Small Business and Employment: A Cross-Sectional Analysis

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Abstract

Politicians within the United States regularly tout the advantages of promoting small business as a means to cure unemployment in the nation's economy. This paper presents an unbiased cross-sectional study, across all fifty states, of the effects of small business on employment. To affirm for the robustness of our model, we control for industry, geographical region, the proportion of small firms in the state (as a percentage of total firms), gross domestic product, education, and government employment. By eliminating the effects of these other determinants of employment, we were able to conclude that for most industries, the proportion of small businesses in a state has no effect on the unemployment rate.

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I. Introduction

The concept of the small business as a disproportionate provider of new jobs to the economy retains significant credence in the public sphere. Recent studies have called into question whether the more general form of this argument mistakes small businesses for young businesses. The employment contribution of small businesses derives from fundamentally different economic forces than the contribution of businesses that are small but growing quickly into large businesses.

The theory subtending expectations of disproportionately large small business employment posits more conservative hiring and firing behavior and seems to predict the largest difference during economic downturns. The agency problem in large, publicly owned firms suggests that managers and directors have little incentive to consider the long-term health of the firm. Managers whose performances are evaluated on a quarterly or annual basis would thus tend to fire workers to minimize losses this year, even if enduring losses by retaining employees this year would lead to five times greater profits three years later. Small businesses, on the other hand, being overwhelmingly run by the same individuals who own them, are more likely to be willing to make long term decisions. Such long term behavior is less likely to eliminate employees in downturns because those employees will be critical to growing when the downturn ends.

Small businesses are also likely to have relatively poorer access to capital than large businesses, both because they are structurally precluded from some means of raising capital like bonds or public offerings and because financial institutions are less willing to provide credit in difficult times. This scarcity of capital would distance small businesses from the destabilizing macroeconomic tendencies of capital markets. Large businesses can, therefore, quickly replace the capacity lost by firing employees during a downturn by raising capital at the beginning of the recovery. For small firms for whom organic growth is the most likely path, firing an employee in a downturn represents a long term loss of capacity that will continue into the recovery. Such firms would have incentives to add capacity carefully in booms and eliminate employees parsimoniously in bad times.

This study seeks to determine the total effect of small business both young and old by examining the unemployment rate on a state-by-state basis with respect to the number of small and large firms and establishments. The geographic variation likely provides random variation across both industrial compositions and geographically tied economic networks so that both young startups and more traditional small businesses provide varying contributions to employment.

II. Literature Review

The role that small businesses play in a growing economy has always been questioned by politicians and policy makers alike. Because of this, there has been extensive research in the past three decades on the relationship between small business and employment. The generally accepted, bipartisan perception among most government officials is that small businesses create more private sector jobs than their larger counterparts. This belief has been confirmed by early empirical studies, such as Birch (1981). In his analysis with the MIT Program on Neighborhood and Regional Change, Birch found that 8 out of 10 jobs in the 1970s were created by small businesses (or by his definition, businesses with fewer than 100 employees). This short study was the catalyst for the many discussions happening in Washington, D.C. and around the nation today. However, many other studies have been done in recent years that debate the conclusions drawn by Birch.

Davis et al. (1996) argued against Birch and claimed that his conclusions were flawed. Using U.S. Census Bureau data for manufacturing plants from 1972 to 1988, they found that "large firms and plants dominate the creation and destruction of jobs in the U.S. manufacturing sector." In general, they determined that there was no relationship between establishment size and net job creation. In addition, they claimed that popular beliefs about small business and job creation were the result of common fallacies, and not addressing the difference between net and gross job creation. In this paper, they go further by saying that any economic policy decisions made based on previous studies were misguided, not only because of the basis on which the decisions were made, but also because the decisions were made without any thoughts on the issues of job quality or marginal responses to proposed policy changes.

