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Local Fiscal Policy and Establishment Growth

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Abstract. This applied study examines the effects of local taxes and government spending on the employment growth of 17,172 Maine establishments that were in operation in 1996 and 1999. Empirical results indicate that taxes have a negative effect on an establishment's three-year employment growth rate, although the tax effects are quite small in magnitude. These results are robust to the omission of establishments located in municipalities that cause group effects in the regression analysis. The negative tax effects are not statistically significant, however, in regressions that correct for sample selection bias related to establishment closures. In general, the empirical findings do not reveal a significant relationship between establishment growth and several types of local government spending.

1. Introduction

When asked, business people will likely say that taxes are too high. A survey conducted in 1996 revealed that 33 percent of urban manufacturing businesses and 23 percent of rural manufacturers believe that taxes are a "major problem" (McGranahan 1998). Many economic climate indices, which are often highly publicized within the business community, place a heavy emphasis on state and local taxes. For example, 11 of the 17 variables included in the *Small Business Survival Index* are related to state tax policy (Keating 2001). Against the commonly held perception that taxes hinder business growth, state and local government officials face an increasing responsibility to pay for public services that were once financed by the federal government (Donahue 1997; Deller 1998). The conflicting pressures felt by local policymakers to lower taxes and spend more money on public services raise questions about the effects of local fiscal policy on business growth.

This applied research study examines the effects of local taxes and government spending on the employment growth of 17,172 Maine establishments that were in operation in 1996 and 1999. We investigate the relation-

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ship between growth and local fiscal policy for several subsets of establishments that are grouped by employment size, industry classification, population size of the city where the establishment is located, and whether or not the establishment received a tax incentive. Our empirical results, from regressions that ignore group effects and do not correct for sample selection, generally reveal a negative relationship between growth and taxes, although the magnitudes of the effects are quite small. Moreover, these results are robust to the omission of establishments (in most cases, less than 5 percent of the sample observations) located in cities that were found to cause group effects in the regression analysis. The negative effects of local taxes on establishment growth, however, are not statistically significant in regressions that correct for sample selection bias. Furthermore, the empirical findings do not generally reveal a significant relationship between establishment growth and several types of local government spending.

Prior to around 1980, state and local taxes were believed to have very little effect on economic activity (Due 1961; Carlton 1983). Many studies written after 1980, however, reveal a negative tax impact on business activity (Helms 1985; Wasylenko and McGuire 1985; Dalenberg and Partridge 1995; Dye, McGuire and Merriman 2001). Bartik (1991, 1992) found that 40 of 57 studies published between 1979 and 1991 have at least one tax variable with a negative and significant effect on business activity. Newman and Sullivan (1988) also suggested that studies published between 1978 and 1987 "cast some doubt" on earlier work that uncovered negligible tax effects.

Much of the previous research on fiscal policy and regional economic growth focused on firm location as the indicator of business activity (Newman and Sullivan 1988; Bartik 1991; Wasylenko 1997; Gabe and Bell). Furthermore, many studies, especially those written before 1980, used aggregate employment growth as the dependent variable of interest in empirical analysis (Wasylenko 1997). Thus, while many studies have dealt with the effects of taxes on business location and aggregate employment growth, much less attention has been devoted to the relationship between establishment-level employment growth and local fiscal policy. Information on the effects of local taxes and government spending on the growth of existing establishments is key because these businesses account for a substantial percentage of overall job creation and destruction (Davis, Haltiwanger, and Schuh 1996).

The estimation of establishment-level employment growth models presents some interesting econometric issues. A common statistical problem that arises in this study is that growth rates are only observed for establishments that are in operation during the beginning and ending periods over which growth is measured. This econometric problem, recognized previously in the firm growth literature by Mansfield (1962), Evans (1987a) and Hall (1987), is handled using a two-stage sample selection model (Heckman 1976, 1979). The correction for sample selection bias related to establishment closures has a fairly dramatic effect on the regression results. The local tax

variable is statistically significant in the majority of the regressions that ignore sample selection bias, but insignificant in all of the sample selection models.

Another econometric problem results from using "macro" city-level variables, such as municipal tax rates and city population size among others, with a "micro" establishment-level data set. Moulton (1990) shows that if group effects, associated with the city-level variables, are present in the data, the use of establishment growth estimates (OLS) may result in downward-biased standard errors and "spurious findings of statistical significance." We handle this problem by identifying the cities that appear to cause the group effects, omitting from the sample the establishments located in these cities, and then re-estimating the growth models. As it turns out, the regression results related to the effects of local taxes on employment growth are largely unaffected by the omission of these establishments.

The rest of the study is organized as follows. The firm growth framework that underlies the empirical analysis is discussed in section two. The data used in the study are then described. Next, our empirical results on the effects of local fiscal policy on establishment growth are presented. We close the study with a brief discussion of policy ramifications.

2. Analytical Framework

A topic that has received considerable attention in the firm growth literature is the relationship between firm (employment) 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). Previous studies have investigated Gibrat's law, which suggests that firm growth is independent of firm size (Hart and Prais 1956). Jovanovic's (1982) passive firm learning hypothesis, which implies a negative relationship between growth and firm age, has also been tested in many empirical studies (Evans 1987a, 1987b; Dunne, Roberts and Samuelson 1989; Variyam and Kraybill 1992, 1994).

