 0th-25th Percentile	Mean (Min,Max) for firms: 25th-50th Percentile	Mean (Min,Max) for firms: 50th-75th Percentile	Mean (Min,Max) for firms: 75th-100th Percentile	Unweighted Mean for all firms (Std.Dev) [e]	Weighted mean for all firms (Wt. Std.Dev) [f]
Total Employment[a]	12.07 (1, 23)	40.32 (24, 63)	95.51 (64, 152)	646.91 (153, 11,000)	197.44 (789.22)	197.44 (382.91)
Annual deflated earnings per job (1982-84=100)	$12,553.57 (10,148.45, 14,497.31)	$16,546.02 (14,497.71, 18,714.21)	$21,913.32 (18,764.75, 24,985.60)	$32,078.04 (25,100.70, 49,636.24)	$20,821.28 (8,012.17)	$20,766.91 (2,449.43)
Net benefit per job[b]	$11.69 (-8897.97, 3508.82)	$5,819.81 (3564.41, 8161.69)	$11,185.96 (8168.76, 14369.24)	$20,624.94 (14372.16, 36913.09)	$9,458.97 (8,388.51)	$9,407.17 (2,996.77)
Costs per job[c]	$180.21 (21.99, 330.87)	$524.42 (336.14, 762.76)	$1,126.24 (764.53, 1791.36)	$8,962.99 (1795.12, 1273982.19)	$5,085.54 (56,142.42)	$2,691.40 (5,007.54)
B-C Ratio[d]	-2.52 (-59.53,2.71)	5.85 (2.72, 9.36)	15.22 (9.48, 24.14)	80.25 (24.41, 1448.75)	24.73 (74.04)	24.73 (37.12)
Unemployment rate	7.46% (3.05, 11.66)	7.03% (2.05, 13.49)	6.69% (2.36, 13.49)	6.80% (2.85, 13.49)	6.34% (2.44)	6.99 (2.25)

a. Total employment in this scenario includes jobs created and retained.
b. Net benefit is defined as Earnings per job – Annual reservation wage.
c. Costs per job include property tax abatements, other local incentives, and costs of infrastructure.
d. B-C ratio is defined as the ratio of net benefit to costs per job. Notice that it is not average net benefit per job (row 3) divided by average cost per job (row 4). If I calculate B-C ratios based on average net benefit and cost per job (rows 3 and 4 respectively), I would not reveal valuable information on the individual firm's B-C ratios which I have calculated as the ratio of individual firms' net benefits to costs per job. The minimum and maximum values for the distribution of B-C ratios should make clear the average values of the B-C distribution, when we compare them to the net benefit and cost distribution.
e. Unweighted means are the raw averages of the relevant variable for all the firms.
f. Weighted means are weighted averages in which the weights are the number of firms in each category (firms in 0th-25th percentile, those in the 25th-50th, 50th-75th, and 75th-100th percentiles) of the relevant distributions. For the weighted means, the weights are multiplied by the means for firms in each category and sum of the weights and the means are divided by the total number of firms. A similar procedure is used to calculate weighted standard deviations for the various distributions.

In Table 5, we may note considerable variation in the employment created by the various firms in the state's zones. The high cost zones are those in which little employment is created. With the variation, it may be noted that the benefits are greater than costs in the average contract

negotiated in Ohio's zones. The net benefits per job approximately equal the earnings less the mean annual reservation wage (about $10,000 per job).

There is also large variation in the costs incurred for every job created, ranging from less than $25 a job to about $1.27 million per job. The highest costs (abatements and other incentives) are incurred for those firms that made the largest investments in personal and real property. This is reasonable because the property tax abatement is an incentive to capital. Given that these firms did not create much employment, the costs per job are high.

There is also considerable variation in the benefit-cost ratios (for local government investment) across zones. The benefit-cost ratio is less than 1 for about 10 percent of the firms indicating that costs are greater than benefits for these firms. The low benefit areas are areas that awarded large abatements because of firms' investments in capital (personal and tangible property), resulting in high costs to create employment. However, for firms in majority of the distribution, the (unweighted) B-C ratio is well above 1 indicating that net benefits per job are substantially higher than costs per job for these firms.

In the data, there is little relationship between net benefits from employment and the unemployment rate. In fact, I find that there is a negative, but insignificant correlation between the net benefits from jobs created in the zones and the unemployment rate of the zone in which these firms are located.

Table 6 shows the distribution of the employment, net benefits, costs and benefit-cost ratios by zone in this scenario. Table 6 shows that, in half of the zones, the cost of creating a job is less than $1,000. In the average zone, the net benefit is above $10,000 per job, which is substantially higher than the costs per job. The difference between the earnings and the net benefit per job is equal to an amount in the range of the annual reservation wage reported earlier (about $10,000 per job).

On average, the unweighted B-C ratio in this scenario is about 27. The weighted B-C ratio (25.5) is also consistent with this indicating that net benefits are 25 times greater than the costs of creating employment. I find that the correlation between the zone unemployment rate and net benefit per job is positive and stronger than that found at the firm level, being 0.09, with many lower B-C ratios found in the low-unemployment zones.