Utilizing a new database, Neumark et al. (2008) sought to revisit the debacle over small businesses' roles in jobs creation. With business and employment data dating back to 1992 through 2004 from the National Establishment Time Series in haul, they conduct two separate analyses: one that divides businesses into classes based on size and that follows the methods of Davis et al. (1996) to bypass the regression fallacy; and another nonparametric method that does not contain size classes. From both, they conclude that "small firms and small establishments create more jobs, on net, although the difference is much smaller than what is suggested by Birch's methods." In direct contrast to Davis et al. (1996), they also deem the relationship between establishment size and job creation to be negative in the manufacturing industry.

Contrary to most studies that came before, Haltiwanger et al (2011) introduces a new variable into their regression: firm age. They find that when controlling for firm age, the negative relationship between firm size and job creation disappears and is replaced by no significant relationship between the two. Moreover, they highlight the paramount role that young firms play in job creation and economic growth in the United States. In their paper, Haltiwanger et al. suggest refocusing the policy debate about how to encourage private sector job creation. Their findings suggest that "policies targeting firms based on size without taking [into] account the role [of] firm age are unlikely to have the desired impact on overall job creation."

In our study, we seek to further investigate this question of who creates jobs by extending the analysis to a state-by-state and industry-by-industry level. In this period of slowed economic growth, we are seeking to uncover whatever relationships we can in an effort to contribute to the stimulation of short-run growth. Because of this, contrary to most of our predecessors, we will be conducting a cross-sectional analysis over all fifty states in the United States. However, because we lack industry level data on firm age, entry, and exit, we are not able to test our hypothesis using a model similar to that used by Haltiwanger et al. (2011). Nonetheless, we are able to use a model similar to that of Neumark et al. (2008). With this paper, we hope to contribute meaningfully to the lasting debate over who is really responsible for job creation – the big or the small?

III. Data

The focus here is on identifying whether or not small firms have a significant impact on regional unemployment rates, and if so determining specifically which industries are in general most significant. The simplest model would simply be a regression of the proportion of small firms in a regional economy against the unemployment rate. However, as expected, such a model would possess little to no explanatory power. Controlling for the additional contributing factors to the unemployment rate is necessary in order to grant this model a significant level of explanatory power and meaning.

To this end, the main factors identified by this model as major contributors to the unemployment rate are the GDP per industry per state, education levels per state, government employment by state, and eight regional dummy variables to allow for a more succinct classification of regional diversification. The purpose of these variables is to isolate the effects of small businesses and industries in specific regions. Since regional economic data varies greatly, all of the variables we included provide additional state level analysis.

The metric GDP per capita per state provides an image of the overall state of the economy at the time. Although it does not provide insights into changes in economic conditions it controls for differences between regional economies that might be affecting the overall unemployment levels. If in the state of Washington there is a lower overall level of unemployment than in Arkansas, this metric will account for the differences caused by differences in GDP. When the regression analysis is done on an industry-by-industry basis, the metric will instead control for differences between state industries. Since the conditions of the economy are a much more important source of unemployment than the ration of large to small firms, this was an essential factor to include in the final regression analysis.

Another essential part of determining regional unemployment rates is the overall education level by state. In this case, since education is highly correlated with employment in certain industries, it was necessary to control for regional education levels since we are seeking to identify which industries contribute meaningfully to the unemployment rate through small firms. Some industries, such as information, which contributes significantly to GDP with minimal employment, require a high level of education. As a result, smaller firms in the information industries will require higher education levels, whereas small firms in the food and accommodation industries may not. As with the GDP, this metric is broken down on the state level to provide an adequate regional analysis.

The inclusion of government employment per state was necessary in order to control for private sector influences on the unemployment rate. The size of the public sector employment is the only sector not controlled for in the model. Since the unemployment data per state reflects the conditions of the total state economy, but likewise since our data on the proportion of small firms in the economy is strictly private sector data, it was deemed necessary to control for public sector employment as well.

