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THE EFFECT OF STATE ECONOMIC DEVELOPMENT INCENTIVES ON EMPLOYMENT GROWTH OF ESTABLISHMENTS*

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ABSTRACT. This paper examines the effects of state economic development incentives on the growth of 366 Ohio manufacturing and nonmanufacturing establishments that launched major expansions between 1993 and 1995. Growth is measured as the actual employment change that occurred in these establishments and as the employment growth announced when expansions were launched. Empirical findings indicate that incentives have very little (or even a negative) effect on actual growth and they have a substantial positive effect on announced growth. Findings also suggest that establishments that received incentives overestimated their announced employment targets more than establishments that did not receive incentives.

1. INTRODUCTION

Many state and local governments use economic development incentives as a means of stimulating job creation and business growth. The number of states offering tax incentives for job creation increased from 27 to 44 between 1984 and 1993 (Chi, 1994), and 61 percent of rural manufacturers in the United States participated in one or more business assistance programs between 1992 and 1995 (Greenberg and Reeder, 1998). The widespread use of incentives has generated interest in the effects of incentives on employment growth and the strategic interactions occurring in incentive negotiations where firms announce plans to create new jobs in exchange for incentives from the government. Knowing whether incentives stimulate growth and whether businesses inflate their announced employment targets to receive

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more valuable incentives is important given the large amount of economic development resources devoted to incentive programs.

This paper presents empirical evidence on the effects of incentives on the growth of 366 Ohio establishments in manufacturing and nonmanufacturing industries.[1] All of these establishments expanded between 1993 and 1995. Growth is measured as the actual employment change that occurred in the two years after expansions were launched and as the employment growth announced when an establishment expanded. The paper addresses two questions concerning the effects of incentives on employment growth. First, do incentives stimulate job creation in business establishments? Second, do businesses overestimate the number of jobs they will create to receive more lucrative incentive packages from the government?

Previous studies have examined the effects of economic development programs and incentives on growth at the regional, industry and firm levels (Bartik, 1991; Buss, 2001). For example, O'hUallachain and Satterthwaite (1992) found that job growth in metropolitan areas is related to the presence of targeted economic development programs such as enterprise zones and university research parks, but growth is not affected by taxes or industrial revenue bonds. A study by de Bartolome and Spiegel (1997) found evidence of a positive relationship between the growth of manufacturing industries and state economic development expenditures. Whereas these studies analyzed aggregate employment growth, our paper examines the relationship between establishment-level employment growth and incentives.

Carlton (1983) found that the number of economic development incentives offered by a state does not affect the location and employment decisions of new firms. However, the effects of incentives are measured using a business climate index that includes nonincentive factors. Walker and Greenstreet (1991) found that economic development incentives have a positive effect on firm location decisions, although incentive programs do not affect the growth of existing businesses. Like the studies by Carlton (1983) and Walker and Greenstreet (1991), this paper examines the effects of incentives on employment growth while controlling for the effects of nonincentive growth factors. Unlike the previous studies, this paper examines the effects of incentives on announced and actual employment growth and analyzes the gap between the two.

Our analysis of the difference between announced and actual employment growth addresses the issue of whether establishments overestimate the number of jobs they will create in order to receive larger incentives. Businesses may benefit by exaggerating their employment targets because the terms of the incentive reward for the most widely used program evaluated in the paper are based on the number of new workers the business plans to hire. Thus, the

[1]Establishments are defined in the paper as single business enterprises that may be part of multi-establishment firms.

total value of an incentive package is related to the establishment's announced plans for job creation. Businesses have better information than the government about their actual intentions, so establishments receiving incentives may be expected to overestimate the number of jobs they will create.

Previous research has dealt with another type of strategic interaction between firms and the government in incentive negotiations (Wolkoff, 1992; Oechssler, 1994; Wohlgemuth and Kilkenny, 1998). These studies developed optimal strategies for state and local governments in response to a firm's request for an incentive, assuming that businesses without relocation opportunities may request incentives under the threat of relocating elsewhere. In these studies, incentive negotiations are characterized by imperfect information, because establishments have private information unknown to the government about their opportunities to relocate elsewhere if the government denies their incentive requests.

The rest of the paper is organized as follows. Section 2 presents the analytical firm growth framework used to examine the effects of incentives on employment growth. Section 3 describes the data used in the paper and explains how actual and announced employment growth rates are calculated. Section 4 presents empirical findings on the effects of incentives and various establishment, industry, and local characteristics on actual and announced employment growth. Section 5 examines whether establishments that received incentives overestimated their announced employment targets. The paper concludes in Section 6.

2. ANALYTICAL FRAMEWORK

Many business growth studies have focused on the link between growth rates and internal conditions such as business size and age (Simon and Bonini, 1958; Hymer and Pashigian, 1962; Singh and Whittington, 1975; Evans, 1987a, 1987b; Hall, 1987). Evans (1987a, 1987b) examined the effects of size and age on firm growth using the empirical model and the corresponding regression model shown as Equations 1 and 2:

$$S_{t'} = [G(S_t, A_t)]^d (S_t) e_t \tag{1}$$

$$(\ln S_{t'} - \ln S_t)/d = \ln G(S_t, A_t) + u_t \tag{2}$$

where S and A are firm size and age, $G(.)$ is a firm growth function, t indicates time where $t' > t$ and $d = t' - t$, e is a lognormally distributed error term, and u is normally distributed with mean zero and is independent of S and A. The partial derivatives of an establishment's logarithmic growth rate with respect to firm size and age are denoted as $g_S = \partial \ln G / \partial \ln S$ and $g_A = \partial \ln G / \partial \ln A$.

Evans (1987a, 1987b) used this framework to test Gibrat's law (Hart and Prais, 1956), which implies that firm growth is independent of firm size ($g_S = 0$). Evans and other researchers have rejected Gibrat's law and instead find that growth rates are negatively related to firm size (Dunne, Roberts, and

Samuelson, 1989; Evans, 1987a, 1987b; Variyam and Kraybill, 1992, 1994). Evans (1987a, 1987b) also used this framework to test Jovanovic's passive firm learning hypothesis (Jovanovic, 1982), which implies a negative relationship between firm growth and firm age ($g_A < 0$). The passive learning hypothesis was supported by Evans' study and others (Dunne, Roberts, and Samuelson, 1989; Evans, 1987a, 1987b; Variyam and Kraybill, 1992, 1994).

In this paper, we extend Evans' (1987a, 1987b) empirical growth model to include additional industry and regional growth factors that may affect establishment growth

$$\begin{aligned}(\ln S_{t'} - \ln S_t) = \beta_0 + \beta_1 \ln S_t + \beta_2 \ln A_t + \beta_3 (\ln S_t)^2 + \beta_4 (\ln A_t)^2 \\ + \beta_5 (\ln S_t)(\ln A_t) + \beta_6 INDGRO + \beta_7 \ln AVESIZE \\ + \beta_8 COUGRO + \beta_9 METRO + \beta_{10} LQ + u\end{aligned} \tag{3}$$

Equation (3) is used to explain the growth of establishments that received and did not receive incentives in a two-stage self-selection regression model presented in Section 4. The dependent variable represents the actual or announced employment growth rates associated with business expansions.