Table 6. Distribution of Net benefits and Benefit-Cost Ratios in Ohio's (143) Enterprise Zones under Scenario 1

	Mean (Min, Max) for zones: 0th-25th Percentile	Mean (Min, Max) for zones: 25th-50th Percentile	Mean (Min, Max) for zones: 50th-75th Percentile	Mean (Min, Max) for zones: 75th-100th Percentile	Unweighted Mean for all zones (Std.Dev)	Weighted Mean for all zones (Wt. Std.Dev)
Total Employment	36.97 (1, 82)	153.75 (83, 231)	335.83 (236, 533)	2,453.83 (549, 26360)	733.15 (2369.38)	733.14 (1113.75)
Annual deflated earnings per job (1982-84=100)	$13,074.35 (10,148.45, 15154.95)	$17,611.45 (15310.28, 19974.22)	$22,152.01 (20020.53, 24177.00)	$31,549.11 (24534.56, 45,281.78)	21,089.35 (7725.08)	21,089.35 (2684.22)
Net benefit per job	$2,739.62 (-2120.76, 5262.69)	$7,048.75 (5282.18, 8950.70)	$12,002.45 (9121.22, 14443.00)	$20,454.63 (14575.34, 36121.29)	10,666.51 (7544.38)	10,487.25 (2563.70)
Costs per job	$179.80 (85.09, 267.59)	$408.01 (268.69, 573.82)	$897.30 (581.38, 1299.17)	$14,154.65 (1383.08, 156491.30e)	$4,927.96 (19,853.35)	$3,860.62 (7148.55)
B-C Ratio	1.79(-3.17,4.61)	8.11 (4.69, 11.55)	22.18 (11.93, 35.66)	72.34 (36.15, 224.84)	26.95 (38.24)	25.55 (13.03)
Unemployment rate	7.13% (2.05, 10.71)	5.85% (2.36, 11.17)	6.44% (2.85, 13.49)	6.63% (2.88, 11.66)	6.34% (2.44)	6.51 (2.13)

Scenario 2

Here the B-C ratios reported at the firm level and zone-level take into account only employment that is newly created. The results in this scenario are based on 575 firms in 148 zones.[15] Retained jobs are excluded from the B-C analysis. Table 7 shows the distribution of B-C ratios at the firm level when calculated based on only new jobs that are created.

[15] Here I impose the same restrictions for the data set of 1,974 firms as I do in Scenario 1 (delete observations with payroll per job <$10,000 and >$50,000, those firms that did not receive tax abatements and those that relocated from within or outside the state). In this scenario, the number of observations are 575 (higher than in Scenario 1where it is 531) because the restriction pertaining to retained jobs is not there since this scenario takes into account only jobs that are newly created. I am thus left with 575 observations in the firm-level data and about 148 observations in the zone-level data.

Table 7. Distribution of Net benefits and Benefit-Cost Ratios for the (575) Firms in Ohio's Enterprise Zones under Scenario 2

	Mean (Min,Max) for firms: 0^{th}-25^{th} Percentile	Mean (Min, Max) for firms: 25^{th}-50^{th} Percentile	Mean (Min, Max) for firms: 50^{th}-75^{th} Percentile	Mean (Min, Max) for firms: 75^{th}-100^{th} Percentile	Unweighted Mean for all firms (Std.Dev)	Weighted Mean for firms (Wt.Std. Dev)
Total Em-ployment	6.37 (1, 11)	17.56 (12, 27)	43.88 (28, 68)	170.79 (69, 1023)	58.95 (92.61)	58.95 (37.23)
Annual deflated earnings per job (1982-84=100)	$12,409.71 (10076.12, 14554.11)	$16,472.92 (14634.91, 18596.79)	$21,491.57 (18600.32, 24635.04)	$31,477.84 (24816.45, 48436.18)	$20,534.26 (7,881.70)	$20,534.26 (2,513.02)
Net benefit per job	$121.06 (-10,138.02, 3670.92)	$5,921.91 (3692.26, 7882.93)	$10,713.90 (7921.71, 14097.20)	$20,381.02 (14127.23, 37980.23)	$9,331.02 (8161.65)	$9,281.10 (2,856.89)
Costs per job	$462.65 (80.04, 754.12)	$1,086.88 (759.82, 1501.95)	$2,173.33 (1512.89, 3039.92)	$14,062.94 (3041.45, 1273982.19[h])	$6,623.86 (54,776.70)	$4,415.92 (6,639.01)
B-C Ratio	-0.76 (-46.43, 1.40)	2.94 (1.49, 4.71)	7.82 (4.77, 11.47)	25.58 (11.59, 106.88[i])	9.05 (14.11)	8.88 (6.20)
Unem-ployment rate	7.57% (2.05, 11.66)	6.76% (2.76, 11.66)	6.76% (2.76, 11.66)	6.59% (2.36, 13.49)	6.34% (2.44)	6.87 (2.19)