Finally, in order to simplify the final analysis, all of the states were grouped into eight distinct geographical regions, in order to provide a better overview of region specific influences on the unemployment rate. The goal is to capture the differences in regional economies based on the industry types that happen to be present in the region. For this model, the regions will serve as dummy variable classifications.

The construction of the model itself relies on data taken from the US Census Bureau and the US Bureau of Labor statistics. Consequently, the study also uses the standards defined by the Census Bureau. When referring to small firms, it is understood that they employ fewer than 500 employees and thus large firms would employ more than 500 employees. Industry category is defined by the standard NAICS codes and the industries under examination by this model are presented in Table 1. The

regression will be applied to each industry separately. It should also be noted that due to incomplete data source for the most recent years, the study has been conducted entirely using cross section data from the year 2010. With the specifics of the variables defined, the model is presented as:

(1) $$U = \beta_0 + \beta_1 smfir + \beta_2 gdp + \beta_3 edu + \beta_4 lgov + \delta_i reg + u$$

Our dependent variable, *U*, is defined as the unemployment rate, or the number of unemployed persons in each industry per state divided by the total labor force of each industry per state. We regress *U* on *smfir,* the proportion of small firms per industry per state; *gdp,* the gross domestic product per industry per state per capita; *edu,* the percent of the population in each state with a Bachelor's degree or higher; *gov,* the logarithm of public sector employment per state, and 8 regional dummy variables denoted as *reg*.

Table 1. NAICS Description

NAICS Number	Description
72	Accommodation and food services
56	Administrative and support and waste management and remediation services
11	Agriculture, forestry, fishing and hunting
71	Arts, entertainment, and recreation
23	Construction
61	Educational services
52	Finance and insurance
62	Health care and social assistance
51	Information
55	Management of companies and enterprises
31-33	Manufacturing
21	Mining, quarrying, and oil and gas extraction
81	Other services (except public administration)
54	Professional, scientific, and technical services
53	Real estate and rental and leasing
44-45	Retail trade
48-49	Transportation and warehousing
22	Utilities
42	Wholesale trade

A cursory glance at the data reveals no distinct relationship between the number of small businesses and the unemployment rate. Figure 1 in the appendix provides a good overview of this. In this chart, the state unemployment rate is contrasted with the number of small firms in that state. While in most states the ratio of unemployment to small firms is similar, deviations in the unemployment rate are not adequately explained by corresponding changes in the number of small firms. While not perfect, the defects of the visual representation will be resolved by the regression analysis. Examining the entire data set, however, also yields some interesting results.

Table 2. Total Summary Statistics

Variable	Observations	Mean	Std. Deviation
Unemployment Rate	51	.087549	.020128
Proportion of Small Firms	969	.9259276	.0983666
GDP per Industry	969	12959.8	23242.37
Education	51	27.5902	5.503473
Log of Government Employment	969	12.45656	.9294232

The results of the initial statistical overview provide a very standard picture of the data this analysis will be using. The total number of observations for the entire data set eliminates any worry of data limitation or bias due to low degrees of freedom. Even in the industry by industry analysis, the total number of observations will be 51, a large enough sample size to prevent most issues. The values of the means for each of the variables provides little surprise, with the average unemployment rate at approximately 9% across each state and the average ratio of small firms to large firms about 93% across each industry per state. The only noteworthy feature in this table is the standard deviation of GDP per industry, which highlights the incredible diversity across the different industries on a state by state basis.

Table 3. Statistical Correlation Table

Variable	Unemployment	Small Firms	GDP	Education	Gov. Emp.
Unemployment Rate	1.0000	-	-	-	-
Proportion of Small Firms	0.0175	1.0000	-	-	-
GDP per Industry	0.2381	0.1588	1.0000	-	-
Education	-0.0598	-0.0944	0.0877	1.0000	-
Log of Government Employment	0.4639	0.0876	0.5356	0.0855	1.0000

The second element of the descriptive statistics discussion is table 3, which presents a table of correlation values between the primary variables in this model. There are several noteworthy points, the first of which is the incredibly low correlation between unemployment and small firms. As expected from a quick glance at figure 1, there is a very tiny positive relationship between unemployment and

small firms; however the results of the regression analysis will attempt to break this down by industry for a closer analysis. Also interesting, is the relatively higher relationship between the proportion of small firms and GDP per industry, which is to be expected. Also expected is the high correlation between government employment and unemployment and GDP per industry.

