Revisiting the Determinants of Small Business Formation

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INTRODUCTION

There have been two notable and important shifts in public policy regarding business over the last decade or so. From a federal perspective, government has become more concerned with promoting the startup of small firms and less preoccupied with constraining the large existing corporations (Gilbert, Audretsch, and McDougall 2004). From the state perspective, policies are now more commonly aimed at fostering small businesses as a source of job growth rather than attracting new branch plants from established businesses (Henderson 2002). Regardless of the level of government, the use of such policies is growing and it would seem important to gain a better understanding of exactly which factors most influence the creation of small businesses and how and to what extent these small businesses contribute to the climate of a state's economy.

Numerous studies and statistics show that a majority of new jobs are created by new startups (e.g. Armstrong and Taylor 2000). New small firms add to both employment and output to boost a state's or region's economic performance.

They also contribute to a more flexible and diversified labor market. Moreover, evidence shows that new small firms stimulate competition with existing businesses and, even more importantly, they stimulate innovation. While innovation-based new small firms may represent a small proportion of startups, they often generate entirely new industries based on their innovations in products or processes, further challenging established businesses to grow and improve. While the magnitude of the contribution has not been established, it is clear that small business activities are important for economic performance. Audretsch and Keilbach (2004), for instance, find that new business creation has a statistically significant positive causal relation in explaining state variation in output in the U.S.

Based on the premise that small businesses contribute to state economic growth, it seems only natural to want to establish the factors that contribute most to the establishment of small businesses within a state. Given the future prospects that states face in terms of tightening budgets, lower federal government assistance, and changing demographics, an analysis of the above factors is of significant importance to all state governments. In this paper we investigate the factors that contribute to small firm startups.

Based on our estimated model of small firm formation rates in 49 states in 2001, we find that five determinants exert significant influence on the rate of new firm formation. Greater industrial diversity, more readily available financing, and larger mean existing establishment sizes are associated with higher rates of firm formation, while higher education levels and larger numbers of hazardous waste sites are associated with lower rates of new firm formation. These relationships are very similar regardless of whether the model uses small- or medium-sized startups as the dependent variable. The most notable result relative to previous studies is the influence of hazardous waste sites on new firm formation. Section 2 provides a review of the literature in this area and how we build upon it. Section 3 presents both the model we employ in our estimation section and a description of the variables. Section 4 presents our estimation results and section 5 provides a conclusion and offers some policy implications.

LITERATURE REVIEW

A wide body of literature from various disciplines provides valuable insight into the determinants of success for small business owners, such as personality characteristics, organizational structures, and management practices. While much of this is not measurable, this has not deterred economists from testing

broader measures of small firm formation. For instance, over the past several years, researchers have been increasingly interested in the regional determinants of new small firm growth. Yet there seems to be little consensus on which factors are most important. This lack of consistent results likely stems from the fact that there are numerous possible independent variables, adding to the difficulty of drawing comparisons between results.

There is one strand of literature, particularly studies on British data, that focuses on self-employment as the measure of small business growth. Georgellis and Wall's 2000 study is an example. They examine self-employment rates across regions in Britain from 1983 to 1993, using numerous explanatory variables to capture four main influences: labor market conditions, labor force characteristics, industry composition, and region-specific effects. They conclude that all four have a significant impact on self-employment rates, especially the labor force characteristics like age, gender, and education level. Johnson (2004) examines regional differences in recent business formation activities in the UK over the period 1994–2001. He considers the extent to which regional differences can be accounted for by variation in industrial structure, with some regions having a larger or small share of sectors where the formation rates tend to be high. He also considers variation across regions in the formation rate in the same sector. He shows that there are wide variations across regions and over time in the relative importance of these two factors.

Another larger thread of literature relies on actual firm birth rates, sometimes weighted by the population or labor force. Armington and Acs (2002) and Lee, Florida, and Acs (2004) use actual firm births per 1,000 residents for 394 Labor Market Areas in the U.S. between 1994 and 1996. Both studies find population growth, income growth, industry density, and human capital to be positively associated with new firm formation, while mean establishment size is negatively related. Sutaria and Hicks (2004) focus on only Texas metropolitan areas and some of their results contradict those of the previous two papers mentioned. They find that population growth and income growth have no significant effect, while mean existing establishment size is positively associated with new firm formation. Sutaria and Hicks also find that greater availability of financial capital is positively associated with new firm formation.