Theories of firm and regional growth provide justification for the choice of explanatory variables. Establishment size S is the focus of Gibrat's law and age A is a key variable in passive learning theories of enterprise growth.[2] While controlling for size and age, Equation (3) includes variables that control for growth occurring in the establishment's industry in Ohio *INDGRO* and the average employment size of establishments in the industry at the national level *AVESIZE*. The variable *INDGRO* represents market conditions relevant to the establishment and *AVESIZE* controls for industry differences in average employment. Other things being equal, we expect establishments in high-growth industries and industries with large average establishment sizes to grow at higher rates than establishments in low-growth industries and industries with small average establishment sizes.

Equation (3) also includes a variable that controls for aggregate employment growth occurring in the county where the establishment is located *COUGRO* and a dummy variable that indicates whether the establishment is located in a metropolitan area with a population greater than one million people *METRO*. The variable *COUGRO* represents the economic vitality of the local area and *METRO* controls for market access and urbanization economies, such as infrastructure (McDonald, 1997). Other things being equal, we expect establishments located in high-growth counties and metropolitan

[2]Like the empirical growth models used by Evans (1987a, 1987b) and Variyam and Kraybill (1992), Equation 3 is a second-order expansion of $G(S_t, A_t)$ and it includes second-order size and age variables and an interaction term. The interaction term is included because, depending on size, age may have a stronger or weaker effect on establishment growth.

counties to grow at higher rates than establishments located in low-growth counties and nonmetropolitan counties.

Finally, Equation (3) includes a variable that represents localization economies in the area where the establishment is located *LQ*. The theory of localization economies is based on Marshall's notion of agglomeration externalities that arise when establishments in the same industry locate close to each other and can share industry-specific infrastructure and attract a pool of specialized labor. Other things being equal, we expect a positive relationship between establishment growth and the concentration of industry in the local area.

3. DATA AND VARIABLE DEFINITIONS

The dataset used in the paper consists of information regarding 366 Ohio manufacturing and nonmanufacturing establishments that expanded between 1993 and 1995. These establishments are included in a list of 2,400 business expansions and attractions that announced creation of 50 or more new jobs, capital investments of one million dollars or more, or facility expansions of 20,000 square feet or larger. The Ohio Department of Development submits the list to *Site Selection* magazine, which compares business growth in states across the nation. Although the list may not include all major expansions that occurred in Ohio, the list is likely to contain a large percentage, because the state has an incentive to document as many projects as possible to improve the state's standing relative to the rest of the nation. By focusing on establishments that launched major expansions, the empirical findings in the paper shed light on the key factors that affect the growth of a sample of growing establishments, which may differ from the factors that influence more gradual establishment growth or decline.

The data were collected in a questionnaire sent to a sample of manufacturing and nonmanufacturing establishments drawn from the Ohio Department of Development list of expansions and attractions. The data collection process followed Dillman's (1978) *Total Design Method*. A survey was sent to 1,000 establishments and follow-up surveys were mailed to nonrespondents. Approximately 50 percent of the establishments responded to the survey. In order to focus on the growth of existing businesses, we omitted establishments that launched startup or business relocation projects. Furthermore, establishments that did not provide employment information for the year they expanded, the year prior to the expansion, and two years after the expansion were omitted from the sample.

There is no central source of information on incentives offered by states or municipalities, and incentive programs are not easily compared because states differ in the intent and administration of their programs. It is for this reason that we use data from a single state (Ohio).

Tables 1 and 2 present descriptive statistics of the variables used in the paper and industry classifications of the 366 establishments included in the

TABLE 1: Variable Definitions and Descriptive Statistics

Variable Name	Variable Definition	Mean	Standard Deviation
Actual Growth Rate	Natural logarithm of employment two years after expansion minus natural logarithm of employment in expansion year[a]	0.23	0.44
Announced Growth Rate	Natural logarithm of announced employment target minus natural logarithm of employment in expansion year[a,b]	0.46	0.60
Overestimation Rate	Natural logarithm of announced employment target minus natural logarithm of employment two years after expansion[a,b]	0.23	0.47
Incentive (I) (*INCENT*)	1 if establishment received incentive in 1993, 1994 or 1995; 0 otherwise[c]	.35	NA
INCPER	Dollar value of incentives received divided by number of jobs establishment announces it will create[c,d]	4,022	4,715
ln *INCPER*	Natural logarithm of dollar value of incentives received divided by number of jobs establishment announces it will create[c,d]	7.78	1.11
Size (S)	Employment size in expansion year[a]	313	871
Age (A)	Establishment age in expansion year[a]	23	26
$\ln S$	Natural logarithm of employment size in expansion year[a]	4.65	1.39
$\ln A$	Natural logarithm of establishment age in expansion year[a]	2.41	1.34
$(\ln S)^2$	Natural logarithm of employment size, squared[a]	23.56	13.60
$(\ln A)^2$	Natural logarithm of establishment age, squared[a]	7.61	6.23
$(\ln S) \times (\ln A)$	Natural logarithm of employment size multiplied by natural logarithm of establishment age[a]	12.12	8.30
Industry Growth (*INDGRO*)	Natural logarithm of employment in 2-digit SIC category in Ohio in 1997 minus natural logarithm of employment in same category in Ohio in 1990, divided by 7[e]	0.003	0.014
Average Establishment Size (*AVESIZE*)	Average employment size of establishments in 2-digit SIC category in the United States in 1995[e]	54	35

Variable Name	Variable Definition	Mean	Standard Deviation
ln*AVESIZE*	Natural logarithm of average employment size of establishments in 2-digit category in the United States in 1995[e]	3.74	0.75
County Growth (*COUGRO*)	Natural logarithm of employment in county in 1997 minus natural logarithm of employment in county in 1990, divided by 7[e]	0.022	0.020
Metropolitan County (*METRO*)	1 if establishment is located in metropolitan area with more than one million people; 0 otherwise[f]	.27	NA
Location Quotient (*LQ*)	Percentage of county's businesses in 2-digit SIC category divided by percentage of businesses in the United States in the same category[e]	2.15	1.98
YEAR93	1 if establishment expanded in 1993; 0 otherwise	.24	NA
YEAR94	1 if establishment expanded in 1994, 0 otherwise	.39	NA
Unemployment (*UNEMP*)	1993 unemployment rate in county[g]	6.87	1.43
Sample Selection Variable (*W*)	Variable derived from a sample selection (probit) regression that relates the incentive dummy variable, *INCENT*, to a set of establishment, industry and local characteristics. The sample selection variable, also referred to as the inverse Mills ratio, is based on parameters estimated by the probit regression. Probit estimates are transformed into the inverse Mills ratio using the probability density (PDF) and cumulative density (CDF) functions of the standard normal distribution.	−0.00000281	0.76
Number of Observations		366	

[a]Age and employment figures are from the surveys of expanding businesses.

[b]Announced employment targets are computed as the number of jobs that an establishment announces it will create (reported by the Ohio Department of Development) added to the average value of its employment levels in the year it expanded and the previous year.

[c]Incentive information is from the Ohio Department of Development.

[d]Descriptive statistics based on 129 establishments that received incentives.

[e]Computed from *County Business Patterns* data from the United States Bureau of the Census.