The total employment created in the zones is 33,896. The remaining 70,944 of the total of 104,840 jobs considered in Scenario 1 are retained. The net benefit in this scenario is about $10,000 on average, and about $10,000 lower than the earnings per job which is approximately equal to the annual mean reservation wage. The B-C ratios are less than 1 till up to the 25^{th} percentile or so indicating that for more than 20 percent of the firms, the costs of creating employment are greater than the benefits from local government investment. The firms with B-C ratios <1 are those that created few jobs (usually <10 jobs) or are offered large abatements and are randomly distributed across low-unemployment and high-unemployment zones. I find that most of the firms with B-C ratios in higher percentiles of the distribution are located in the zones with high unemployment rates (have unemployment rates greater than 125% of the state's average for 1990). The correlation, however, between net

benefits and unemployment rate of the zone (in which firm had located) is negative though not statistically significant, being -0.1.

The same pattern of B-C ratios essentially repeats itself when we take into account zone-level performance in Scenario 2, the results from which are reported in Table 8. Table 8 shows that the mean earnings per job is reasonable around $20,000, and concurs with the expectation of the Ohio Department of Development regarding the nature of jobs that are created by the firms that typically locate in the zones. The high-cost areas are those in which firms made large investments in personal and real property and as a result large abatements were provided. Zones with B-C ratios less than 1 are those with low net benefits because of low earnings from employment. Thus the lowest net benefits from employment are in zones in which the earnings per job are below average or when reservation wages are high due to the area's low unemployment rate. Lower net benefits are found in some high-unemployment zones, with correlation between net benefits and unemployment rate at the zone-level also being –0.1.

Table 8. Distribution of Net benefits and Benefit-Cost Ratios for (148) Ohio's Enterprise Zones under Scenario 2

	Mean (Min, Max) for zones: 0^{th} -25^{th} Percentile	Mean (Min, Max) for zones: 25^{th} -50^{th} Percentile	Mean (Min, Max) for zones: 50^{th} -75^{th} Percentile	Mean (Min, Max) for zones: 75^{th}-100^{th} Percentile	Unweighted Mean for all zones (Std.Dev)	Weighted Mean for zones (Wt.Std.Dev)
Total Employment	19.87 (1, 42)	74.69 (43, 106)	191.40 (107, 288)	631.62 (290, 1431)	229.03 (280.56)	229.02 (93.06)
Annual deflated earnings per job	$13,337.93 (10148.45, 15311.77)	$17,706.85 (15438.60, 19707.11)	$21,468.59 (19757.39, 23618.26)	$29,282.95 (23861.97, 47345.77)	$20,449.08 (6574.58)	$20,449.08 (2326.66)
Net benefit per job	$2,952.61 (-755.87, 5036.53)	$7,118.41 (5194.37, 8950.70)	$11,224.33 (8964.85, 13440.43)	$18,495.26 (13702.25, 37980.67)	$10,079.31 (6643.42)	$9,957.24 (2,172.44)
Costs per job	$440.94 (134.61, 662.61)	$915.05 (668.12, 1233.86)	$1,723.47 (1265.99, 2428.51)	$19,970.69 (2464.24, 182954.77[f])	$5,762.54 (20,148.18)	$5,762.54 (9,452.37)
B-C Ratio	1.01 (-0.59, 3.17)	4.96 (3.20, 6.69)	9.95 (6.77, 13.76)	24.77 (13.90, 67.03 [i])	10.17 (10.96)	10.17 (4.16)
Unemployment rate	7.30% (2.05, 11.17)	.90% (2.67, 10.30)	5.99% (2.36, 11.66)	6.65% (3.05, 13.49)	6.34 (2.44)	6.46 (2.11)

Scenario 3

Tables 9-12 show the results from the net benefits from employment and B-C ratios for respectively 198 (in 62 zones) and 91 firms (in 32 zones).[16] The results in Table 9 are based on the assumption that the elasticity of employment with respect to taxes is –0.3 (the upper range in Bartik's summary of econometric studies) and they are reported at the *firm level*. Table 10 shows the results again for the firm level assuming that the elasticity of employment with respect to taxes is –0.1 (the lower range in Bartik's summary). Thus the employment and net benefits that are reported in these tables refer to the portion of annual employment created and retained that is actually attributable to the tax incentive under two different assumptions of elasticity (-0.3 and –0.1).[17] Tables 11 and 12 report the results of benefit-cost analyses at the *zone level* for these two assumptions of elasticity. With an assumed elasticity of employment with respect to taxes equal to –0.3, of the 19,990 jobs that are reported by the firms to be created and retained, only about 8,791 (about

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[16] Here I impose the same restrictions as I do in Scenario 1 (delete observations with payroll per job <$10,000 and >$50,000, those firms that did not receive tax abatements and those that relocated from within or outside the state). However the extra condition here that reduces the number of firm observations considerably is that of eliminating observations that have X (i.e., total taxes that would've been paid in the absence of the abatement) = 0. This condition is necessary because X appears in the denominator in the calculation of dY in the expression for elasticity: dY / dX * X / Y = -0.1 (-0.3). So dY=(dX / X)*0.3(0.1)*Y. See the next footnote.