Reynolds, Storey, and Westhead (1995) use actual firm births but they expand the scope of their study to include cross-national comparisons. They examine new firm formation in six countries during the 1980s and conclude that regional

variations within countries are roughly similar. For the United States in particular, they examine 382 regions and find that the statistically significant positive determinants of firm births include population growth, GDP growth, percentage of managers in the work force, unemployment level, dwelling prices, and industry specialization. Local government expenditures and the percentage of workers with higher education were negatively associated with new firm formation.

Many of the studies referenced above employ primarily cross-sectional data in their analysis. This is largely due to the fact that in many instances, new firm formation data and the associated independent variables are not necessarily available over time. While cross-sectional studies still provide valuable insights, some potentially valuable time-series dimensions are lost. Two recent studies employ unique panel datasets that shed light on a number of time-dimensional issues. For instance, in an investigation of Taiwanese new firm formation, Wang (2006) employed a panel dataset covering the period 1986–2001 to test, among other things, the recession-push versus prosperity-pull hypotheses of new firm formation. Using regional unemployment rates as a measure of recession/prosperity, Wang finds a positive relationship between unemployment and new firm formation, supporting the recession-push hypothesis.

Investigating new business formation in West Germany between 1983 and 1997, Fritsch and Falck (2007) find compelling evidence that a region's innovation activities strongly influence new firm formation. Indeed, these authors find a statistically significant, positive relationship between the number of patents issued in a region and subsequent new business ventures.

Our study is similar to those that employ firm births instead of self-employed, because small firm birth data is readily available for the United States. The empirical model (discussed in more detail below) developed in this paper is an attempt to synthesize the strong points of this literature, such as the recession-push versus prosperity-pull hypotheses, and to build upon them. Yet, our study differs from previous ones in two main ways.

First, it includes some notable variables that have not previously been included in the literature on small business start-ups, but which might be expected to affect business start-up decisions. Such determinants are proximity to and size of environmental health hazards, information transmission infrastructure (such as reliable Internet access), and the regional composition of industrial activity and the broader business environment.

Second, this paper updates those studies that focus on the United States' experience, using a cross-section of 2001 data. The popularity of studying new firm formation peaked during the 1980s and has only recently begun to attract significant attention again from economists (Armington and Acs 2002). Therefore, the data in most regional models of new firm formation cover the 1980s and early 1990s. Arguably, the rapid economic expansion and technology boom of the late 1990s changed underlying trends in the national economy, warranting a fresh look at business start-up behavior.

DEVELOPMENT OF ESTIMATED MODEL AND DATA DESCRIPTION

Models of new firm formation rates in the previous literature have used a wide variety of factors to explain differences in small firm formation among regions. Storey (1994), in particular, provides a useful outline of eight general factors that influence the start-up of new firms and the selection of our independent variables is largely consistent with that analysis. We will build upon these factors in developing the estimating equation for this paper. The proposed model expressed in implicit form is given as:

$$NEW_t = f(POPCH_{t-1}, MES_{t-1}, DIV_{t-1}, RPICH_{t-1}, FIN_{t-1}, EDUC_{t-1}, U_{t-1}, CLIM_{t-1}, WEB_{t-1}, ENV_{t-1})$$

These variables are defined and described in more detail below and summarized in Table 2.

The Dependent Variable

The dependent variable, NEW, is the annual total number of new establishments in each state in 2001. These data were collected and reported by the Statistics of U.S. Business (SUSB), a subdivision of the U.S. Census Bureau. At the time of this writing, 2001 was the most recent year for which data were available. We estimate two versions of the model, using two different size categories: small firms (those with fewer than 20 employees in their first year of business) and medium firms (those with 20–99 employees in their first year). The respective variable names used to designate these categories are NEW_SM and NEW_MD. Of the total new firm establishments in 2001, 77.3% were small firms, according to the categories used for this paper, and an additional 4.3% fell into the medium category.