[f]Metropolitan area designations are based on Rural-Urban Continuum (Beale) Codes from the United States Department of Agriculture.

[g]Unemployment rates are from the Ohio Bureau of Employment Services.

TABLE 2: Industrial Classifications of Establishments in the Dataset

Industry	Establishments in the Sector as a Percentage of all Establishments
Services (SIC 70–89)	3.6
FIRE (SIC 60–67)	1.6
Wholesale and Retail Trade (SIC 50–59)	9.6
Transportation and Public Utilities (SIC 40–49)	0.8
Food and Kindred Products (SIC 20)	5.2
Textiles (SIC 22–23)	0.6
Lumber, Wood, Furniture and Fixtures (SIC 24–25)	2.2
Paper and Allied Products (SIC 26)	3.3
Printing and Publishing (SIC 27)	3.3
Chemicals and Petroleum Products (SIC 28–29)	4.1
Rubber and Plastic Products (SIC 30)	9.0
Leather Products (SIC 31)	0.6
Stone, Clay, and Glass Products (SIC 32)	4.9
Primary Metal Industries (SIC 33)	6.8
Fabricated Metal Products (SIC 34)	10.1
Industrial Machinery and Equipment (SIC 35)	18.3
Electronic Equipment (SIC 36)	5.7
Transportation Equipment (SIC 37)	8.2
Instruments and Related Products (SIC 38)	1.1
Miscellaneous Manufacturing (SIC 39)	1.1

dataset, respectively. We measure actual employment growth as the difference between the natural logarithm of employment two years after an expansion was launched and the natural logarithm of employment the year an establishment expanded, which gives a two-year growth rate. Announced establishment growth is measured as the difference between the natural logarithm of an establishment's announced employment target and the natural logarithm of employment the year it expanded, which gives a growth rate of announced employment change.

Announced employment targets are computed as the number of jobs establishments announce they will create added to the average annual value of their employment levels in the year they expanded and the previous year. Differences between announced and actual growth are measured as the difference between the natural logarithm of an establishment's announced employment target and the natural logarithm of its employment two years after an expansion. This gives the percentage by which an establishment announces more or less employment change than actually occurs in two years, which is referred to as an establishment's overestimation rate.

The average establishment in the sample announced plans to hire 61 workers but grew by only 47 workers in the two-year period after the expansion began. Establishments that received incentives announced plans to hire 91 workers but actual growth was only 51 workers. Businesses that did not receive incentives announced average expansions of 45 workers and actually grew by 45 workers, thus creating the number of jobs that they promised. The average establishment employed 313 workers and had been in operation 23 years as of the year it expanded.

The Ohio Department of Development provided an average of 437,430 dollars (4,022 dollars per announced new job) in incentives to 129 establishments through five development programs. The Ohio Job Creation Tax Credit Program provided an average of 436,840 dollars in incentives to 101 establishments in the form of credits against their state franchise (corporate income) taxes based on the income taxes withheld on new workers. Thirty establishments received an average of 43,467 dollars in assistance from the Ohio Industrial Training Program, which provides support for worker orientation and training. The Business Development Account and the Roadwork Development Account provide grant money for infrastructure and roadway improvements to establishments launching projects that involve job creation or retention. The Business Development Account provided an average of 247,570 dollars in incentives to 14 establishments and the Roadway Development Account assisted six establishments with an average of 771,670 dollars. The Community Development Block Grant Discretionary Fund offers assistance to establishments launching projects that involve job creation or retention and that do not qualify for other assistance programs sponsored by the state. Eleven establishments received an average of 264,330 dollars in incentives from this fund.

4. EMPIRICAL MODEL AND FINDINGS

One way to evaluate the effects of incentives on employment growth would be to estimate a regression model similar to Equation (3) using ordinary least squares (OLS). Such a model would relate an establishment's growth rate to an incentive dummy variable, not shown in Equation (3), and other factors likely to affect business growth (e.g., establishment size, establishment age, industry growth, and so on). A problem with this approach is that the incentive dummy variable is likely to be endogenous because the decision of business managers to apply for an incentive may be influenced by the establishment's rate of growth. Furthermore, government officials who administer incentive programs, in their desire for the programs to be viewed as successful, may systematically select establishments whose growth rates are already above average. Thus, establishments that apply for and receive incentives (i.e., self-select into the incentive programs) may have greater potential for growth than a randomly selected expanding business. Endogeneity of the incentive award process implies that the sample of establishments receiving incentives may not accurately represent the population of all expanding businesses.

The econometric literature on selection bias proposes models in which the sample distribution is reweighted to more accurately reflect the underlying population distribution. One weight that is widely used to correct for selection bias is the inverse Mills ratio. This ratio is constructed by estimating a probit model of the selection process, where the dependent variable is binary (with a value of unity if an incentive is received and zero otherwise) and the independent variables are factors that determine participation in the incentive program. Predicted values from the probit regression, calculated for each observation, are transformed into the inverse Mills ratio using the probability density function (PDF) and cumulative density function (CDF) of the standard normal distribution—as shown below, following Equation (9). The ratio is then used as a 'sample selection variable' in the establishment growth model to reweight the sample to account for the fact that establishments that receive incentives may have a fundamentally different potential for growth than establishments that do not receive incentives.

It should be noted that instrumental-variable methods are somewhat restrictive for dealing with the endogeneity between establishment growth and incentives because these approaches do not allow for interaction between an establishment's receipt of an incentive and other characteristics of the business (Maddala, 1983). These models would force the estimated coefficients of the nonincentive variables to be the same across establishments that received and did not receive incentives. To overcome this limitation, Lee (1978) and Maddala (1983) proposed a two-stage self-selection method that, in our application, allows for the estimated coefficients to differ across both groups of establishments and accounts for endogeneity between establishment growth and incentives.[3]

This econometric procedure involves estimating three equations: a first-stage sample selection equation, Equation (7), and second-stage employment growth equations for establishments that received incentives, Equation (8), and did not receive incentives, Equation (9). Equations (5) and (6) are not actually estimated but, rather, are transformed into Equations (8) and (9). We present results from two different self-selection regression models: one uses the actual growth rate as the dependent variable in Equations (8) and (9) and the other uses the announced growth rate as the dependent variable in these equations.

The first stage is a probit regression, Equation (7), that analyzes an establishment's receipt of an incentive. The dependent variable is a dummy variable that equals unity if the establishment received an incentive and zero otherwise. Independent variables used in the probit model include the firm growth factors from Equation 3 and the unemployment rate in the county where the establishment is located. Estimates from the probit model are used to compute the

[3]Maddala (1983) describes this approach in the context of evaluating social programs in which individuals select whether or not to participate in the program. Lee (1978) uses a similar model to examine the effects of union participation on wage rates and Faulk (2002) uses this approach to examine the effects of Georgia's Job Tax Credit Program on job creation. The model accounts for endogeneity arising from interaction between establishment growth and the receipt of an incentive. However, it does not treat a different sample selection issue that may be present because our data set is made up solely of Ohio businesses that expanded between 1993 and 1995.

sample selection variable (the inverse Mills ratio), denoted by the symbol W. The sample selection variable is added to the set of explanatory variables in Equations (5) and (6), transforming them into Equations (8) and (9).