Evans (1987a, 1987b) and Variyam and Kraybill (1992, 1994) used the empirical framework shown as equations (1) and (2) to analyze firm growth rates:

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

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

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 independent of S

and A. We extend equation (2) to include fiscal policy and other industry and regional variables that may affect establishment growth:

$$GROWTH = \beta_0 + \beta_1 \ln S + \beta_2 \ln A + \beta_3 \ln TAX + \beta_4 \ln EDUC\ SUB + \quad (3)$$
$$\beta_5 \ln GOVT\ SPEND + \beta_6 \ln EDUC\ ADMIN +$$
$$\beta_7 \ln EDUC\ INSTRUCT + \beta_8 \ln EDUC\ OTHER +$$
$$\beta_9 INDGRO + \beta_{10} \ln INDSIZ + \beta_{11} POPGRO + \beta_{12} \ln POP +$$
$$\beta_{13} \ln LQ + \beta_{14} \ln WAGE + \beta_{15} \ln EDUC + u$$

Establishment growth (GROWTH), the dependent variable in equation (3), is measured as the difference between the natural logarithm of employment in the first quarter of 1999 and the natural logarithm of employment in the first quarter of 1996, which gives a three-year growth rate. Definitions and descriptive statistics of the variables in equation (3) are presented in Table 1.

Table 1. Variable Definitions and Descriptive Statistics

		Mean Values	
Variables	Definitions	In operation in 1996 and 1999	In operation in 1996 but not in 1999
Growth	Natural logarithm of employment in 1999 minus natural logarithm of employment in 1996[2]	0.0671 (0.5609)	NA
Size (S)	Establishment employment, 1996[2]	20.4 (100.1)	9.7 (30.1)
In S	Natural logarithm of employment[2]	1.805 (1.329)	1.240 (1.269)
Age(A)	Establishment age, as of 1997[3]	14.2 (11.0)	10.5 (9.0)
In A	Natural logarithm of age[3]	2.395 (0.712)	2.098 (0.668)
TAX	Local personal and real property tax rate, 1996[4]	0.0204 (0.0045)	0.0206 (0.0044)
In TAX	Natural logarithm of property tax rate[4]	-3.918 (0.236)	-3.905 (0.228)
EDUC SUB	Dollar amount of school subsidies received per pupil from state and federal sources, 1996[5]	2.505 (952.9)	2,470 (916.5)
In EDUC SUB	Natural logarithm of school subsidies[5]	70721 (0.551)	7.710 (0.544)
GOVT SPEND	Dollar amount spent per capita on goods and services other than education, 1996[5]	315.8 (354.2)	326.4 (353.0)

Table 1 Continued

Variables	Definitions	Mean Values: In operation in 1996 and 1999	Mean Values: In operation in 1996 but not in 1999
In GOVT SPEND	Natural logarithm of non-education government spending[5]	4.995 (1.392)	5.084 (1.338)
EDUC ADMIN	Dollar amount spent per capita on ecuation administration[5]	564.2 (162.6)	563.9 (156.7)
In EDUC ADMIN	Natural logarithm of spending on education administration[5]	6.295 (0.291)	6.295 (0.289)
EDUC INSTRUCT	Dollar amount spent per pupil on education instruction and operations, 1996[5]	4,903 (856.8)	4,920 (806.0)
In EDUC INSTRUCT	Natural logarithm of spending on education instruction and operations[5]	8.483 (0.177)	8.488 (0.170)
EDUC OTHER	Dollar amount spend per pupil on "other" education categories, 1996[5]	641.2 (282.3)	639.6 (247.7)
In EDUC OTHER	Natural logarithm of spending on "other" education categories[5]	6.363 (0.477)	6.366 (0.466)
NDGRO	Natural logarithm of U.S. employment in 3-digit SIC category in 1997 minus natural logarithm of industry employment in 1994[6]	0.089 (0.116)	0.096 (0.110)
INDSIZ	Average employment size of U.S. establishments in 3-digit SIC category, 1995[6]	18.0 (44.4)	15.0 (23.4)
In INDSIZ	Natural logarithm of average industry employment size[6]	2.416 (0.752)	2.389 (0.665)
POPGRO	Natural logarithm of population in municipality in 1999 minus natural logarithm of population in 1995[7]	0.0035 ((0.0437)	0.0025 (0.0428)
POP	Population in municipality, 1995[7]	19,369 (18,394)	20,751 (19,057)
In POP	Natural logarithm of population[7]	9.443 (0.939)	9.527 (0.928)
LQ	Percentage of county's establishments in 2-digit SIC category divided by percentage of U.S. establishments in the same category, 1995[6]	1.313 (1.489)	1.235 (1.449)
In LQ	Natural logarithm of location quotient[6]	0.079 (0.520)	0.048 (0.467)
WAGE	Average annual wages ($1,000) earned per worker in the county, 1995[6]	22.60 (2.253)	22.69 (2.257)
In WAGE	Natural logarithm of wages per worker[6]	3.113 (0.101)	3.117 (0.101)
EDUC	Average educational attainment (years of schooling) of county resident, 1990[8]	12.81 (0.41)	12.83 (0.42)
In EDUC	Natural logarithm of educational attainment[8]	2.549 (0.032)	2.551 (0.033)