Table 1
New Firm Formation Rates in 2001

	Total New Firms (small+medium)	New Firms/ 1,000 Employed	New Firms/ 100 Establishments	% Change in Establishments Due to New Firms
California	77,458	6.01	11.00	13.5
Florida	45,218	7.28	12.10	15.1
New York	42,513	5.78	9.80	11.6
Texas	42,218	5.26	9.98	13.0
Illinois	22,196	4.04	8.07	10.1
Pennsylvania	19,876	3.91	7.40	9.4
New Jersey	19,822	5.59	9.60	11.5
Georgia	18,812	5.40	10.61	13.9
North Carolina	17,547	5.18	9.59	12.3
Ohio	17,374	3.47	7.04	9.1
Michigan	17,307	4.25	8.20	10.3
Washington	15,150	6.68	10.54	12.8
Virginia	14,234	4.90	9.02	11.8
Colorado	14,036	7.34	11.88	14.6
Massachusetts	13,812	4.47	8.78	10.8
Arizona	11,264	5.87	11.20	14.6
Missouri	10,788	4.50	8.24	10.4
Minnesota	10,643	4.44	8.72	10.8
Maryland	10,624	5.16	9.31	11.8
Indiana	10,254	3.87	7.70	10.0
Tennessee	9,910	4.15	8.31	11.1
Wisconsin	9,475	3.92	7.49	9.3
Oregon	9,097	6.71	10.25	12.5
South Carolina	8,148	5.09	9.32	12.0
Louisiana	7,781	4.89	8.46	10.8
Alabama	7,684	4.65	8.43	10.9
Oklahoma	7,118	5.93	9.29	11.6
Kentucky	6,637	4.39	8.10	10.5
Connecticut	6,206	4.01	7.45	9.1
Utah	5,974	6.52	12.52	15.9
Kansas	5,780	5.12	8.57	10.8
Nevada	5,450	6.04	13.13	17.1
Arkansas	5,329	5.38	9.42	11.8

(continued on following page)

	Total New Firms (small+medium)	New Firms/ 1,000 Employed	New Firms/ 100 Establishments	% Change in Establishments Due to New Firms
Iowa	5,109	4.04	6.96	8.7
Mississippi	4,730	4.94	8.72	11.2
Nebraska	3,737	4.98	8.40	10.4
New Mexico	3,721	6.78	9.72	12.3
Idaho	3,720	8.25	11.48	13.8
Maine	3,204	6.52	9.36	11.2
Montana	2,903	9.80	10.55	12.3
New Hampshire	2,884	5.28	8.65	10.6
West Virginia	2,721	4.88	7.23	9.2
Hawaii	2,380	5.51	8.77	11.0
Delaware	2,091	5.54	9.94	12.9
Rhode Island	2,050	4.94	8.05	9.6
South Dakota	1,885	6.15	8.92	10.7
Wyoming	1,669	9.57	10.51	12.4
Alaska	1,545	7.55	10.10	12.1
Vermont	1,516	5.98	7.91	9.2
North Dakota	1,319	5.17	7.26	8.8

Source: Statistics of U.S. Business

Table 1 lists the fifty states in order by total new firms in 2001 (after summing the small and medium totals). For comparison, Table 1 also lists two proportions: new firms per 1,000 people employed and new firms per 100 existing establishments. The final column in Table 1 shows the percentage increase in small and medium establishments due to new firm births in 2001 (this does not take firm deaths into account).

Noting the differences between the total new firms and the proportions of new firms, the question may arise here as to why the total was used instead of a proportion. There are several reasons. For one, there does not seem to be a general consensus in the literature on which is the more appropriate measure to use; however, the more recent studies utilize the total rather than a proportion (Sutaria and Hicks 2004; Wall 2004). Secondly, imposing a constant and unitary elasticity between the dependent variable and a scale variable may be too restrictive. The inclusion of mean existing establishment size and hazardous waste sites per person, explained below, already controls for scale indirectly. Finally, using the total new establishments more precisely links to the overall purpose

of this paper; that is, to target the behavior of new start-ups. Policymakers most commonly seek to increase the total number of establishments, not a proportion based on the number employed or the number of existing establishments.

Independent Variables

The potential determinants of new firm creation are numerous and often intangible, as Malecki (1994) explains. Storey (1994) also points out that the list of factors can be very long, but he summarizes them into the eight general influences listed in Table 2. This list of eight guided the selection of independent variables for this model, to account for all the general influences based on previous research. At least one variable was chosen to represent each category from Storey's list. Table 2 lists the proxy variable(s) used in this analysis next to its corresponding category. The ninth row is added to capture the network effects and knowledge access that have become more important and better understood in recent years. As Armington and Acs (2002) mention, there have been new theoretical developments regarding spatial perspectives, agglomeration, localization, and economic growth that have affected our modeling of new firm formation rates. See Table A.1 in the Appendix for a complete definition of each variable and its source.