In preparation for the regression, the data should be examined to ensure adherence to the standard Gauss-Markov assumptions. As already shown by the equation, the model maintains linear parameters, and the trusted source of the data ensures that it represents a random sample. For the third assumption table 3 outlines the correlation coefficients between the four non-dummy variables. As none of the variables are perfectly correlated, the model maintains the assumption of no perfect collinearity. More pressing is the fourth assumption, for which discussion of excluded variables is necessary. In this case there are undoubtedly numerous omissions from the model, given the complexity of the unemployment rate. However, the focus was on factors that contribute to unemployment, but also correlate with the number of small firms. This model should capture the largest effects on the unemployment rate with the minimal number of additional variables. As a result, the overall explanatory power will be limited. Nevertheless omitted variable bias will inevitably be present in some form; however this model attempts to limit its presence to some degree. In the case of homoscedasticity, figure 1 in the appendix illustrates this. With the exception of a handful of outliers, the variance of most of the data points does not change dramatically as the x values increase. For this data set heteroskedasticity is limited and the assumption of homoscedasticity is maintained.

III. Results

Table 4. Summary of Results

Unemployment Rate			
Independent Variables	Model (1) - Total	Model (2) - Total	Model (3) – By Industry, see Appendix
Small Firms	.003584	-0.0045116	-
GDP per capita	-	2.16e-07***	-
Education	-	-0.0008703***	-
Log of Government Employment	-	.0104164***	-
Southeast		0.0058032***	
Southwest	-	-0.0023526	-
Far West	-	0.0204475***	-
Rockies	-	0.0050137**	-
Plains	-	-0.0162517***	-
Great Lakes	-	0.0128198***	-
New England	-	0.0132571***	-
Mideast Region	-	Omitted	-
Intercept	.0842305	-0.0275478***	-
No. of obs.	969	969	-
Adj. R-square	-0.0007	0.4930	-

*Significant at 10%, **5%, ***1%

An initial glance at the final results of the analysis reveals a result largely in favor of the proposed hypothesis. When the analysis is performed collectively at the national level almost all of the variables controlled for in the model, with the notable exception of small firms, prove to be statistically significant at least the 5% level. In fact the proportion of small firms within the economy does not tribute significantly to the unemployment rate at all. However, this result is somewhat expected, given the low R-squared values of the simple regression and the extensive research already provided on this subject. More important is the industry-by-industry analysis, which breaks down the national level

regression in an attempt to isolate in which industries the proportion of small firms may contribute to the unemployment rate.

From the final results table given in the appendix, the industry analysis largely provides additional evidence to support the proposed hypothesis. In general, the proportion of small firms does not have a statistically significant impact on the unemployment rate in most industries. There are, however, five notable exceptions, where the proportion of small firms contributes in some manner to the unemployment rate: the accommodation and food services, arts, entertainment, and recreation, construction, retail trade and transportation/warehousing industries. The one general factor held in common by almost all of the industry models was a low R-squared value, which in most serves to limit the explanatory power of the model. This can be attributed to the large number of contributing factors to the unemployment metric, all of which we were not capable of including within the model. However, the general significance of these results will depend greatly on what role each of these industries plays within the economy. Even if small firms contribute significantly to employment in the arts and entertainment industry, targeted efforts to increase small firm performance in this industry may not have the desired effect if the industry is taken out of its specific economic context. Targeted policy making should couple the results of this data with more specific industry analysis.