Table 1 Continued

Variables	Definitions	Mean Values: In operation in 1996 and 1999	Mean Values: In operation in 1996 but not in 1999
CLOSURE	Number of establishments that closed in city between 1996 and 1999	154.3 (197.3)	169.6 (206.5)
In CLOSURE	Natural logarithm of establishment closures[2]	4.263 (1.352)	4.431 (1.252)
CONS	1 if establishment isin SIC category 1500–1700; 0 otherwise	0.099	0.100
MANU	1 if establishment is in SIC category 2000 or 2200-3900; 0 otherwise	0.065	0.034
TRANS	1 if establishment is in SIC category 4100, 4200, or 4400-4900; 0 otherwise	0.049	0.056
WHOLE	1 if establishment is in SIC category 5000 or 5100; 0 otherwise	0.067	0.080
RETAIL	1 if establishment is in SIC category5200-5900;0 otherwise	0.258	0.299
FIRE	1 if establishment is in SIC category 6000-6500, or 6700; 0 otherwise	0.082	0.080
SERV	1 if establishment is in SIC category 7000, 7200, 7300, 7500, 7600, 7800-8400, 8600, 8700 or 8900; 0 otherwise	0.381	0.350
Number of Observations		17,172	4,665

[1] Figures in parentheses are standard deviations.
[2] Computed using Covered Employment and Wages (ES-202) data.
[3] Age is measured as the number of years between an establishment's initial liability year, listed in the ES-202 database, and 1997.
[4] Tax rate information is from the *1996 Municipal Valuation Return Statistical Summary*, compiled by the Property Tax Division of the State of Maine bureau of Taxation.
[5] Computed using data from the Main Department of Education.
[6] Industry employment and county wage data are from County Business Patterns
[7] Population figures are from the Maine State Planning Office.
[8] Computed using data from the United States Census Bureau.

Theories of firm and regional growth provide justification for the explanatory variables used in the empirical analysis. The relationship between growth and business size (S) is the emphasis of Gibrat's law and passive firm learning theories focus on the link between growth and business age (A). On the basis of previous studies that rejected Gibrat's law and instead found that growth rates are inversely related to size, we expect a negative relationship between an establishment's three-year growth rate and size (Evans 1987a, 1987b; Dunne, Roberts and Samuelson 1989; Variyam and Kraybill 1992, 1994). We also expect a negative relationship between growth and establishment age, as predicted by the passive firm learning hypothesis (Evans 1987a, 1987b; Dunne, Roberts and Samuelson 1989; Variyam and Kraybill 1992, 1994).

Equation (3) includes the city's property tax rate (TAX), the amount of education subsidies received per pupil from the state and federal government (EDUC SUB), and four local government expenditure variables (GOVT SPEND, EDUC ADMIN, EDUC INSTRUCT and EDUC OTHER). In FY 2000, property taxes and education subsidies provided a combined 87 percent of the $2.4 billion in revenue received by Maine municipalities. Maine cities and towns collected $1.2 billion (51 percent of total revenue) in personal property taxes paid on business machinery and equipment, and real property taxes paid on land and structures. Municipalities received another $858 million (36 percent of total revenue) in state ($778 million) and federal ($80 million) subsidies for local education (Mills 1999). Maine towns also received $244 million (13 percent of total revenue) from other sources, such as vehicle excise taxes ($130 million), which are not included in the analysis.

The government spending variables included in equation (3) accounted for about 97 percent of the expenditures made by Maine municipalities and public schools. In FY 2000, Maine towns spent $700 million (30 percent of total expenditures) on municipal services and an additional $1.6 billion (67 percent of total expenditures) was spent on local education (Mills 1999). Maine towns also transferred $60 million (3 percent of total expenditures) to county governments, which is not included in the analysis. Detailed information on expenditures other than education is not available.

Assuming that taxes increase an establishment's operating costs, we expect a negative relationship between growth and the local tax rate for a given level of government spending.[2] Local government spending, when it extends or improves the quality of public services, may decrease an establishment's costs, which would stimulate growth.[3]

We use industry employment (INDGRO) and city population (POPGRO) growth to control for conditions in national and local markets. Other things being equal, establishments in expanding industries and cities are expected to grow at higher rates than establishments in declining sectors and areas. Average industry establishment size (INDSIZ) is included to control for industry differences in establishment size, which, other things being equal, is

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[2] Bartik (1991) and Fisher (1997) suggest that econometric studies that control for government spending are more likely to uncover a negative relationship between economic activity and taxes than studies that do not control for state or local government expenditures. For example, Mofidi and Stone (1990) found that taxes have a negative and significant effect on state-level investment and employment in regressions that include government spending variables, but the tax effect is insignificant in regressions that do not control for expenditures.

[3] Evans and Karras (1994) found that current spending on education has a positive effect on gross state product, but that spending on highways, health and public safety do not contribute to private production. Fisher's (1997) survey of the literature shows that education spending has a positive effect on business activity in 12 of 19 reviewed studies, and a positive and significant effect in six studies. Likewise, spending on public safety has a positive effect on business activity in five of nine studies, and a positive and significant effect in four studies.

expected to have a positive effect on growth. Equation (3) also includes variables to represent agglomeration economies, associated with city population size (POP) and industry concentration (LQ), which may lower costs and have a positive effect on establishment growth. Finally, the average wages earned by workers in the county (WAGE) is expected to decrease establishment growth, whereas the average educational attainment of county residents (EDUC) is expected to have a positive effect on growth.

3. Data

The empirical analysis uses Covered Employment and Wages (ES-202) data on a sample of 17,172 establishments that employed one or more workers during the first quarters of 1996 and 1999. These establishments are located in one of 127 Maine municipalities with 2,500 or more residents. Establishments that began operations or closed between 1996 and 1999 are not included in the sample. As shown in Table 1, establishments that were in operation in 1996 and 1999 grew by an average of 6.71 percent over the three-year period. These establishments had an average initial employment size (S) of 20 workers and had been in operation (A) an average of 14 years. Establishments that closed between 1996 and 1999 were, on average, smaller and younger than establishments that remained in operation over the period.