Table 2
Potential Determinants of Small Firm Formation Rates

Determinant Group (based on Storey 1994)		Proxy Variable	Expected Sign
(1)	Population and its Characteristics	POPCH	positive
(2)	Industrial Structure	MES	indeterminate
		DIV	negative
(3)	Wealth/Income	RPICH	positive
(4)	Owner-Occupied Housing (proxy for finance)	FIN	positive
(5)	Occupational/Educational Characteristics	EDUC	positive
(6)	Unemployment	U	indeterminate
(7,8)	Government and Policy Initiatives	ENV	negative
		CLIM	negative
[9]	Network Effects/ Access to Knowledge	WEB	positive

Population growth, represented by the variable POPCH, is calculated as the log difference in state population from 1999 to 2000, based on population data available from the Regional Economic Information System (REIS), a subdivision of the Bureau of Economic Analysis. The a priori expectation is that population growth is positively associated with new firm formation, because it is thought that growth stimulates business start-ups (Armstrong and Taylor 2000). An increase in population leads to both an increase in demand for goods and services and an increase in the pool of labor, both of which should encourage the formation of new firms.

Two variables capture the industrial structural characteristics in each state. MES is the mean establishment size in each state in 2000, calculated from SUSB data. Studies have found mixed results for this factor, as mentioned earlier. It is commonly hypothesized that new firm formation is higher in areas where many small firms already exist, because a lower MES indicates an area that has already restructured away from large manufacturing dominance (Armington and Acs 2002). So a higher MES indicates a greater dominance by large firms and therefore may be negatively associated with the dependent variable. Alternatively, large firms may actually play a positive role by purchasing inputs from, and outsourcing work to, small neighboring firms, suggesting a positive relationship between MES and new firm formation (Sutaria and Hicks 2004).

The other variable representing industrial structure in the model is the industrial diversity factor, which has not been examined much in earlier literature. Industry diversity, DIV, is calculated as the Herfindahl index for each state in 2000, defined as $\Sigma(Eis/Es)2$, where Eis/Es is the employment share of industry i in state s. These indexes were calculated from the employment shares for each industry by state over time and the data was provided by County Business Patterns, the Census Bureau's annual report on business activity. A higher Herfindahl index indicates a less industrially diverse state, while a lower index indicates greater industrial diversity. The sign on this variable depends on whether new firms can more easily compete when there is a wider variety of industries amongst which to fill niche markets or whether new firms can more easily compete when they are supporting and benefiting from a few large growth industries. Friedman (1995) is one study that has investigated this relationship. She finds that greater industrial diversity is positively associated with the presence of high-growth small start-ups, but she measures diversity as the standard deviation of the percentages employed within each industry rather than using the Herfindahl index.

RPICH, real per capita income growth, is included to account for the change in wealth and income in each state. It is calculated as the log difference in real per capita income from 1999 to 2000, and it is based on income data from REIS. RPICH is expected to be positively associated with new firm formation. States with higher growth in disposable income have more income available to be spent on the output from new firms, thus increasing demand in a way similar to population growth.

The fourth category in Table 2, owner-occupied housing, represents an earlier trend in this line of research: using the percentage of owner-occupied housing as a determinant of new firm formation. This idea was based on the assumption that the key method of funding a new business is for the small business owner to use his or her home as collateral. Essentially, this category is measuring the availability or access to financing. Instead of using owner-occupied housing, this model relies on the total dollar amount of venture capital financing provided in each state, which we designate by the abbreviation FIN. This data came from the PricewaterhouseCoopers Moneytree Survey, which began collecting data on a quarterly basis in 1995. It is the only industry-endorsed research effort on venture capital investment activity in the U.S. The a priori expectation for this variable is positive, because greater availability of venture capital financing should encourage a higher rate of new business creation. Specifically, FIN is the average dollar amount of venture capital provided in each state over the three-year period prior to 2001. Focusing on venture capital in particular, as opposed to including local funding sources, captures an additional aspect of working with venture capital firms. That is, venture capitalists tend to provide management advice and information sources to the small businesses they finance, an advantage that local banks do not typically provide.