Returning to the results of our industry analysis, a more detailed look into the major exceptions can shed light onto understanding their contribution to the unemployment rate. In the accommodation and food services model, the proportion of small firms contributed to a decrease in the unemployment level at the 1% significance level. Furthermore the explanatory power of the model was approximately 0.46, which ranks high relative to the other industry models. This can likely be explained due to the large prevalence of family or individually owned restaurants. Also included in the small firm category were those restaurants and smaller accommodation services that operate under a franchise. Since a large majority of fast food and hotel chains operate under this model, this likely explains their statically significant contribution to the employment rate.

Likewise with the arts/entertainment and retail industries, the predominance of smaller firms in the market place ensures that their contribution. In the case of the arts and entertainment industry, the number of large firms was notably smaller in comparison to other industries, and as with the food and accommodation industries, small family owned shops and franchises likely contributed significantly to the unemployment rate in the retail industry.

More interesting are the construction and logistical oriented industries, in which small firms contribute significantly to the state unemployment rate. In both cases firms, both large and small tend to employ larger numbers of people, which means employment numbers are due to the general predominance of small firms, which is the case for all industries. In these specific cases promoting small firms would not necessarily lead to a higher level of employment in comparison to large firms.

Table 5. Robustness Tests

Independent Variables	Education and per Capita GDP	Per Capita GDP and Government Employment	Government Employment and Education	Gov't Employment, Per Capita GDP, and Education
F statistic	12.33	145.79	147.74	98.69

The F tests indicate joint significance among the individually significant variables. The very large values for the F statistics indicate that the independent variables have a robust explanatory power in the model. This result seems to suggest that the proportion of small businesses plays a very much inferior role in determining unemployment compared to education, government employment, and GDPper capita.

IV. Conclusions

For most industries, the number of small firms and establishments does not provide a significant explanation of unemployment rates. This conclusion does not hold for the accommodation and food services; arts; entertainment and recreation; construction; retail trade; and transportation/warehousing industries. This general result is not unexpected given previous studies conducted on employment numbers. Likewise, the significant effect of the number of large firms follows the literature. The lack of significance in small and large establishments does provide some interesting insight. The number of small firms and the number of small establishments are almost perfectly correlated. This follows from the nature of small firms. On the other hand, large firms and large establishments have a correlation coefficient of .5607. This also follows that since large firms are more likely to operate multiple

establishments, the number of large firms (but not the number of large establishments) is a significant predictor of unemployment.

There are several reasons that the number of large firms might be more significant than the number of small establishments. Within an industry, small firms are more likely to occupy a market space with smaller economies of scale and thus large establishments would likely employ more workers. However, large firms should be able to better operate all of their many establishments at the most efficient scale. This would seem to suggest that large establishments should have greater significance than the number of small firms.

This also suggests that aggregating so many industries may be obscuring the underlying dynamics. A future study might seek to examine the employment effects of similarly sized establishments owned by small and large firms. Also, if the availability of data suffices, future studies may explore the significance of firm age on an industry-by-industry basis, as this seemed to be a key factor in the literature.

Figure 1: Scatter Plot comparing the proportion of small firms a state to the state's unemployment rate.