The second stage of the procedure involves estimating establishment growth equations for establishments that received incentives, Equation (8), and establishments that did not receive incentives, Equation (9). The dependent variable in these equations is an establishment's logarithmic growth rate of employment (actual employment growth in the model shown in Table 3 and announced employment growth in the model shown in Table 4). Explanatory variables used in the second-stage growth equations include the firm growth factors from Equation 3 and the sample selection variable, from the first-stage probit regression.

The self-selection regression model is derived as follows:

$$I_i^* = \mathbf{Z}_i\gamma + e_i, \text{ and } I_i = 1 \text{ if } I_i^* > 0 \text{ and } I_i = 0 \text{ if } I_i^* \leq 0 \tag{4}$$

$$y_{1i} = \mathbf{X}_i\beta_1 + u_{1i} \tag{5}$$

$$y_{2i} = \mathbf{X}_i\beta_2 + u_{2i} \tag{6}$$

where $y_i = y_{1i}$ if $I_i = 1$, $y_i = y_{2i}$ if $I_i = 0$; u_1, u_2, and e_i are normally distributed with mean zero; and

$$\text{Cov}(u_{1i}, u_{2i}, e_i) = \begin{bmatrix} \sigma_{11} & \sigma_{12} & \sigma_{1e} \\ \sigma_{12} & \sigma_{22} & \sigma_{2e} \\ \sigma_{1e} & \sigma_{2e} & 1 \end{bmatrix}$$

Equation (4) is a selection equation that determines whether or not an establishment received an incentive, where $\mathbf{Z}_i$ is a vector of exogenous establishment, industry, and local characteristics, and γ is a vector of estimated parameters. The left-hand side variable of Equation (4), labeled as I^*, is an unobserved continuous variable that represents an establishment's potential for receiving an incentive. The variable I, which is observed, indicates whether an establishment qualifies for, requests and receives an incentive. The incentive dummy variable I equals unity if the establishment received an incentive and zero otherwise. Equations (5) and (6), which are transformed into Equations (8) and (9) with the addition of the sample selection variable, are establishment growth models for establishments that received and did not receive incentives. The variables y_{1i} and y_{2i} represent the employment growth rates of businesses that received and did not receive incentives (the actual rate in the first variant of the model and the announced rate in the second variant), $\mathbf{X}_i$ is a vector of exogenous establishment, industry and local characteristics, and β is a vector of estimated parameters.

TABLE 3: GLS Regression Results: Factors Affecting an Establishment's Actual Growth Rate

Variable	Estimated Coefficients[a] Establishment Received Incentives	Establishment Did Not Receive Incentives
Intercept	3.618**	0.798**
	(4.192)	(3.644)
$\ln S$	−0.761**	−0.295**
	(−4.318)	(−3.806)
$(\ln S)^2$	0.039*	0.011
	(1.696)	(1.160)
$\ln A$	−0.306	−0.066
	(−1.478)	(−0.804)
$(\ln A)^2$	−0.005719	−0.049**
	(−0.181)	(−3.403)
$(\ln S) \times (\ln A)$	0.065	0.057**
	(1.416)	(2.864)
INDGRO	−2.282	3.577*
	(−0.545)	(1.759)
ln*AVESIZE*	−0.059	0.105**
	(−0.597)	(2.152)
COUGRO	0.967	1.505
	(0.418)	(1.286)
METRO	−0.053	0.073
	(−0.491)	(1.263)
LQ	−0.019	0.002508
	(−0.717)	(0.227)
YEAR93	0.241**	0.164**
	(2.017)	(2.624)
YEAR94	0.076	0.095*
	(0.697)	(1.667)
Sample Selection Variable	−0.499*	0.303
	(−1.683)	(1.257)
R^2	.456	.284
Adjusted R^2	.394	.242
Quasi-R^2 [b]	.240	.232
R^2 (linear model)[c]	.134	.109
Number of Observations	129	237

[a]Figures in parentheses are *t*-statistics.

[b]We transformed the predicted values of the log form of the dependent variable into a linear form to construct a quasi-R^2. The quasi-R^2 can be used to compare the overall fit of the logarithmic form of the regression model with the overall fit of a linear form of the regression model (Studenmund, 1992).

[c]R^2 resulting from the regression when all variables, including the dependent variable, use linear forms.

*Indicates variable is significant at the 10 percent level, | *t*-statistic | > 1.645.

**Indicates variable is significant at the 5 percent level, | *t*-statistic | > 1.960.

TABLE 4: GLS Regression Results: Factors Affecting an Establishment's Announced Growth Rate

Variable	Estimated Coefficients[a] Establishment Received Incentives	Establishment Did Not Receive Incentives
Intercept	4.306**	2.598**
	(7.477)	(11.751)
$\ln S$	−1.189**	−0.908**
	(−9.991)	(−11.508)
$(\ln S)^2$	0.076**	0.056**
	(4.750)	(5.890)
$\ln A$	−0.385**	−0.091
	(−2.699)	(−1.106)
$(\ln A)^2$	0.020	−0.020
	(0.935)	(−1.372)
$(\ln S) \times (\ln A)$	0.047	0.047**
	(1.521)	(2.370)
INDGRO	−6.703**	4.266**
	(−2.349)	(2.052)
ln*AVESIZE*	0.045	0.089*
	(0.680)	(1.773)
COUGRO	0.036	0.929
	(0.024)	(0.774)
METRO	0.087	0.099*
	(1.201)	(1.653)
LQ	0.001502	0.002706
	(0.082)	(0.245)
YEAR93	0.057	0.082
	(0.711)	(1.273)
YEAR94	−0.113	0.035
	(−1.542)	(0.596)
Sample Selection Variable	0.114	−0.084
	(0.511)	(−0.330)
R^2	.789	.565
Adjusted R^2	.765	.539
Quasi-R^2 [b]	.725	.459
R^2 (linear model)[c]	.162	.093
Number of Observations	129	237

[a]Figures in parentheses are *t*-statistics.

[b]We transformed the predicted values of the log form of the dependent variable into a linear form to construct a quasi-R^2. The quasi-R^2 can be used to compare the overall fit of the logarithmic form of the regression model with the overall fit of a linear form of the regression model (Studenmund, 1992).

[c]R^2 resulting from the regression when all variables, including the dependent variable, use linear forms.

*Indicates variable is significant at the 10 percent level, $|t\text{-statistic}| > 1.645$.