The analysis focuses on the growth of individual business establishments, which may be part of multi-establishment firms. White et al., (1990) discuss several limitations of ES-202 data for establishment-level analysis. First, although multi-establishment firms are supposed to report employment information for each establishment separately, some report firm-level information from a single location. The address given in the ES-202 data is the location used in the analysis. Second, the data set does not include information on sole proprietorships, farms, and agricultural enterprises with fewer than ten employees. Thus, our analysis does not incorporate the growth of these mostly, small establishments. A third limitation of the ES-202 data is the way in which the transfer of business ownership is handled. ES-202 records include "predecessor" and "successor" numbers to track business changes in legal status, although sometimes these codes are missing (White et al., 1990). To minimize the number of ownership transfers mistakenly classified as establishment births or deaths, we "visually inspected" the data set to check for these types of errors before proceeding with the analysis. Finally, an establishment's SIC designation may change if its dominant product or service changes. The establishment SIC categories used in the study are from 1996.

Tax rate (TAX) information is from the *1996 Municipal Valuation Return Statistical Summary*, published by the State of Maine Bureau of Taxation. The dollar amount of taxes paid on business equipment (and machinery) is determined by multiplying the local property tax rate (TAX) times the equip-

ment's assessed value. Personal and real property is taxed at 100 percent of its assessed value in 98 of the municipalities, and at an average of 98 percent of its assessed value in the other 29 towns and cities included in the analysis.

Education subsidy (EDUC SUB) and government spending information is from the Maine Department of Education. The variable GOVT SPEND represents the dollar amount of local government spending per capita on non-education services, such as public safety and public works. The education spending variables (EDUC ADMIN, EDUC INSTRUCT and EDUC OTHER) represent the dollar amount of total spending per pupil on education administration, instruction, and "other" education categories, such as transportation and nutrition.

Industry growth (INDGRO) is measured, using County Business Patterns data, as the natural logarithm of U.S. employment in an establishment's 3-digit SIC category in 1997 minus the natural logarithm of industry employment in 1994, which gives a three-year growth rate. We calculated the average industry establishment size (INDSIZ) by dividing the number of U.S. employees in an establishment's 3-digit SIC category by the number of establishments in the sector. City population growth (POPGRO) is measured, using data from the Maine State Planning Office, as the natural logarithm of population in an establishment's municipality in 1999 minus the natural logarithm of population in 1995, which gives a four-year growth rate. Location quotients (LQ), calculated as the percentage of a county's establishments in a 2-digit SIC category in 1995 divided by the percentage of U.S. establishments in the same category, are used to represent industry concentration. Local labor costs (WAGE) are calculated as the total annual payroll in a county divided by the total number of workers in the county. Average educational levels (EDUC) of the local (county) labor force are calculated using 1990 Census data.

Along with the analysis of the entire sample (n = 17,172), we also examine the effects of local taxes and government spending on the growth of several subsets of establishments. First, we investigate the relationship between growth and local fiscal policy for establishments that employed 20 or fewer workers (n = 14,286) and establishments that employed more than 20 workers (n = 2,886) in 1996. Next, the analysis focuses on manufacturing plants (n = 1,109) and establishments in the services and retail sectors (n = 10,974). Third, the effects of local fiscal policy on the growth of establishments located in towns with 2,500 to 10,000 residents (n = 8,409) and cities with more than 10,000 people (n = 8,763) are considered. Finally, we look at the effects of local taxes and spending on the growth of establishments that participated in the Business Equipment Property Tax Reimbursement (BETR) program (n = 430) and those that did not (n = 16,742). The receipt of a tax incentive may alter the relationship between establishment growth and the local tax rate, since the BETR program reimburses to companies all personal property taxes

paid on "qualified" business property that was placed in service after April 1, 1995.

4. Empirical Findings

To investigate the effects of local taxes and government spending on establishment growth, we estimate several regression models that differ in their treatment of group effects and sample selection bias. The left-hand-side column of results displayed in Table 2 is from a conventional OLS regression of equation (3), without the government-spending variables. The estimates shown in the right-hand-side column are from a regression that controls for government expenditures, as shown in equation (3). Along with the establishment, industry and regional control variables from equation (3), both regression equations include dummy variables that indicate an establishment's major SIC category.

The results displayed in Table 2, which may be subject to group effects and sample selection bias, imply that the local personal property tax rate has a negative effect on establishment growth, whereas growth is not significantly related to the local government expenditure variables. The empirical estimates imply that, for a given level of government spending, a 10-percent increase in the personal property tax rate is associated with, on average, a 0.8-percent decrease in an establishment's three-year growth rate. Although this suggests that local taxes hinder establishment growth, the magnitudes of the effects are quite small when compared to previous studies that examined the effects of taxes on economic activity. For example, the results from 48 studies surveyed by Bartik (1992) suggest that a 10-percent increase in taxes is associated with a 2.5-percent decrease in business activity.

For the most part, the control variables included in the analysis have the expected effects on establishment growth. The empirical results indicate that small establishments grow faster than large establishments, and young establishments grow faster than mature establishments. The industry growth rate and the average size of establishments in the industry have a positive effect on growth, other things being equal. The results suggest that agglomeration economies encourage growth, as evidenced by the positive effects of city population size and the industry location quotient on establishment growth. We find that local population growth, the average annual wages earned by local workers and the average educational attainment of county residents do not have a significant effect on establishment growth. Three of the six industry dummy variables have a significant effect on establishment growth.