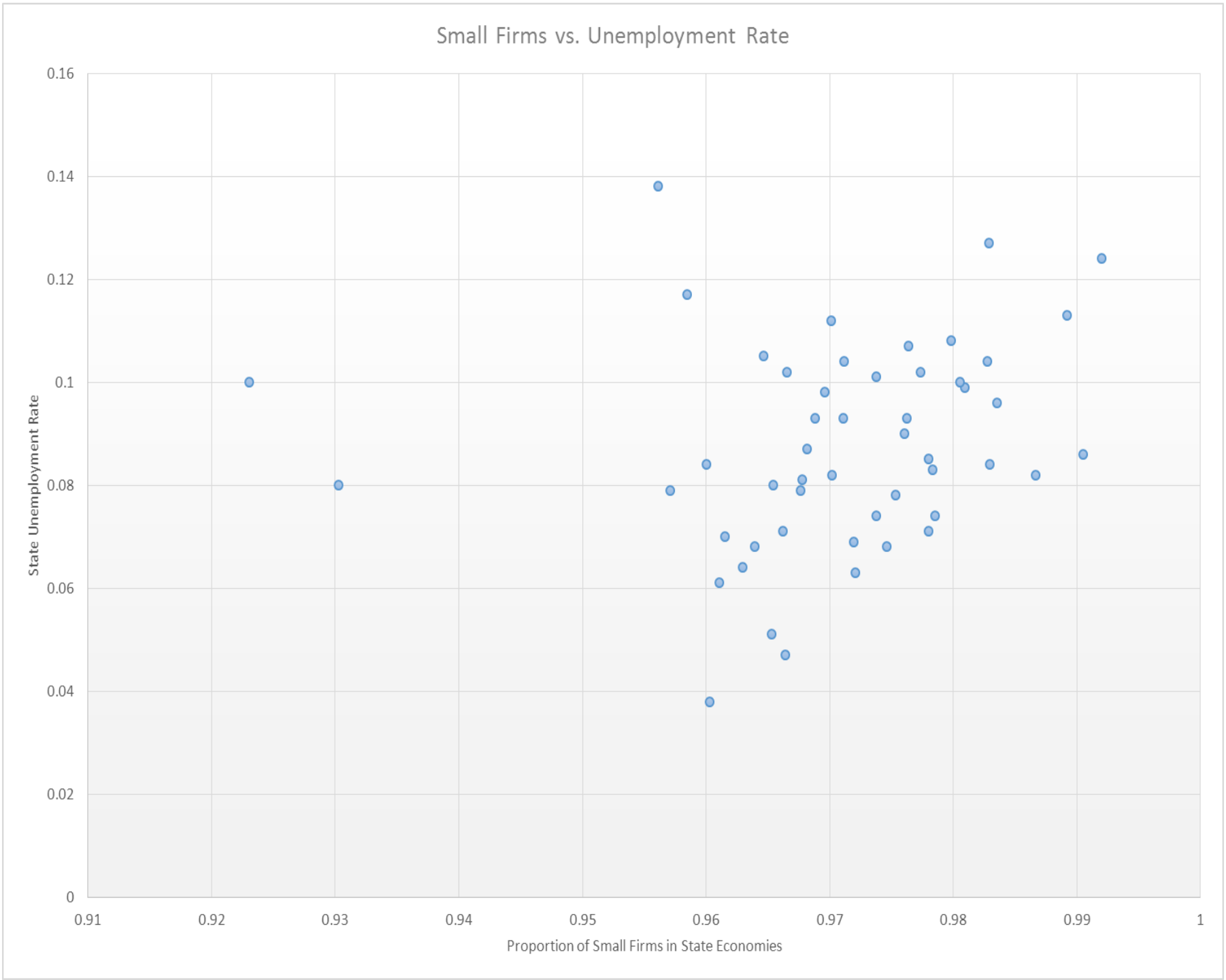

Table 6. Detailed Results

Independent Variables	Accommodation and Food Services	Administrative Services	Agriculture	Arts and Entertainment	Construction	Educational Services	Finance and Insurance	Health Care
Small Firms	-0.7736822***	-0.27443	0.27633	-0.643694**	-1.589593*	-0.32977	-0.23417	-0.63221
GDP per capita	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Education	-0.00060	-0.00070	-0.00091	-0.00119	-0.00059	-0.00049	-0.00107	-0.00069
Log of Government Employment	0.0150149***	. 0146484***	0.0103619***	0.0125519***	.0121407***	.0126169***	.0181191***	.0142645**
Southeast	0.000533**	0.00282	0.00534	0.00366	0.00035	0.00771	0.00560	0.00739
Southwest	-0.00605	-0.00457	-0.00221	-0.00637	-0.00677	0.00046	-0.00221	-0.00050
Far West	0.0220875**	.0230846**	0.01794	0.0198646*	0.01565	.0250882**	.0212425**	.0266013**
Rockies	0.00828	0.00967	0.00442	0.00894	0.00518	0.01007	0.01215	0.01123
Plains	-0.01589	-0.01448	-0.01561	-0.01385	-0.01504	-0.01601	-0.00827	-0.01376
Great Lakes	0.01411	0.01369	0.01387	0.01298	0.01214	0.01416	0.01492	0.01482
New England	0.01812	0.01765	0.01034	0.01805	0.01677	0.01382	0.01504	0.01532
Mideast Region	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
Intercept	0.6688426**	0.18050	-0.30208	0.5862118*	1.53797*	0.25148	0.10477	0.53607
No. of obs.	51.00000	51.00000	51.00000	51.00000	51.00000	51.00000	51.00000	51.00000
Adj. R-square	0.46090	0.37740	0.36350	0.41970	0.41390	0.37980	0.39350	0.37150

Table 7. Detailed Results

Independent Variables	Transport and Warehousing	Utilities	Wholesale Trade	Information	Management of Companies	Manufacturing
Small Firms	-0.3213127***	-0.03033	-0.05802	-0.12750	-0.06558	-0.05223
GDP per capita	0.00000	0.00000	0.00000	0.00000	0.00000	0.00000
Education	0.00091	-0.00100	-0.00077	-0.00094	-0.00129	0.00080