The number of observations differs across the two elasticity assumptions because the restriction of deleting observations with payroll per job <$10,000 and >$50,000 that is imposed takes into account only employment that is attributable to the tax incentive under the two assumptions of elasticity. Under the lower elasticity assumption, it should be clear that the employment attributable to the tax incentive will be lower than that under the higher elasticity assumption. We should also see that the cost per job is undefined when the total employment attributable to the tax incentive is 0 (since cost per job is defined as abatements / jobs). So I define the cost per job to be missing if total employment is 0. If cost per job is missing, the B-C ratio would also be missing and the number of valid observations reduce. It is easy to see why some firms created no jobs that are attributable to the tax incentive according to the lower elasticity assumption, and so a large number of observations are lost this way when elasticity= -0.1 (rather than when it is –0.3).

[17] The long-run (which may be defined as 10 years or more) elasticity of business activity (here, employment) due to a proportionate change in taxes, for intrametropolitan locations, according to Bartik 1991; 1992 is in the range of -1.0 to -3.0. For any given year, then, the elasticity is (divided by 10), dY / dX * X / Y = -0.1 (-0.3) X refers to original taxes (total taxes that would have been paid in the absence of the EZ), Y is the original (baseline) employment at the site (without EZ), dX is the change in taxes paid due to the EZ (which is the abatement) and dY is the change in employment because of EZ. I substitute for the values of dX, X and Y to obtain employment that is attributable to the tax incentive (dY), based on the two ranges of elasticity reported by Bartik 1991. So dY=(dX / X)*0.3(0.1)*Y. If dY turns out to be > actual employment created and retained by the firm or zone, I make dY=actual total employment created and retained by the firm or zone. In cases where dY turns out to be <=actual employment, I use the smaller dY (instead of actual employment) to calculate earnings / job, net benefit / job, costs / job and B-C ratios / job.

44%) are actually attributable to the tax incentive. With an assumed elasticity of –0.1, only about 1,894 (about 31%) of the 5,974 jobs that are created are actually attributable to the tax incentive.

For firms in the lower end of the employment distribution, the number of jobs attributable to the tax incentive (dY) is always less when compared to the actual number of jobs created and retained. A calculated value of dY=0 for a firm indicates that none of the jobs it created are attributable to the tax incentive,[18] (for instance, the case of 0.91 jobs a firm created, see the 1st row and 1st column of Table 9). For firms in the upper part of the employment distribution, a majority of the employment they report as being created and / or retained is due to the tax incentive.

Tables 9-10 provide a range for the benefit-cost ratio for local government investment at the firm level if we assume elasticity in the range –0.3 to –0.1. Tables 9-10 show that on average, the (weighted as well as unweighted) B-C ratio can be expected to be in the range 28 (with an elasticity of –0.3) to 13 (with elasticity of –0.1). Naturally with the assumption of elasticity in the lower range, the benefits from creating employment are lower when compared to costs. However, under both assumptions of elasticity, it should be noted that for firms in the upper quintile of the B-C distribution, the benefits are substantially greater than costs.

A similar pattern repeats for the zone-level performance data (see Tables 11-12). At the zone-level, (unweighted) average B-C ratios are slightly lower than at the firm level. The correlation between net benefits from employment and zone unemployment rates with an assumed elasticity of –0.3 is negative, but small and insignificant, being about -0.03. With an elasticity assumption of –0.1, this correlation is positive and higher, being 0.12. The zones in the top portion of the B-C ratio distribution are ones with higher net benefits relative to lower costs of creating employment. The average unemployment rate for the (2) zones with B-C ratio>100 (with an assumed elasticity of –0.3) is 9.9%, which is higher than 120% of the state's average unemployment rate in 1990. With an assumed elasticity of –0.1, the only zone that has a B-C ratio > 100 (111.97) has a high unemployment rate also, being 8.13% in 1990.

Table 13 summarizes the weighted and unweighted average B-C ratios for the various scenarios at the firm and the zone-level. The summary in Table 13 conforms to our expectations. The most optimistic zone-level B-C ratios are in Scenario 1, which makes favorable assumptions regarding job creation and retention. These ratios become smaller when only jobs that are attributable to the tax incentive are taken

[18] Note that the specific instance of a firm's jobs not being attributable to the tax incentive does not invalidate the general finding (as has been found in Sridhar 2000) that tax incentives reduce the unemployment rate of areas adopting it.

into account (especially with the lower assumed elasticity, which is natural). B-C ratios are considerably lower when only jobs created are taken into account, which is also to be expected.[19] Thus on average, the B-C ratio for firm level and zone-level performance for local government investment indicates that the local net benefits from employment can be expected to be greater than the local costs of generating them.