Table 2. Establishment Growth Estimates (OLS), Entire Sample

	Estimated Coefficients[1]	
Variables	Version 1	Version 2
Intercept	-0.842*	-0.743
	(-1.863)	(-1.400)
InS	-0.094***	-0.095***
	(-25.830)	(-25.836)
InA	-0.066***	-0.066***
	(-10.977)	(-10.991)
In TAX	-0.084***	-0.077***
	(-3.201)	(-2.678)
In EDUC SUB		0.003
		(0.267)
In GOVT SPEND		0.005
		(1.205)
In EDUC ADMIN		-0.025
		(-1.388)
In ECUC INSTRUCT		-0.005
		(-0.167)
In EDUC OTHER		-0.003
		(-0.278)
INDGRO	0.096***	0.096**
	(2.577)	(2.559)
In INDSIZ	0.076***	0.076***
	(11.115)	(11.109)
POPGRO	-0.134	-0.103
	(-0.999)	(-0.728)
In POP	0.022***	0.018**
	(3.520)	(2.347)
In LQ	0.034***	0.034***
	(3.949)	(4.019)
In WAGE	0.015	0.014
	(0.216)	(0.201)
In EDUC	0.181	0.239
	(0.807)	(0.011)
CONS	0.054***	0.053***
	(2.652)	(2.586)
MANU	-0.072***	-0.073***
	(-3.003)	(-3.034)
TRANS	0.051***	-0.051***
	(-2.035)	(-2.050)
WHOLE	0.035	0.034
	(1.589)	(1.542)
RETAIL	-0.001	-0.002
	(-0.065)	(-0.102)
SERV	-0.010	-0.011
	(-0.635)	(-0.677)
R-squared	0.0593	0.0596
Adjusted R-squared	0.0584	0.0584
Number of Observations	17,172	17,172

[1] Figures in parentheses are t-statistics.

*, ** and *** indicate variable is significant at 10-percent, 5-percent and 1-percent level.

The effects of the fiscal policy variables on the growth of several subsets of Maine establishments are summarized in Table 3.[4] Taxes have a negative and significant effect on the growth of establishments with 20 or fewer employees, establishments with more than 20 workers, establishments in the services and retail sectors, establishments located in cities with between 2,500 and 10,000 residents, and establishments that did not receive a tax incentive. As before, however, the effects of taxes on the growth of these establishments are quite modest. In four of the five subsets in which taxes have a negative and significant effect on growth, a 10-percent increase in local taxes is associated with less than a 1-percent decrease in establishment growth. Taxes do not have a significant effect on the growth of manufacturing plants, establishments located in cities with more than 10,000 residents, and establishments that received a tax incentive. Non-education government spending has a positive effect on the growth of manufacturing plants and establishments that received a tax incentive. Spending on local education in Maine municipalities does not have a significant effect on growth in any of the subsets of establishments.

4.1 Group Effects

The results presented in Tables 2 and 3, which indicate a negative and statistically significant relationship between growth and taxes in 12 of the 18 regression equations, may provide a misleading impression of the effects of local taxes on establishment growth. The fiscal policy variables are measured at the municipal level and, therefore, they do not vary across establishments located in the same town or city. If the random errors in the OLS regressions are correlated within the groups of 127 municipalities, the estimated standard errors may be biased downward (Moulton 1990).

Moulton (1987) proposed a straightforward F-test for the presence of group effects in OLS regressions. The test involves comparing the sum-of-squares errors for the regression model that includes the city-specific group variables to the sum-of-squares errors for a fixed-effects model that includes city-level indicator variables (in place of the group variables). Sources of group effects, if they are detected, can be uncovered by examining group-mean residuals (Moulton 1987). We calculated group-mean residuals by summing the residuals estimated for each establishment in the municipality and dividing this amount by the number of establishments in the municipality. The relative magnitudes, in absolute value, of the group-mean residuals indicate the relative strength of group-specific effects.

[4] Full regression results are available from the author upon request.

Table 4. Tests for Group Effects

		Omit establishments located in 10 cities		Omit establishments until group effects not detected	
Establishments in Sample	F-stat[1]	F-stat[1]	Sample Size	F-stat[1]	Sample Size
Entire sample, n = 17,172	1.208	1.013	16,930	0.998	
20 or fewer employees, n = 14,286	1.281	0.989	13,998	NA	NA
More than 20 employees, n = 2,886	0.895	NA	NA	NA	NA
Manufacturing , n = 1,109	0.855	NA	NA	NA	NA
Service and retail, n = 10,974	1.082	0.883	10,870	NA	NA
Located in cities with between 2,500 and 10,000 residents, n = 8,409	1.224	0.997	8,123	NA	NA
Located in cities with more than 10,000 residents, n = 8,763	2.699	NA[2]	NA[2]	NA[2]	NA[2]
Received a tax incentive, n = 430	1.605	1.07	410		402
Did not receive a tax incentive, n = 16,742	1.232	1.019	16,487	0.982	16,384

[1] F-statistic greater than 1.0 rejects null hypothesis (at 5-percent confidence level) of no group effect.
[2] Data set includes only 17 municipalities with more than 10,000 residents.

Test results for city-specific group effects, where an F-statistic greater than 1.0 provides evidence (at a 5-percent confidence level) of group effects in the regression, are provided in Table 4. The analysis of group effects focuses on the regression equations that include the local tax rate without the government-spending variables, because the initial analysis did not generally reveal a statistically significant relationship between growth and local government expenditures. The left-hand-side column of test results shows that city-specific group effects are present in the regression that uses the entire data set, and in six of the eight regressions that use subsets of the data. In the regressions where group effects were found, we omitted from the sample the establishments located in the ten municipalities with the largest (in absolute value) group-mean residuals and then re-estimated the models and re-tested for group effects. If group effects were still present, we omitted additional establishments, one municipality at a time, until group effects were no longer detected.