**Indicates variable is significant at the 5 percent level, $|t\text{-statistic}| > 1.960$.

From Equation (4), the probability that an establishment requests and receives an incentive is

$$\text{Prob}(I_i^* > 0) = \text{Prob}(\mathbf{Z}_i\gamma + e_i > 0)$$

or

$$\text{Prob}(I_i = 1) = \text{Prob}(e_i > -\mathbf{Z}_i\gamma) \tag{7}$$

Under the assumption that e_i is normally distributed, this probability is estimated using a probit regression model. Probit estimates of γ are used to compute the sample selection variable for each of the second-stage GLS regressions of Equations (8) and (9)

$$y_{1i} = \mathbf{X}_i\beta_1 - \sigma_{1e}W_{1i} + \varepsilon_{1i} \tag{8}$$

$$y_{2i} = \mathbf{X}_i\beta_2 - \sigma_{2e}W_{2i} + \varepsilon_{2i} \tag{9}$$

where $W_{1i} = \phi(\mathbf{Z}_i\gamma)/\Phi(\mathbf{Z}_i\gamma)$, $W_{2i} = \phi(\mathbf{Z}_i\gamma)/[1 - \Phi(\mathbf{Z}_i\gamma)]$, $\varepsilon_{1i} = u_{1i} + \sigma_{1e}W_{1i}$, $\varepsilon_{2i} = u_{2i} + \sigma_{2e}W_{2i}$, and $\phi(.)$ and $\Phi(.)$ are the PDF and CDF of the standard normal distribution, respectively (Maddala, 1983). The sample selection variable W, referred to above as the inverse Mills ratio, is the probability of observing growth rate y_{1i} conditional on the establishment receiving an incentive (in Equation (8)) and the probability of observing growth rate y_{2i} conditional on the establishment not receiving an incentive (in Equation (9)). Equations (8) and (9), which are estimated in the second stage of the procedure, are growth equations for establishments that received and did not receive incentives. The two-stage estimation procedure (the probit regression of Equation (7) and the GLS regressions of Equations (8) and (9)) generates consistent estimates of the parameters β_1, β_2, σ_{1e}, and σ_{2e} (Lee, 1978; Heckman, 1979; Maddala, 1983).

With this approach, estimated parameters from Equations (8) and (9) are used to compute the expected effect of incentives for the ith establishment that received an incentive

$$E(y_{1i}|I_i = 1) - E(y_{2i}|I_i = 1) = \mathbf{X}_i(\beta_1 - \beta_2) + W_{1i}(\sigma_{2e} - \sigma_{1e})$$

The incentive effect is the expected growth of an establishment that received an incentive ($\mathbf{X}_i\beta_1 - \sigma_{1e}W_{1i}$) minus the expected growth of the same establishment if it had not received an incentive ($\mathbf{X}_i\beta_2 - \sigma_{2e}W_{1i}$).

Tables 3 and 4 present GLS estimates of Equations (8) and (9). The dependent variables in Tables 3 and 4 are an establishment's actual and announced employment growth rates. Explanatory variables used in Equations (8) and (9) are the firm growth factors included in Equation (3) and the sample selection variable W_i.[4] The models also include two dummy variables, indicating whether the expansion occurred in 1993 *YEAR93* or 1994 *YEAR94*. In Appendix A, we present findings from an alternative specification of Equations (8) and (9) that does not include the establishment size and age interaction term.

Table 5 shows probit results of Equation (7). The probit model relates the incentive dummy variable to the exogenous variables in Equations (8) and (9) and the 1993 unemployment rate in the county where the establishment is located. Unemployment rates represent economic conditions in the locales where establishments are located, which may affect whether they received incentives.

Along with the self-selection models discussed in this section, we also estimated regression models that relate establishment growth to an exogenous incentive dummy variable and, in a separate model, to the amount of incentives received per announced job. The results from these regressions are presented in Appendix B. Findings from these models, which do not account for endogeneity between growth and incentives, generally reveal a positive relationship between growth and incentives. The incentive dummy variable has a positive and statistically significant effect on an establishment's actual and announced growth rates, and the amount of incentives received per announced new job has a positive and statistically significant effect on an establishment's actual growth rate.

Effects of Incentives on Actual and Announced Growth

Table 6 summarizes the effects of incentives on actual and announced employment growth calculated using estimates from the self-selection models. The incentive effects are expressed in terms of levels of employment change. The expected incentive effect for the ith establishment that received an incentive is

$$S_i\left[\exp(\mathbf{X}_i\beta_1 - \sigma_{1e}W_{1i}) - \exp(\mathbf{X}_i\beta_2 - \sigma_{2e}W_{1i})\right]$$

where S_i is the establishment's employment size in the year it expanded.

Using the estimated coefficients from Equations (8) and (9), we estimate that the average effect of incentives for establishments that received

[4]We used a method proposed by Davidson and MacKinnon (1981) to test the functional forms of the regression equations estimated in the paper. The test results suggest that logarithmic specifications of the regression equations provide a better fit than linear specifications in the estimation of actual growth rates, announced growth rates, and overestimation rates. The procedure used to compute the GLS standard errors is outlined by Greene (1981).

TABLE 5: Probit Regression Results: Factors Affecting an Establishment's Receipt of an Incentive

Variable	Estimated Coefficients[a]
Intercept	−2.880**
	(−3.473)
$\ln S$	0.315
	(1.305)
$(\ln S)^2$	−0.037
	(−1.154)
$\ln A$	−0.389
	(−1.444)
$(\ln A)^2$	−0.031
	(−0.673)
$(\ln S) \times (\ln A)$	0.088
	(1.412)
INDGRO	−1.276
	(−0.199)
ln*AVESIZE*	0.258**
	(2.110)
COUGRO	3.686
	(0.945)
METRO	0.234
	(1.414)
LQ	−0.012
	(−0.317)
YEAR93	−0.099
	(−0.544)
YEAR94	−0.169
	(−1.043)
UNEMP	0.143**
	(2.603)
Log-likelihood	−221.97
Number of Observations	366

[a]Figures in parentheses are t-statistics.
**Indicates variable is significant at the 5 percent level, $|t\text{-statistic}| > 1.960$.

TABLE 6: Effects of Incentives on Establishment Growth

	Average Incentive Effect per Establishment on:	
	Actual Employment Growth	Announced Employment Growth
Establishment Received Incentives	−10.5 jobs	26.7 jobs
Establishment Did Not Receive Incentives	6.5 jobs	18.9 jobs
All Establishments	0.5 jobs	21.7 jobs

incentives is a decrease of 10.5 in the number of (actual) jobs created as compared to the number of (actual) jobs the establishment would have created without the incentive. The average establishment that received an incentive would have employed 457 workers two years after receiving the incentive compared to 467 workers if it had not received an incentive. In contrast, the effect of incentives on announced employment growth is an increase of 26.7 jobs for establishments that received incentives.

The finding that incentives lead to a reduction in the number of jobs actually created is somewhat surprising. Policy observers often point out that taxes are only one of many factors affecting business expansion decisions, and therefore incentives may have less effect than politicians claim, but observers have seldom hypothesized negative effects. From a conceptual standpoint, it is possible that establishment managers view incentives as a return on rent-seeking activity and that this perception encourages them to engage in further rent seeking. Theories of rent seeking suggest that efforts by managers to obtain governmental concessions, such as tax incentives, may reduce the time and effort that managers devote to improving the internal efficiency of their operations (Krueger, 1974). Reduced efficiency because of success in rent seeking may have dampened expansions of the establishments in our sample.

We used similar calculations to estimate the potential effects of incentives for establishments that did not receive incentives. The average effects of incentives for these businesses would be an increase in actual and announced employment growth of 6.5 and 18.9 jobs, respectively. Considering the entire sample of businesses that received and did not receive incentives, we find that the effects of incentives on actual and announced employment growth are 0.5 and 21.7 jobs, respectively. Thus, our findings indicate incentives have very little effect on actual growth of establishments and they have a substantial positive effect on announced growth. Section 5 further investigates the effects of incentives on the divergence between announced and actual employment growth.