Certain caveats have to be noted immediately. The results in the tables refer only to local government investment, not all government investment. Second, the summary in Table 13 is based on averages. The inference is that it is not a good strategy for all zones to adopt tax incentives to create employment. The policy implications of the findings relate to program design and focus on targeting of areas for zone designation and targeting of certain kinds of firms.

7. Policy Implications

The results from the B-C analyses call for more selective designation criteria that possibly can result in a reduction of competition by reducing the number of zones. In this context, it is enlightening to know that as of 1997, Ohio was only one of the few states in the United States that had greater than 75 enterprise zones in its territory (with the exception of Louisiana and Arkansas).

[19] It should be noted that at the zone-level, the (unweighted and weighted) B-C ratios (13.8 with an assumed elasticity of 0.3 and 9.7 with an elasticity of 0.1) are lower in scenario 3 than under scenario 1 (25.6), as we would expect. At the firm level, the (unweighted and weighted) B-C ratios are higher in scenario 3 (27.7 with the 0.3 elasticity) than under scenario 1 (24.7), and this may seem counter-intuitive. Some observations can be made regarding the firm-level B-C ratios under scenario 3.
First, although scenario 3 is more restrictive, the number of firms is only 198 in scenario 3 whereas there are 531 firms in scenario 1. It reduces to a subset of those firms under scenario 1, which created all its employment attributable to the tax incentive.
Second, it should be noted that B-C ratio is defined as the ratio of net benefits to costs per job. The two scenarios themselves differ in the magnitude of the employment that is created. But the reason that caused the somewhat counter-intuitive ratios is the magnitude of earnings and net benefit from employment created by the firms under scenario 3. This is not inconsistent with the assumptions of the two scenarios. The firms under scenario 3 located in zones that have lower reservation wages and so net benefits from employment created by firms under scenario 3 are greater. Thus firm level B-C ratios under scenario 3, although the scenario is based on a more restrictive assumption, are higher because of higher net benefit. This is true although the costs are more or less the same for firms under both the scenarios, and employment is less in scenario 3 than under scenario 1.

Table 9. Distribution of Net benefits and Benefit-Cost Ratios for (198) Firms in Ohio's Enterprise Zones under Scenario 3 (Assumed Elasticity = -0.3)

	Mean (Min, Max) for firms: 0^{th}-25^{th} Percentile	Mean (Min, Max) for firms: 25^{th}-50^{th} Percentile	Mean (Min, Max) for firms: 50^{th}-75^{th} Percentile	Mean (Min, Max) for firms: 75^{th}-100^{th} Percentile	Unweighted Mean for all firms (Std.Dev)	Weighted Mean for firms (Wt.Std.Dev)
Total Em-ployment	3.53 (0.91, 6)	9.29 (6.16, 12.51)	18.33 (12.61, 25)	148.18 (26, 1200)	44.40 (124.41)	44.40 (56.47)
Annual deflated earnings per job	$13,636.09 (10177.08, 17207.95)	$21,584.98 (17274.79, 25880.46)	$30,591.50 (25919.16, 35455.71)	$42,440.13 (35862.24, 49737.04)	$27,073.02 (11,198.61)	$27,073.02 (2,898.34)
Net benefit per job	$2,075.81 (-15703.50, 6272.03)	$10,959.53 (6755.28, 15741.49)	$20,199.52 (15936.28, 24809.38)	$31,510.01 (25017.49, 40862.68)	$16,135.22 (11,518.54)	$16,135.22 (3,538.53)
Costs per job	$614.57 (16.22, 1051.17)	$1,642.51 (1073.13, 2255.08)	$3,166.89 (2264.07, 4326.76)	$16,051.59 (4435.09, 1273982.19[h])	$11,692.13 (91,494.86)	$5,284.57 (7,456.57)
B-C Ratio	0.18 (-10.28, 1.73)	3.49 (1.73, 5.60)	9.41 (5.88, 15.21)	96.61 (15.50, 2159.17[i])	27.65 (159.40)	27.65 (79.54)
Unem-ployment rate	7.31% (3.05, 11.61)	7.23% (2.88, 11.98)	7.95% (3.70, 13.49)	6.61% (3.44, 13.49)	6.34 (2.44)	7.27 (2.18)

Table 10. Distribution of Net benefits and Benefit-Cost Ratios for (91) Firms in Ohio's Enterprise Zones under Scenario 3 (Assumed Elasticity = -0.1)