Empirical results from regression equations, estimated before and after excluding from the sample establishments located in the municipalities that cause the city-specific group effects, are reported in Table 5. The left-hand-side column of results, also shown in Table 2, is from the regression analysis that ignores group effects (n = 17,172). Results shown in the center column are from a regression that was re-estimated after omitting establishments located in the ten municipalities with the largest group-mean residuals (n = 16,930). Since group effects were still present after omitting these establishments, we excluded establishments from one additional municipality, at which point city-specific group effects were no longer detected. The right-hand-side column of Table 5 shows results from the regression model that is no longer subject to city-specific group effects (n = 16,895). A comparison of

the results presented in Table 5 confirm that the regression estimates, in particular those related to the effects of taxes on establishment growth, are largely unaffected by the group effects treatment.

Table 5. Establishment Growth Estimates (OLS) with Group Effects Treatment, Entire Sample

Variables	Estimated Coefficients[1]		
	Ignore group effects	Omit establishments located in 10 cities	Omit establishments until group effects not detected
Intercept	-0.842*	-0.861*	-0.873*
	(-1.863)	(-1.901)	(-1.929)
In S	-0.094***	-0.094***	-0.094***
	(-25.830)	(-25.548)	(-25.574)
In A	-0.066***	-0.068***	-0.068***
	(-10.977)	(-11.210)	(-11.302)
In TAX	-0.084***	-0.076***	-0.075***
	(-3.201)	(-2.865)	(-2.823)
INDGRO	0.096***	0.098***	0.099***
	(2.577)	(2.622)	(2.633)
In INDSIZ	0.076***	0.076***	0.075***
	(11.115)	(11.028)	(11.002)
POPGRO	-0.134	-0.073	-0.089
	(0.999)	(-0.538)	(-0.657)
In POP	0.022***	0.019***	0.018***
	(3.520)	(3.013)	(2.864)
In LQ	0.034***	0.036***	0.036***
	(3.949)	(4.120)	(4.151)
In WAGE	0.015	-0.022	-0.024
	(0.216)	(-0.314)	(-0.345)
In EDUC	0.181	0.260	0.273
	(0.807)	(1.149)	(1.208)
CONS	0.054***	0.049**	0.050***
	(2.652)	(2.373)	(2.426)
MANU	-0.072***	-0.074***	-0.071***
	(-3.003)	(-3.089)	(-2,954)
TRANS	-0.051***	-0.048*	-0.049I
	(-2.035)	(-1.928)	(-1.949)
WHOLE	0.035	0.030	0.031
	(1.589)	(1.376)	(1.430)
RETAIL	-0.001	-0.004	--0.004
	(-0.065)	(-0.221)	(-0.221)
SERV	-0.010	-0.013	-0.012
	(-0.635)	(-0.766)	(-0.752)
R-squared	0.0593	00.0595	0.0599
Adjusted R-squared	0.0584	0.0586	0.0590
Number of observations	17,172	16,930	16,895

[1] Figures in parentheses are t-statistics.

*, **, and *** indicate variable is significant at 10-percent, 5-percent and 1-percent level.

Table 6. Summary of Establishment Growth Estimates (OLS) with Group Effects Treatment

	Estimated Coefficients[1]		
Establishments in sample	Ignore group effects	Omit establishments located in 10 cities	Omit establishments until group effects not detected
Entire sample, n = 17,172	-0.084***	-0.076***	-0.075***
	(-3.201)	(-2.865)	(-2.823)
20 or fewer employees, n = 14,286	-0.068***	-0.055*	NA[2]
	(-2.376)	(-1.906)	
More than 20 employees, n = 2,886	-0.190***	NA[3]	NA[3]
	(-3.029)		
Manufacturing, n = 1,109	-0.164	NA[3]	NA[3]
	(-1.347)		
Service and retail, n = 10,974	-0.082**	-0.075**	NA[2]
	(-2.575)	(-2.344)	
Located in cities with between 2,500 and 10,000 residents, n = 8,409	-0.082***	-0.075***	NA[2]
	(-2.883)	(-2.643)	
Located in cities with more than 10,000 residents, n = 8,763	-0.133	NA[4]	NA[4]
	(-1.486)		
Received a tax incentive, n = 430	-0.259	-0.215	
	(-1.327)	(-1.129)	
Did not receive a tax incentive, n = 16,742	-0.081***	-0.071***	NA[2]
	(-3.064)	(-2.657)	

[1] The effect of local taxes on establishment growth. Figures in parentheses are t-statistics.
[2] Group effects no longer detected after omitting establishments in 10 municipalities.
[3] Group effects not detected.
[4] Data set includes only 17 municipalities with more than 10,000 residents.
*, ** and *** indicate variable is significant at 10-percent, 5-percent and 1-percent level.

We summarize the regression results on the relationship between growth and local taxes for the eight subsets of establishments in Table 6. A comparison of the empirical findings shown in the table reveals that the omission of establishments, located in the cities that cause the group effects, leads to only a slight decrease in the statistical significance of the tax impact.

4.2 Sample Selection Bias

The empirical findings presented in Tables 2 and 3 may also be subject to sample selection bias, since the regression results are based on samples that are not randomly selected. Although the underlying population of interest consists of all establishments in operation as of the first quarter of 1996, the analysis focuses on "distorted" samples of establishments that remained in operation until at least the first quarter of 1999 (Lee 2001). The samples are censored because growth rates, the dependent variable in the regression analysis, are only observed for establishments that are in operation during 1996 and 1999. Since the samples are non-randomly generated, the statistical characteristics of the samples may not accurately represent the characteristics of the underlying population, even if the samples are large in size (Lee 2001).