EDUC is included to represent the skill and education level of the labor force in each state. It is measured as the percentage of the state population that has at least a bachelor's degree; these figures come from the U.S. Statistical Abstracts. EDUC is expected to be positively related to new firm formation, as it is generally thought that a state with a higher education level fosters more entrepreneurial growth.

To address the recession-push versus prosperity-pull hypotheses, the state unemployment rate, U, is added as an explanatory variable. Unemployment varies considerably across states and regions so it is important to capture its influence on new firm formation. These data came from the Bureau of Labor Statistics

website. The expectation, consistent with Wang's (2006) findings, is that a high unemployment rate is associated with a high rate of new firm formation, but, of course, it is possible that the prosperity associated with an expansion and low unemployment may foster new business startups to take advantage of market opportunities.

A measure of the environmental conditions in each state, ENV, was added to the model and indirectly reflects the multifaceted role government plays in promoting new business. This variable is an innovation relative to previous literature, so its resulting influence is especially interesting. ENV is the log of the number of hazardous waste sites located in each state in 2000 divided by the 2000 population. These hazardous waste sites are those included on the National Priority List of the Federal Superfund program and the list of sites per state is provided by the Statistical Abstract of the United States. While hazardous waste sites mostly influence the actual location decision, they can also influence the business start-up decision in a couple of ways. For one, a small business owner may think of the long-term future and is less likely to locate their new business, and therefore their family, near hazardous waste sites. Amenities, or "disamenities" in the case of hazardous waste sites, also influence a new firm's ability to attract and retain employees, a key issue for a new start-up's early success (Friedman 1995). In addition, some business owners may view a high number of hazardous waste sites as a potential spillover cost to them in terms of state taxes. Cebula (2005) finds that the number of hazardous waste sites has a highly significant and negative impact on state in-migration rates, further motivating the inclusion of this variable in the model for this paper. It has been documented that potential small business owners do not commonly migrate in order to start their new businesses (see Reynolds 1988), but they are, as Friedman (1995) points out, affected by the migration of potential employees and therefore the presence of environmental hazards may indirectly influence start-up decisions. To our knowledge, a measure of environmental conditions has not been included in any previous literature on new firm formation.

As mentioned, state governments play a multifaceted role in promoting business and one of the most difficult concepts to measure and incorporate into this type of analysis is the policy environment for new business start-ups. Yet this aspect is very important, as certain policy initiatives may be the deciding factor when choosing whether to begin a new venture. It would be very time-consuming to research and compile the various policies for each state, so a published index will be used to measure the business climate for new firms. This variable, CLIM,

is a ranking from 1 to 50 of the public policy environment in each state, with 1 being the most positive toward small business start-ups and 50 being the most hostile or restrictive. This index is compiled annually by the Small Business and Entrepreneurship Council and published on their website each year. It is based on seventeen major government-related or government imposed costs:

- personal income tax
- corporate income tax
- sales tax
- unemployment tax
- electricity costs
- crime rates
- number of bureaucrats
- internet tax
- state minimum wage
- capital gains tax
- property tax
- death tax
- health insurance tax
- workers' compensation costs
- right to work status
- tax limitation status
- gas tax

Table A.2 in the Appendix lists the rankings for 2000. CLIM is expected to be negatively associated with the dependent variable; that is, a low ranking will be associated with a higher rate of new firm creation.

Finally, WEB is included in the model both as a literal measure of Internet access in each state and as a proxy for the availability and application of new technology in general. It is specifically measured as the percentage of zip codes in each state that had at least one provider of high-speed Internet access in 2000. The Federal Communication Commission began reporting this statistic in 1999. This variable has not been analyzed in much of the previous literature on firm formation, but it is of increasing importance to small businesses, as e-commerce continues its rapid growth. High-speed internet access greatly increases the markets available for purchasing inputs and selling outputs. It is also seen as a way to share and gain industry knowledge and expertise, thus allowing for agglomeration effects despite a lack of geographical proximity. Therefore, a higher value of WEB should be positively associated with a higher firm birth rate. Descriptive statistics for these variables are provided in Table 3. More detailed descriptions of the data sources are listed in Table A.1 of the Appendix.