Nonincentive Factors Affecting Actual and Announced Growth

Since the growth equations include second-order size and age variables and an interaction term, the effects of size and age are calculated as the partial derivatives of the growth rate with respect to size and age, respectively, for each sample observation. The direct effects of establishment size on actual employment growth are -0.220 (F-statistic $= 19.942$; p-value $= 0.000$) and -0.061 (F-statistic $= 16.822$; p-value $= 0.000$) at the sample mean for businesses that received and did not receive incentives. The effects of size on announced employment growth are -0.317 (F-statistic $= 66.852$; p-value $= 0.000$) and -0.291 (F-statistic $= 96.383$; p-value $= 0.000$) at the sample mean for establishments that received and did not receive incentives. These results are consistent with findings from other studies that found a negative relationship between firm growth and size (Dunne, Roberts, and Samuelson, 1989; Evans, 1987a, 1987b; Variyam and Kraybill, 1992, 1994).[5]

The direct effects of age on actual employment growth rates are −0.009 (F-statistic = 2.771; p-value = 0.099) and −0.061 (F-statistic = 1.221; p-value = 0.270) at the sample mean for businesses that received and did not receive incentives. Furthermore, the effects of age on announced employment growth are −0.056 (F-statistic = 6.000; p-value = 0.016) and 0.024 (F-statistic = 1.907; p-value = 0.169) at the sample mean for establishments that received and did not receive incentives. Our finding that the actual and announced growth rates are negatively related to age for businesses that received incentives is consistent with results from other studies that found a negative relationship between firm growth and age (Dunne, Roberts, and Samuelson, 1989; Evans, 1987a, 1987b; Variyam and Kraybill, 1992, 1994). Our results do not reveal a significant relationship between the growth of businesses that did not receive incentives and establishment age.

The results in Tables 3 and 4 indicate that the industry growth rate and the average size of establishments in the industry have a positive effect on both actual and announced growth rates of the businesses that did not receive incentives. On the other hand, the industry growth rate has a negative effect on the announced growth of businesses that received incentives and no effect on the actual growth of businesses that received incentives. The actual and announced growth rates of establishments that received incentives are not significantly related to the average size of establishments in the industry.

Overall, we find that local growth factors have relatively little effect on employment growth in expanding establishments in Ohio. We find that an establishment's actual and announced growth rates are not significantly related to the industry location quotient. This is consistent with findings reported by Glaeser et al. (1992) that suggest industry growth is not affected by knowledge spillovers. Aside from the positive relationship between the announced growth rate of establishments that did not receive incentives and the metropolitan area dummy variable, establishment growth rates are not significantly related to the local factors. This is consistent with findings from a study by Walker and Greenstreet (1991) in which the employment growth rates of new manufacturing plants in the Appalachian region are not significantly related to various county characteristics and local economic conditions.

Our findings also indicate that, in the sample of businesses that received incentives, establishments that expanded in 1993 had higher actual employ-

[5]Our results on the effects of establishment size and age on growth should be qualified when we compare our results with those from other studies that have examined firm growth theories. Our analysis focuses on a sample of growing establishments and, therefore, findings on the factors that affect growth in these businesses may not be directly comparable to findings from studies that examined both growing and declining businesses.

ment growth rates than those that expanded in 1995 (the omitted category). In the sample of businesses that did not receive incentives, businesses that expanded in 1993 and 1994 had higher actual employment growth rates than establishments that expanded in 1995. Finally, the regression results reveal a negative relationship between the actual employment growth rates of establishments that received incentives and the sample selection variable. This suggests sample selection bias is present in our model of actual employment growth and provides evidence in favor of the self-selection regression model over a standard OLS model of actual employment growth.[6]

Factors Affecting Receipt of an Incentive

Results from the probit regression shown in Table 5 indicate that an establishment's receipt of an incentive is positively related to the unemployment rate in the county where it is located. This suggests that incentive programs in Ohio may favor expanding establishments in areas with adverse economic conditions. An establishment's receipt of an incentive is also positively related to the average employment size of establishments in the industry.

5. ANNOUNCED VERSUS ACTUAL EMPLOYMENT GROWTH

Findings presented in Table 6 indicate that incentives increase announced growth more than actual growth. In this section we estimate a different self-selection regression model to examine the effects of incentives on the divergence between announced and actual employment growth. The dependent variable is an establishment's overestimation rate, defined in Section 2. The explanatory variables used in the analysis are the firm growth factors included in Equation 3, the sample selection variable and the dummy variables that control for the year the expansion occurred.

On the basis of the estimated coefficients presented in Table 7, we estimate the incentive effect for establishments that received incentives is an increase in the difference between announced and actual employment growth of 28.5 jobs. The average effect of incentives for establishments that did not receive incentives would be an increase in the difference between announced and actual employment growth of 21.5 jobs. For the entire sample, including establishments that received and those that did not receive incentives, we find that incentives contribute to overestimation of 23.9 jobs per establishment on average.

[6]The announced growth rates of establishments that received and did not receive incentives are not significantly related to the sample selection variable, so we also estimated a different version of the model that includes the exogenous variables in Equations (8) and (9) without the sample selection variable. Results from this model indicate that the effect of incentives on establishments that received and did not receive incentives is an increase in announced employment growth of 24.6 and 24.2 jobs, respectively.

TABLE 7: GLS Regression Results: Factors Affecting an Establishment's Overestimation Rate

	Estimated Coefficients[a]	
Variable	Establishment Received Incentives	Establishment Did Not Receive Incentives
Intercept	0.688	1.800**
	(0.742)	(6.759)
$\ln S$	−0.427**	−0.612**
	(−2.259)	(−6.511)
$(\ln S)^2$	0.038	0.045**
	(1.514)	(3.913)
$\ln A$	−0.079	−0.025
	(−0.361)	(−0.250)
$(\ln A)^2$	0.026	0.029*
	(0.595)	(1.705)
$(\ln S) \times (\ln A)$	−0.018	−0.010
	(−0.366)	(−0.412)
INDGRO	−4.422	0.689
	(−0.990)	(0.279)
$\ln$ *AVESIZE*	0.104	−0.016
	(0.999)	(−0.270)
COUGRO	−0.932	−0.576
	(−0.377)	(−0.405)
METRO	0.141	0.026
	(1.216)	(0.371)
LQ	0.020	0.0002
	(0.710)	(0.015)
YEAR93	−0.183	− 0.082
	(−1.429)	(−1.081)
YEAR94	−0.189	−0.061
	(−1.615)	(−1.030)
Sample Selection Variable	0.614*	−0.387
	(1.679)	(−1.327)
R^2	.374	.354
Adjusted R^2	.303	.317
Quasi-R^2 [b]	.350	.319
R^2 (linear model)[c]	.139	.064
Number of Observations	129	237

[a]Figures in parentheses are *t*-statistics.

[b]We transformed the predicted values of the log form of the dependent variable into a linear form to construct a quasi-R^2. The quasi-R^2 can be used to compare the overall fit of the logarithmic form of the regression model with the overall fit of a linear form of the regression model (Studenmund, 1992).

[c]R^2 resulting from the regression when all variables, including the dependent variable, use linear forms.