This econometric problem is handled using Heckman's (1976, 1979) two-stage sample selection model.

The first stage of the sample selection procedure is a probit model that examines the likelihood that an establishment, in operation in 1996, is still in business in 1999. The dependent variable is a dummy variable that equals one if the establishment remained in operation over the three-year period, and zero otherwise. The probit model uses data on 21,837 establishments, of which 4,665 closed between 1996 and 1999. The probit model includes an additional explanatory variable (ln CLOSE) to control for the number of establishments that closed between 1996 and 1999 in an establishment's surrounding city. This variable, which does not have a significant effect on growth, is expected to decrease an establishment's probability of remaining in operation.

Estimates from the probit model are used to compute an additional variable that controls for sample selection in the second-stage establishment growth regression. The second stage of the procedure is a GLS estimation of equation (3), with the sample selection variable that uses data on the 17,172 establishments that remained in operation between 1996 and 1999. The two-stage procedure generates consistent estimates of the parameters in the second-stage establishment growth equation (Heckman 1979; Maddala 1983).

Empirical results, corresponding to the estimates presented in Table 2 from the sample selection models, are presented in Tables 7 and 8. The total effects reported are comprised of the variable's direct effect on growth (through the establishment growth equation) and the variable's indirect effect on growth (through whether or not the establishment remained in operation between 1996 and 1999). Indirect effects are calculated using coefficients from the probit model and the sample selection variable estimated in the growth equation (Greene 1998, 2000). Results from the sample selection models suggest that the local personal property tax rate and the amount of government spending per resident do not have a significant (total) effect on establishment growth. The probit estimates imply that establishments located in high tax locales were less likely to remain in operation between 1996 and 1999 than establishments in low tax areas, although the results are not statistically significant.

Sample selection results, corresponding to the estimates shown in Table 3, for the eight subsets of establishments are summarized in Table 9. Taxes and local government spending do not have a significant (total) effect on growth in any of the subsets of establishments.

Table 7. Sample Selection Results (Version 1), Entire Sample

	Estimated Coefficients[1]			
Variable	Probit results	Indirect effects	GLS results (direct effects)	Total effects
Intercept	-3.132***	2.338***	-0.946	
	(-2.605)	(3.054)	(-1.21)	
In S	0.218***	-0.163***	2.14E-03	-0.161***
	(24.560)	(-28.803)	(0.156)	(-10.811)
In A	0.289***	-0.215***	0.066***	-0.149***
	(19.697)	(-23.100)	(3.375)	(-6.838)
In TAX	-0.094	0.070*	-0.103**	-0.033
	(-1.464)	(1.717)	(-2.274)	(-0.592)
INDGRO	-0.075	0.056	0.067	0.123
	(-0.826)	(0.969)	(1.034)	(1.417)
In INDSIZ	-0.167***	0.125***	-4.84E-03	0.120***
	(-10.006)	(11.735)	(-0.310)	(6.356)
POPGRO	-0.066	0.049	0.261	0.310
	(-0.195)	(0.228)	(1.109)	(0.973)
In POP	0.177***	-0.132***	-0.012	(-0.144***
	(5.356)	(-6.281)	(-1.038)	(-5.996)
In LQ	3.68E-03	-2.75E-03	0.033**	0.030
	(0.170)	(-0.199)	(2.231)	(1.493)
In WAGE	-0.346**	0.258**	-0.028	0.230
	(-2.026)	(2.376)	(-0.234)	(1.434)
In EDUC	1.269**	-0.948***	0.097	-0.851
	(2.244)	(-2.631)	(0.252)	(-1.616)
CONS	-0.022	0.016	0.058*	0.074
	(-0.442)	(0.518)	(1.646)	(1.576)
MANU	0.362***	-0.270***	0.080*	-0.190***
	(5.717)	(-6.704)	(1.769)	(-3.126)
TRANS	-0.072	0.054	-0.075*	-0.021
	(-1.247)	(1.463)	(-1.757)	(-0.366)
WHOLE	-0.111**	0.083***	-0.017	0.066
	(-2.205)	(2.585)	(-0.449)	(1.331)
RETAIL	-0.170***	0.127***	-0.071**	0.056
	(-4.257)	(4.992)	(-2.332)	(1.420)
SERV	0.058	-0.043*	0.024	-0.019
	(1.2877)	(-1.743)	(0.840)	(-0.518)
In CLOSURE	-0.193***	0.144***		
	(-8.324)	(9.761)		
Sample Selection Variable			1.173***	
			(7.899)	
Chi-Squared	1,494			
Significance Level	0.000			
R-squared			0.0681	
Adjusted R-squared			0.0672	
Number of observations	21,837		17,172	

Figures in parentheses are t-statistics.

*, ** and *** indicate variable is significant at 10-percent, 5-percent and 1-percent level.