	Mean (Min, Max) for firms: 0th-25th Percentile	Mean (Min, Max) for firms: 25th-50th Percentile	Mean (Min, Max) for firms: 50th -75th Percentile	Mean (Min, Max) for firms: 75th-100th Percentile	Unweighted Mean for all firms (Std.Dev)	Weighted mean for firms (Wt.Std. Dev)
Total Employment	1.96 (0.37, 3.73)	5.87 (4, 8.53)	14.14 (8.89, 21)	72.43 (21.5, 387)	23.15 (48.62)	23.23 (21.40)
Annual deflated earnings per job	$13,962.83 (11013.22, 16497.22)	$20,016.23 (17134.53, 24146.00)	$30,263.82 (24709.70, 35165.22)	$41,796.84 (36306.58, 49292.28)	$26,617.57 (11,100.76)	$26,365.62 (2636.23)
Net benefit per job	$3,586.48 (-125.77, 6272.03)	$9,514.91 (6899.56, 13466.98)	$19,601.75 (13585.95, 26671.05)	$32,005.81 (26974.90, 36384.07)	$16,135.39 (11,002.71)	$16,348.94 (2,731.12)
Costs per job	$750.35 (40.25, 1028.13)	$2,254.77 (1038.42, 3587.38)	$5,516.82 (3609.37, 9016.16)	$27,686.49 (9548.63, 152773.40)	$10,517.92 (23,761.22)	$8,937.30 (8,125.57)
B-C Ratio	0.66 (-0.03, 1.38)	2.37 (1.40, 3.62)	5.56 (3.69, 7.98)	42.31 (8.62, 422.78 [i])	12.80 (45.36)	12.80 (22.11)
Unemployment rate	7.08% (3.05, 9.35)	7.20% (2.88, 11.61)	7.44% (4.26, 11.98)	6.54% (2.05, 13.49)	6.34 (2.44)	6.61 (2.02)

Table 11. Distribution of Net benefits and Benefit-Cost Ratios for Ohio's (62) Enterprise Zones under Scenario 3 (Assumed Elasticity = -0.3)

	Mean (Min,Max) for zones: 0th-25th Percentile	Mean (Min,Max) for zones: 25th-50th Percentile	Mean (Min,Max) for zones: 50th -75th Percentile	Mean (Min,Max) for zones: 75th-100th Percentile	Unweighted Mean for all zones (Std.Dev)	Weighted Mean for zones (Wt.Std. Dev)
Total Employment	7.56 (1.41, 12.61)	26.77 (13.15, 41.29)	95.81 (43.74, 157.46)	454.88 (162, 1570)	143.51 (268.11)	143.51 (112.24)
Annual deflated earnings per job	$15,508.67 (10894.26, 19022.55)	$22,630.06 (19041.19, 27154.26)	$29,532.43 (27379.72, 32714.84)	$41,133.26 (33360.46, 48587.09)	$27,357.45 (10,212.04)	$27,009.42 (2,574.45)
Net benefit per job	$3,988.64 (-4990.01, 8491.40)	$12,565.93 (8506.76, 16857.30)	$19,629.91 (17688.55, 23154.76)	$30,809.09 (23298.23, 39143.82)	$16,589.07 (10,458.32)	$16,589.07 (3,262.76)
Costs per job	$672.67 (51.17, 1120.73)	$1,354.99 (1126.21, 1735.04)	$2,535.31 (1767.29, 3394.43)	$8,772.99 (3618.97, 1273982.19)	$23,684.78 (161479.00)	$3,188.10 (2,394.90)
B-C Ratio	1.11 (-4.15, 2.98)	5.44 (3.00, 7.76)	11.03 (7.93, 15.55)	38.63 (15.86, 150.33)	21.36 (63.55)	13.84 (10.61)
Unemployment rate	7.28% (3.05, 10.20)	7.74 (4.26, 11.00)	7.39% (4.76, 11.17)	6.69% (3.49, 13.49)	6.34 (2.44)	7.27 (2.14)

Table 12. Distribution of Net benefits and Benefit-Cost Ratios for Ohio's (32) Enterprise Zones under Scenario 3 (Assumed Elasticity = -0.1)

	Mean (Min,Max) for zones: 0th-25th Percentile	Mean (Min,Max) for zones: 25th-50th Percentile	Mean (Min,Max) for zones: 50th -75th Percentile	Mean (Min,Max) for zones: 75th-100th Percentile	Unweighted Mean for all zones (Std.Dev)	Weighted Mean for zones (Wt.Std.Dev)
Total Em-ployment	4.50 (1.55, 7.42)	11.34 (8, 16.14)	38.85 (27.97, 48.72)	182.11 (64.01, 523)	59.20 (106.01)	59.20 (43.49)
Annual deflated earnings per job	$15,085.66 (11013.22, 18899.14)	$21,350.98 (18905.91, 25450.02)	$28,404.33 (25844.22, 32716.81)	$39,968.96 (34347.08, 43895.87)	$26,202.48 (9,866.44)	$26,202.48 (3,099.63)
Net benefit per job	$5148.80 (-125.77, 8692.74)	$10,728.34 (8800.55, 13272.49)	$17,587.70 (14066.98, 22528.87)	$30,119.24 (25039.41, 36384.07)	$15,896.02 (10019.75)	$15,896.02 (3,288.36)
Costs per job	$952.72 (199.66, 1827.23)	$2,435.89 (1925.31, 3175.07)	$5,605.98 (3669.23, 10585.77)	$34,076.44 (11433.87, 97277.84)	$12,742.80 (23,168.14)	$10,015.86 (6,572.82)
B-C Ratio	0.56 (-0.03, 1.61)	2.20 (1.88, 2.39)	5.79 (3.69, 8.76)	30.38 (9.48, 111.97)	9.73 (20.48)	9.73 (9.27)
Unem-ployment rate	5.40% (3.05, 6.88)	7.97% (5.24, 9.35)	7.97% (4.76, 11.00)	6.87% (2.05, 13.49)	6.34 (2.44)	7.05 (2.01)