*Indicates variable is significant at the 10 percent level, $|t\text{-statistic}| > 1.645$.

**Indicates variable is significant at the 5 percent level, $|t\text{-statistic}| > 1.960$.

Our analysis suggests that an establishment's overestimation rate is negatively related to employment size. The effects of size on the overestimation rate are -0.097 (F-statistic $= 5.951$; p-value $= 0.016$) and -0.230 (F-statistic $= 43.371$; p-value $= 0.000$) at the sample mean for establishments that received and did not receive incentives. On the other hand, the results do not reveal a significant relationship between the overestimation rate and age. Other things being equal, the direct effects of age on the overestimation rate are -0.047 (F-statistic $= 0.119$; p-value $= 0.731$) and 0.069 (F-statistic $= 0.041$; p-value $= 0.840$) at the sample mean for establishments that received and did not receive incentives.

Our results indicate that an establishment's overestimation rate is not significantly related to the industry and local growth factors used in the analysis or the year in which the establishment expanded. Furthermore, the overestimation rate of businesses that received incentives is positively related to the sample selection variable. This suggests that sample selection bias is present in the model.

6. SUMMARY AND CONCLUSIONS

Using data from Ohio establishments that launched major expansions between 1993 and 1995, this paper examined two questions related to the effects of economic development incentives on establishment growth. First, do incentives stimulate job creation in business establishments? Second, do businesses overestimate the number of jobs they will create to receive more lucrative incentive packages from the government? According to the empirical evidence presented in the paper, the answers to these questions are "probably not" and "it appears they do."

Our analysis suggests that incentives do not substantially increase, and may even decrease slightly, the amount of employment change in the two years after an establishment launched an expansion. After controlling for other factors, we found that the effect of incentives on establishments that received incentives is a decrease of 10.5 jobs per establishment. Relative to an average of 51 jobs created in businesses that received incentives, the existence of incentives results in expansions that are about 20 percent smaller than would be the case if incentives were not available. The effect of incentives on establishments that did not receive incentives is an increase of 6.5 jobs per establishment. For these businesses, incentives would increase expansions (that average 45 workers) by about 14 percent.

Our findings reveal that incentives have a substantial positive effect on announced employment growth. We estimate that the state's offering of incentives leads the average business that receives incentives to announce an employment increase of 26.7 more jobs than they would promise if the incentive programs did not exist. This is 29 percent more than the average of 91 jobs promised by establishments that received incentives. For businesses that did not receive incentives, the incentive programs led the average business to announce 18.9 more jobs than it would promise in the absence of the program.

This is 42 percent more than the average announced expansion of 45 jobs by establishments that did not receive incentives.

Our results indicate that incentives substantially widen the difference between announced and actual employment change. We estimate that incentives lead the average business that received incentives to overestimate its future employment by 28.5 jobs. For businesses that did not receive incentives, the incentive programs would lead the average business to overestimate its future employment by 21.5 jobs. These findings imply that establishments misrepresent their hiring plans to receive larger incentives from the government. In the firm versus city subsidy game analyzed by Oechssler (1994) and Wohlgemuth and Kilkenny (1998), the firm has knowledge not possessed by the government regarding the firm's true intentions. The government does not know whether the firm has other attractive location opportunities unless it refrains from providing an incentive and the firm subsequently moves to another location. Our study deals with expansions rather than relocations, but the information asymmetry is similar. The government does not know whether an incentive is crucial for a proposed expansion to occur unless it denies the establishment's incentive request.

Politicians seeking credit for growth of the state and local economy may offer incentives because there is no means to ensure against the potential loss of an opportunity to gain political support if the expansion does not occur. However, our findings suggest that incentives do not result in the creation of more jobs than would have been created without the programs. Why then, are expansion incentives offered so often? It is likely that incentives are offered in some cases primarily to give politicians 'talking points' or 'bragging rights' regarding their role in expansions whose true cause cannot be clearly identified by the electorate. Furthermore, voters generally do not receive information on whether businesses that receive incentives actually create the number of jobs they promise. Given the imperfect information available to voters, the overestimation of announced jobs might result from complicity between business managers and politicians, both of whom presumably gain from the arrangement.

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APPENDIX A

TABLE A1: GLS Regression Results from the Actual Employment Growth Model without the Interaction Term

Variable	Estimated Coefficients[a]: Establishment Received Incentives	Establishment Did Not Receive Incentives
Intercept	3.657**	0.632**
	(4.001)	(2.633)
$\ln S$	−0.872**	−0.303**
	(−5.317)	(−3.602)
$(\ln S)^2$	0.067**	0.028**
	(4.400)	(3.439)
$\ln A$	−0.057	0.081
	(−0.412)	(1.226)
$(\ln A)^2$	0.007349	−0.028**
	(0.256)	(−2.091)
INDGRO	−2.241	3.242
	(−0.524)	(1.437)
ln*AVESIZE*	−0.059	0.121**
	(−0.786)	(2.237)
COUGRO	0.947	1.113
	(0.401)	(0.862)
METRO	−0.098	0.053
	(−0.941)	(0.869)
LQ	−0.015	0.001360
	(−0.565)	(0.109)
YEAR93	0.243**	0.162**
	(2.017)	(2.350)
YEAR94	0.072	0.088
	(0.647)	(1.400)
Sample Selection Variable	−0.500*	0.303
	(−1.694)	(1.560)
R^2	.423	.262
Adjusted R^2	.363	.222
Quasi-R^2 [b]	.223	.205
R^2 (linear model)[c]	.125	.105
Number of Observations	129	237

[a]Figures in parentheses are *t*-statistics.

[b]We transformed the predicted values of the log form of the dependent variable into a linear form to construct a quasi-R^2. The quasi-R^2 can be used to compare the overall fit of the logarithmic form of the regression model with the overall fit of a linear form of the regression model (Studenmund, 1992).

[c]R^2 resulting from the regression when all variables, including the dependent variable, use linear forms.

*Indicates variable is significant at the 10 percent level, $|t\text{-statistic}| > 1.645$.

**Indicates variable is significant at the 5 percent level, $|t\text{-statistic}| > 1.960$.

TABLE A2: GLS Regression Results from the Announced Employment Growth Model without the Interaction Term

	Estimated Coefficients[a]	
Variable	Establishment Received Incentives	Establishment Did Not Receive Incentives
Intercept	4.301**	2.443**
	(7.156)	(11.142)
$\ln S$	−1.252**	−0.902**
	(−11.593)	(−11.564)
$(\ln S)^2$	0.095**	0.070**
	(9.497)	(9.092)
$\ln A$	−0.222**	0.022
	(−2.387)	(0.366)
$(\ln A)^2$	0.032*	−0.002941
	(1.695)	(−0.237)
INDGRO	−6.793**	3.840*
	(−2.413)	(1.819)
ln*AVESIZE*	0.035	0.113**
	(0.511)	(2.260)
COUGRO	0.040	0.529
	(0.025)	(0.438)
METRO	0.058	0.091
	(0.852)	(1.567)
LQ	0.002633	0.001545
	(0.146)	(0.141)
YEAR93	0.061	0.074
	(0.758)	(1.151)
YEAR94	−0.114	0.021
	(−1.548)	(0.353)
Sample Selection Variable	0.113	−0.086
	(0.492)	(−0.328)
R^2	.786	.552
Adjusted R^2	.763	.528
Quasi-R^2 [b]	.719	.438
R^2 (linear model)[c]	.156	.086
Number of Observations	129	237

[a]Figures in parentheses are *t*-statistics.