Table 8. Sample Selection Results (Version 2), Entire Sample

	Estimated Coefficients[1]			
Variable	Probit results	Indirect effects	GLS results (direct effects)	Total effects
Intercept	-2.893**	2.167**	-0.720	
	(-2.063)	(2.473)	(-0.780)	
In S	0.218***	-0.167**	4.55E-03	-0.162***
	(24.585)	(-29.474)	(0.321)	(-10.622)
In A	0.289***	-0.220***	0.069***	-0.151***
	(19.702)	(-23.620)	(3.425)	(-6.771)
In TAX	-0.077	0.058	-0.102**	-0.044
	(-1.092)	(1.309)	(-2.040)	(-0.654)
In EDUC SUB	-0.027	0.020	1.54E-03	0.022
	(-1.140)	(1.367)	(0.091)	(0.975)
In GOVT SPEND	2.21E-03	-1.69E-03	3.16E-04	-1.37E-03
	(0.224)	(-0.269)	(0.044)	(-0.144)
In EDUC ADMIN	0.037	-0.028	0.021	-7.16E-03
	(0.826)	(-0.990)	(0.647)	(-0.166)
In EDUC INSTRUCT	-2.47E-03	1.89E-03	-0.070	-0.069
	(-0.033)	(0.039)	(-1.296)	(-0.942)
In EDUC OTHER	7.78E-03	-5.94E-03	-3.19E-03	-9.13E-03
	(0.296)	(-0.354)	(-0.166)	(-0.359)
INDGRO	-0.073	0.056	0.067	0.123
	(-0.805)	(0.965)	(1.014)	(1.399)
In INDSIZ	-0.168***	0.128***	-6.87E-03	0.121***
	(-10.029)	(12.024)	(-0.429)	(6.303)
POPGRO	-0.155	0.119	0.256	0.374
	(-0.434)	(0.521)	(1.014)	(1.102)
In POP	0.171***	-0.130***	-0.013**	-0.144***
	(4.949)	(-5.933)	(2.167)	(-5.489)
In LQ	3.13E-03	-2.39E-03	0.032**	0.030
	(0.145)	(-0.173)	(2.167)	(1.478)
In WAGE	-0.317*	0.242**	-0.030	0.212
	(-1.829)	(2.193)	(-0.245)	(1.285)
In EDUC	1.148*	-0.876**	0.197	-0.679
	(1.947)	(-2.334)	(0.477)	(-1.218)
CONS	-0.020	0.015	0.057	0.072
	(-0.409)	(0.490)	(1.597)	(1.526)
MANU	0.364***	-0.278***	0.082*	-0.195***
	(5.754)	(-6.898)	(1.781)	(-3.183)
TRANS	-0.070	0.053	-0.075*	-0.022
	(-1.200)	(1.438)	(-1.744)	(-0.391)
WHOLE	-0.111**	0.084***	-0.019	0.066
	(-2.191)	(2.627)	(-0.481)	(1.314)
RETAIL	-0.169***	0.129***	-0.073**	0.056
	(-4.237)	(5.080)	(-2.361)	(1.404)
SERV	0.058	-0.044*	0.024	-0.021
	(1.495)	(-1.792)	(0.824)	(-0.545)
In CLOSURE	-0.196***	0.149***		
	(-8.039)	(9.637)		
Lambda			1.199***	
			(7.821)	
Chi-Squared	1,497			
Significance Level	0.000			
R-squared			0.0685	
Adjusted R-squared			0.0673	
Number of observations	21,837		17,172	

Figures in parentheses are t-statistics.

*, ** and *** indicate variable is significant at 10-percent, 5-percent and 1-percent level.

5. Summary and Conclusions

Using employment information on a large sample of Maine establishments located in 127 municipalities, this applied research study investigated the relationship between establishment growth and local fiscal policy. Empirical findings indicate that taxes have a negative effect on employment growth, both in the analysis of the entire sample and in regressions using various subsets of the data. The magnitudes of these effects, however, are quite small and the estimates are not statistically significant in regression models that correct for sample selection bias related to establishment closures. Furthermore, since the dataset does not include sole proprietorships and some agricultural enterprises, the results from this study may not apply to very small businesses. In general, the empirical findings do not reveal a significant relationship between establishment growth and several types of local government spending.

Our empirical findings, while generally consistent with earlier research that found negligible tax impacts on economic activity (Due 1961; Carlton 1983), may appear to contradict post-1980 studies that uncovered more substantial tax impacts on business location and aggregate economic growth (Helms 1985; Wasylenko and McGuire 1985; Dalenberg and Partridge 1995; Dye, McGuire and Merriman 2001). Given the study's focus on establishment-level employment growth, however, our results are not directly comparable to previous tax impact studies that analyzed firm location and aggregate (state or local) employment growth. While many of these studies found that high taxes may decrease an area's desirability as a location for a new firm or branch plant (Bartik 1985; Friedman, Gerlowski and Silberman 1992), our results suggest that taxes have very little effect on the growth of establishments that are already in operation.

Results from this study can be considered along with findings from a companion study to gain a sense of how local fiscal policy may affect aggregate employment growth. Using a similar data set on Maine municipalities, Gabe and Bell found that the local government spending variables used in this study have a significant effect on business location. Businesses are attracted to municipalities that spend high amounts on local education and other public services, even when additional spending requires a tax hike. The results from the two studies, taken together, suggest that local fiscal policy affects aggregate employment change largely through business openings and closures, and less through the expansions and contractions of existing businesses.

From the standpoint of overall local economic growth, it is unlikely that differences in municipal tax rates across Maine cities and towns would lead to substantial inter-municipal differences in aggregate employment growth or decline. In a study of U.S. manufacturing industries, Davis, Haltiwanger,

and Schuh (1996) found that the expansions and contractions of existing businesses accounted for an average of 85 and 77 percent of the total annual job creation and destruction, respectively, that occurred in U.S. manufacturing between 1973 and 1988. Even though local fiscal policy has a fairly substantial effect on the location decisions of Maine businesses, the modest impacts of fiscal policy on the growth of existing establishments found in this study suggest that the impact of local fiscal policy on overall economic activity may likely be quite small.

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