Table 13. Summary of Average B-C Ratios in Various Scenarios at Firm-level and Zone-level

	Firm-level: Unweighted	Weighted	Zone-level: Unweighted	Weighted
Scenario 1 (All employment taken into account)	24.7	24.7	27.0	25.6
Scenario 2 (Only jobs created taken into account)	9.1	8.9	10.2	10.2
Scenario 3: Elasticity = -0.3	27.7	27.7	21.4	13.8
Scenario 3: Elasticity = -0.1	12.8	12.8	9.7	9.7

Table 14. Proportion of Zones with B-C Ratios>1 in Various Scenarios

Scenario	Proportion of Zones
Scenario 1	90%
Scenario 2	75%
Scenario 3 (Assumed Elasticity: -0.3)	80%
Scenario 3 (Assumed Elasticity: -0.1)	78%

Table 15. Efficiency Losses in Various Scenarios

Scenario	Efficiency Losses (in millions of $)
Scenario 1 (Created and Retained employment taken into account)	$44.2
Scenario 2 (Only Created employment taken into account)	$44.9
Scenario 3: Assumed elasticity = -0.3	$16.1
Scenario 3: Assumed elasticity = -0.1	$4.2

Based on the results I find here, one implication is to decertify zones that perform poorly in terms of B-C ratios. Table 14 shows the proportion of zones that have unweighted B-C ratios >1 under various scenarios.[20] Table 14 shows that the proportion of zones with B-C ratios>1 is highest in scenario 1, which is natural to expect. When we take into account only jobs that are created (as in scenario 2), only 75 percent of zones have B-C ratios greater than 1. In scenario 3, the proportion of zones with B-C ratios>1 is higher (being 80%) in the higher assumed elasticity than with the lower assumed elasticity (where it is about 78%), consistent with what we would expect. I explain at the end of this section what are the factors that distinguish zones with B-C ratios >1 from those that have B-C ratios <1, and their policy implications.

Based on the B-C ratios, it is possible to evaluate the efficiency implications of decertifying poor-performing zones. Efficiency loss is defined as the extent to which costs exceed benefits in the zones (defined as poor-performing) in which the B-C ratio is <1. Table 15 summarizes these efficiency losses in the poor-performing zones in various scenarios. When total employment (created and retained) created by the firms is taken into account (scenario 1), I find that the most (8) of the (11) zones that have B-C ratios <1 are limited authority zones, i.e., have been designated on the basis of their population, not necessarily high unemployment. The efficiency loss in the form of property tax abatements and other incentives provided by the local governments of these (8) zones amounts to $44 million (or about $5.5 million per zone).[21]

When we take into account only jobs that are created (as in scenario 2), this efficiency loss turns out to be of slightly higher magnitude which is natural to expect. More (21 zones as opposed to 8 zones in scenario 1) zones turn out to be inefficient in this scenario than under scenario 1

[20] The proportion of zones with B-C ratios >1 cannot be calculated with the weighted averages. This is because the weighted average is calculated (it is a single figure) for the entire distribution of zones taking into account zones in each percentile of the B-C distribution (which is obtained by taking the ratio of net benefits from employment to the costs for every zone).

[21] More specifically, I have calculated efficiency loss as the sum of the abatements, infrastructure and other incentives provided to firms in zones that have B-C ratios <1 in the various scenarios, and divided the total efficiency loss by the number of zones in each category to arrive at efficiency loss per zone.

because the assumption is more restrictive. The property tax abatements, provision of infrastructure and other incentives to firms in these (21) zones that have B-C ratios <1 in this scenario amounts to $45 million (or about $2 million per zone). Understandably, many of the zones that do poorly in scenario 1 are also the ones that perform poorly under this scenario. The average unemployment rate for these (21) zones that have negative B-C ratios is 6.92%, which may be considered only average unemployment by state standards (this is just around 120% of the state's average unemployment rate of 5.7% for 1990).

Under scenario 3, the efficiency loss under the higher elasticity assumption is higher than under the low elasticity. With the assumed elasticity of employment with respect to taxes being –0.3, the efficiency loss is $16 million for 6 zones the average unemployment rate for them being 6.73%. If the elasticity is assumed to be –0.1, then the efficiency loss is $4 million for 5 zones (approximately $850,000 per zone) whose average unemployment rate is just 6% for 1990.