[b]We transformed the predicted values of the log form of the dependent variable into a linear form to construct a quasi-R^2. The quasi-R^2 can be used to compare the overall fit of the logarithmic form of the regression model with the overall fit of a linear form of the regression model (Studenmund, 1992).

[c]R^2 resulting from the regression when all variables, including the dependent variable, use linear forms.

*Indicates variable is significant at the 10 percent level, $|t\text{-statistic}| > 1.645$.

**Indicates variable is significant at the 5 percent level, $|t\text{-statistic}| > 1.960$.

APPENDIX B

ADDITIONAL REGRESSION RESULTS

We present additional results on the effects of economic development incentives on actual and announced employment growth in Tables B1 and B2, respectively. The first two columns of results, in both tables, are from models that regress an establishment's logarithmic growth rate on an exogenous incentive dummy variable *INCENT* and the business growth factors from Equation (3). The second two columns of results are from models that relate establishment growth to the natural logarithm of the dollar amount of incentives received per announced new job, ln *INCPER*, and the control variables included in Equation (3). The regression models with the incentive dummy variable use data on all 366 establishments, whereas the models with the incentive size variable use data only on the 129 establishments that received incentives.

TABLE B1: OLS Regression Results: Factors Affecting an Establishment's Actual Growth Rate

Variable	Estimated Coefficients[a]			
Intercept	1.365**	1.242**	2.002**	1.933**
	(6.938)	(6.309)	(3.610)	(3.417)
INCENT	0.081*	0.090**		
	(1.916)	(2.092)		
ln *INCPER*			0.069*	0.077**
			(1.858)	(2.040)
ln *S*	−0.459**	−0.497**	−0.640**	−0.768**
	(−7.050)	(−7.611)	(−4.495)	(−5.675)
$(\ln S)^2$	0.020**	0.040**	0.026	0.062**
	(2.375)	(6.099)	(1.315)	(4.685)
ln *A*	−0.137*	0.032	−0.386**	−0.062
	(−1.915)	(0.592)	(−2.150)	(−0.497)
$(\ln A)^2$	−0.036**	−0.015	−0.021	0.001404
	(−2.809)	(−1.290)	(−0.769)	(0.054)
$(\ln S) \times (\ln A)$	0.060**		0.091**	
	(3.576)		(2.469)	
INDGRO	2.946	2.790	−2.189	−2.330
	(1.644)	(1.532)	(−0.578)	(−0.602)
ln *AVESIZE*	0.071**	0.070**	0.020	−0.001523
	(2.071)	(2.025)	(0.277)	(−0.021)
COUGRO	1.279	1.049	1.654	1.605
	(1.254)	(1.013)	(0.791)	(0.751)
METRO	0.029	−0.001504	−0.028	−0.086
	(0.617)	(−0.032)	(−0.301)	(−0.931)
LQ	−0.003550	−0.004130	−0.021	−0.019
	(−0.344)	(−0.394)	(−0.870)	(−0.760)

Variable	Estimated Coefficients[a]			
YEAR93	0.192**	0.201**	0.227**	0.234**
	(3.689)	(3.802)	(2.152)	(2.173)
YEAR94	0.059	0.062	0.029	0.026
	(1.307)	(1.351)	(0.313)	(0.270)
R^2	.308	.283	.459	.430
Adjusted R^2	.282	.258	.398	.371
Quasi-R^2 [b]	.110	.100	.225	.211
R^2 (linear model)[c]	.064	.062	.161	.157
Number of Observations	366	366	129	129

[a]Figures in parentheses are *t*-statistics.

[b]We transformed the predicted values of the log form of the dependent variable into a linear form to construct a quasi-R^2. The quasi-R^2 can be used to compare the overall fit of the logarithmic form of the regression model with the overall fit of a linear form of the regression model (Studenmund, 1992).

[c]R^2 resulting from the regression when all variables, including the dependent variable, use linear forms.

*Indicates variable is significant at the 10 percent level, $|t\text{-statistic}| > 1.645$.

**Indicates variable is significant at the 5 percent level, $|t\text{-statistic}| > 1.960$.

TABLE B2: OLS Regression Results: Factors Affecting an Establishment's Announced Growth Rate

Variable	Estimated Coefficients[a]			
Intercept	3.097**	3.020**	4.344**	4.315**
	(15.880)	(15.630)	(9.993)	(9.909)
INCENT	0.245**	0.250**		
	(5.841)	(5.949)		
ln *INCPER*			0.023	0.027
			(0.804)	(0.920)
ln *S*	−1.015**	−1.039**	−1.214**	−1.268**
	(−15.730)	(−16.230)	(−10.880)	(−12.170)
$(\ln S)^2$	0.066**	0.079**	0.080**	0.096**
	(7.855)	(12.240)	(5.203)	(9.321)
ln *A*	−0.166**	−0.060	−0.348**	−0.213**
	(−2.340)	(−1.101)	(−2.472)	(−2.212)
$(\ln A)^2$	−0.003036	0.010	0.023	0.032
	(−0.242)	(0.904)	(1.091)	(1.614)
$(\ln S) \times (\ln A)$	0.038**		0.038	
	(2.281)		(1.310)	
INDGRO	1.306	1.208	−6.850**	−6.909**
	(0.735)	(0.676)	(−2.308)	(−2.320)
ln *AVESIZE*	0.097**	0.096**	0.024	0.015
	(2.846)	(2.821)	(0.430)	(0.273)
COUGRO	0.417	0.271	0.207	0.187
	(0.412)	(0.267)	(0.126)	(0.113)
METRO	0.110**	0.091**	0.074	0.050
	(2.397)	(2.004)	(1.009)	(0.701)

Variable	Estimated Coefficients[a]			
LQ	0.001819	0.001453	0.00036	0.00133
	(0.178)	(0.141)	(0.019)	(0.069)
YEAR93	0.057	0.062	0.066	0.069
	(1.100)	(1.203)	(0.799)	(0.833)
YEAR94	−0.061	−0.059	−0.107	−0.108
	(−1.356)	(−1.307)	(−1.440)	(−1.455)
R^2	.631	.625	.790	.787
Adjusted R^2	.617	.613	.766	.765
Quasi-R^2 [b]	.440	.427	.738	.733
R^2 (linear model)[c]	.215	.146	.203	.200
Number of Observations	366	366	129	129

[a]Figures in parentheses are *t*-statistics.

[b]We transformed the predicted values of the log form of the dependent variable into a linear form to construct a quasi-R^2. The quasi-R^2 can be used to compare the overall fit of the logarithmic form of the regression model with the overall fit of a linear form of the regression model (Studenmund, 1992).

[c]R^2 resulting from the regression when all variables, including the dependent variable, use linear forms.

*Indicates variable is significant at the 10 percent level, | *t*-statistic | > 1.645.

**Indicates variable is significant at the 5 percent level, | *t*-statistic | > 1.960.