Log of Government Employment	0.0141828***	.0111056***	.012432*	0.0147013**	.0101643***	0.0108637**
Southeast	-0.00296	0.00740	0.00489	0.00207	0.00218	0.00475
Southwest	-0.01067	0.00133	-0.00329	-0.00428	-0.00421	-0.00196
Far West	0. 0157321	.024681**	.0205038*	0.0233362**	.0219006**	0.0215835**
Rockies	0.00735	0.00851	0.00452	0.00814	0.00552	0.00604
Plains	-0.01108	-0.01475	-0.01562	-0.01543	-0.01551	-0.01633
Great Lakes	0.01129	0.01379	0.01295	0.01049	0.01089	0.01330
New England	0.01432	0.01412	0.01372	0.01635	0.01207	0.01431
Mideast Region	Omitted	Omitted	Omitted	Omitted	Omitted	Omitted
Intercept	0.2425226**	-0.00831	-0.00324	0.03290	0.02514	0.00942
No. of obs.	51.00000	51.00000	51.00000	51.00000	51.00000	51.00000
Adj. R-square	0.49150	0.36980	0.35900	0.38410	0.37830	0.35870

Table 8. Detailed Results

Independent Variables	Mining	Other Services	Professional Services	Real Estate	Retail Trade
Small Firms	-0.04565	-1.43259	-0.17199	-0.40965	-0.6057155***
GDP per capita	0.00000	0.00000	0.00000	0.00000	0.00000
Education	-0.00103	-0.00065	-0.00086	-0.00073	-0.00078
Log of Government Employment	.0115329***	.0151877***	.012104**	.0153532***	0.0224137***
Southeast	0.00311	0.00653	0.00536	0.00847	0.00958
Southwest	-0.00248	-0.00429	-0.00258	0.00177	-0.00204
Far West	.0193709*	.0187325*	.0205642*	.0278846**	0.0238342**
Rockies	0.00616	0.00484	0.00674	0.01570	0.01454
Plains	-0.01540	-0.01132	-0.01583	-0.01021	-0.00807
Great Lakes	0.01245	0.01501	0.01271	0.01715	0.0179643*
New England	0.01593	0.01442	0.01415	0.01942	0.021702*
Mideast Region	Omitted	Omitted	Omitted	Omitted	Omitted
Intercept	0.00443	1.32519	0.11735	0.30265	0.4062864**
No. of obs.	51.00000	51.00000	51.00000	51.00000	51.00000
Adj. R-square	0.36620	0.38890	0.35950	0.38530	0.46390

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