Overall then, when I examine zones with B-C ratios <1 and their unemployment rates in various scenarios, I find that they are mostly low-unemployment areas, consistent with Bartik's (1991) hypothesis. I find that all the firms and zones with negative B-C ratios and positive B-C ratios <1 are ones in which the earnings from jobs are low relative to the reservation wages. This is because of the areas' lower unemployment rate in relation to state average, leading to low net benefits and consequently low B-C ratios from employment. On the other hand, firms that locate in high-unemployment zones have low reservation wages and wherever this coincides with well-paying jobs, it results in high net benefits and high B-C ratios. Some of the zones in which the net benefit from employment could have been high due to this reason have lower B-C ratios because of the large abatements that are given to firms that located in them. On the other hand, I find, based on my analysis, that even when skilled or unskilled (well- or poor-paying) jobs are created in low-unemployment zones, the B-C ratios are low because of higher reservation wages in such low-unemployment zones.

The first implication that comes out of this analysis is that it is beneficial for local government investment when skilled (i.e., well-paying) jobs are created in high unemployment zones since they are lower reservation wage areas. This maximizes net benefits from employment. The creation of well-paying jobs in high-unemployment areas can be induced by providing incentives (similar to current state-level incentives that exist relating to Comprehensive Employment Training Act (CETA) employees) to firms in the area to provide training to their low-skilled employees to help them obtain the necessary skills. Since unemployment rate tends to be higher in areas where the labor force is less skilled, in the absence of incentives, it is appropriate to

acknowledge that firms would have little incentive to offer skilled jobs to unemployed zone residents.

Second, it is necessary for local governments to ensure strict compliance from firms in terms of job commitment so that they create employment stated in the agreement. This implies that the role of the Tax Incentive Review Council (TIRC) that has been constituted for this purpose, will become larger. It is also necessary to place a ceiling on the amount of the abatement to be given to a single firm, based on my findings here. As of now, the legislation states the limits of the incentives in terms of the percentage of assessed values of the property (see section on incentives). The location of firms that create low-skill jobs in low-unemployment areas is not beneficial for the state and local governments and hence should not be encouraged. As of now, retail operations are not eligible for tax incentives within zones and this is a step in the right direction, based on the results I have found.

Finally, it may be necessary to decertify zones that have performed poorly, depending on the assumption one makes regarding employment. It may be noted from Table 15 that total efficiency losses are greatest in scenario 2 (which is a restrictive assumption involving only jobs that are newly created) and are the lowest in scenario 3 (with an assumed elasticity of –0.1). The analysis with scenario 3 (with an assumed elasticity of -0.3) provides a middle ground.[22] There are a few zones that perform poorly in all the scenarios. The implication that comes out of the B-C analysis presented here is then that these zones can be decertified to avoid these efficiency losses. Alternatively, if one were to apply the model developed here only to new jobs that are created (when they are held by the local unemployed), the implication is to decertify the zones that have not performed well in Scenario 2. Thus, it has to be recognized that the decertification implications for the program depend on the assumptions one is comfortable making.

This final implication is consistent with what is found in Sridhar 2000. While that study found support for the robust result that areas with tax incentives see a reduction in their unemployment, it concludes with lesser consensus regarding the duration for which the tax incentives should be offered. Based on the findings, that study suggests 3-5 years to be the optimum period for maximizing the effect of tax incentives on unemployment rate, after which it is preferable that the area abate

[22] One could expect, for instance, that the efficiency losses under Scenario 1 would be the least and that under Scenario 2 would be the highest because of their assumptions pertaining to job creation and retention. However here efficiency loss is measured as the total amount of abatements and other incentives provided to firms in zones in which the B-C ratios <1. It should be remembered that the amount of abatements could vary quite independently of the assumptions pertaining to jobs. I find that the abatement amount is mostly related to the amount of investment firms make in the zone, which of course can create differing amounts of employment depending on the capital or labor intensity of the firm.

offering incentives. In terms of policy action, this translates into decertifying areas that have been tax incentive areas for longer than 5 years. It is easy to see why it is likely that unemployment problems return if incentives continue for long periods of time. With time, tax incentives encourage lobbying for such programs and degenerate into employment redistribution games that increase the unemployment of areas that lose firms.

Also, we may note that, although decertification depends on the assumptions we want to make, certain bottom-line results appear to be valid under all assumptions. More selective designation criteria are to be used for zone designation – these could be distress criteria pertaining to high unemployment. This implies the decertification of zones that do not qualify on the basis of unemployment or other distress criteria. Appropriate incentive structures and monitoring mechanisms must be devised that reward labor-intensive (those with high labor-output ratios) and performing firms, according to criteria I have summarized above. Since labor-intensive firms create employment, they must be made eligible for incentives to train labor to move up the value chain of producing a product or service.

If these criteria are taken into account in design of the program and targeting, the EZ program in Ohio can be capable of generating greater employment for its high-unemployment areas and reducing wasteful competition. Such enlightened programs can provide a positive response to the policy debate and to the challenges that have been raised in the literature regarding such traditional tax incentive programs.

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