ESTIMATION RESULTS

Consistent with previous literature, ordinary least squares regression analysis is used to model the results for the two size categories. While new firm formation

Table 3
Descriptive Statistics

Variable	Mean	Std. Deviation	Minimum	Maximum
NEW_SM	8.89	0.94	7.28	11.20
NEW_MD	6.00	1.01	4.14	8.45
CLIM	25.59	14.72	1.00	50.00
DIV	947.81	120.60	785.86	1390.57
EDUC	24.98	4.34	15.30	34.60
FIN	17.40	3.43	0.00	22.59
MES	16.88	2.33	10.62	21.23
POPCH	0.01	0.01	0.00	0.04
RPICH	0.03	0.01	0.00	0.07
U	3.91	0.95	2.20	6.69
WEB	74.82	17.63	22.00	100.00
ENV	-12.27	0.70	-14.52	-10.74
N	49			

data is for the year 2001, as noted in the variable descriptions, each independent variable is lagged one year to reflect the reality that business decisions take time and are likely based on the conditions present in the year prior to the actual start-up of the new business. The sample size for all of the models is 49 states due to the fact that North Dakota had zero hazardous waste sites and thus the log of ENV yielded a missing value for that state.

The results are presented in Tables 4 and 5 for small and medium-sized new business establishments respectively. Again, small-sized businesses are those with fewer than 20 employees and medium-sized businesses are those with 20 to 99 employees. Model 1 in Tables 4 and 5 represents the initial analysis.

Before continuing with a discussion of the results, two important econometric issues, multicollinearity and heteroskedasticity, must be addressed. First, analysis revealed a 64% correlation between FIN and MES. When both variables are included in the model, MES is not significant, suggesting that multicollinearity may be an issue. There are a couple of ways to address this problem. The most common is to estimate two additional regressions, dropping FIN as one of the regressors in one equation while keeping MES, and then dropping MES as one of the regressors while keeping FIN. Models 2 and 3 (as reported in Tables 4 and 5) illustrate these results. They indicate that when entered individually both

FIN and MES are statistically significant determinants of both MED_SM and MED_MD.

A second means of addressing this issue is to construct an instrument for one of the two variables by employing the following procedure. First, since it is logical to expect that states with larger businesses on average are more likely to attract the attention of venture capital investors, a simple bivariate regression was estimated using FIN as the dependent variable and MES as the explanatory variable. The residuals from this analysis then capture, called RESID_FIN, by construction, the variation in FIN that is unexplained by MES. So RESID_FIN was substituted for FIN in the original model, and then both MES and RESID_FIN turn out to be statistically significant, positive determinants of small and medium-sized firm births (see Model 4 in Tables 4 and 5).

Second, based on the White residual test, all models, except Model 3, exhibit a heteroskedastic error process. Hence, the models were estimated using the White correction for heteroskedasticity.

Turning attention, then, to the statistical findings, the F-statistic for both models is statistically significant at the 1% level, indicating that the independent variables explain the variation in new small firm establishments reasonably well. The adjusted R-squared values of 63.7 and 71.0 indicate that approximately 60–70% of the variation in new small firm establishments is explained by the variation in the independent included in the estimated model. The percentage of explained variation in the previously mentioned literature ranged widely from 49 to 86%, with the majority falling in the 60% range. Thus, the adjusted R-squared values found here are very similar.

As expected, the number of hazardous waste sites, ENV, has a statistically significant negative impact on new firm formation, indicating a desire to avoid starting a business in locations with a greater number of hazardous waste sites. Focusing on Model 4 results, a 10% increase in the number of hazardous waste sites per person is associated with a 4.7% decrease in small firm formation. For medium-sized start-ups, a 10% increase in hazardous waste sites corresponds to a 5.7% decrease in firm formation.

The statistically significant positive coefficient on the venture capital finance variable, FIN, was also in line with expectations. One would expect that a higher dollar amount of financing would signal a greater availability of capital and therefore motivate more small business startups. Based on the coefficient for

Table 4
Regression Results: New Small Firms as Dependent Variable (Fewer Than 20 Employees)

Independent Variable	Model 1	Model 2	Model 3	Model 4
CLIM	-0.005	0.000	-0.005	-0.005
	(-0.809)	(0.037)	(-0.847)	(-0.809)
DIV	-0.003**	-0.004***	-0.003***	-0.003**
	(-2.645)	(-3.243)	(-2.759)	(-2.645)
EDUC	-0.056**	-0.020	-0.056**	-0.056**
	(-2.088)	(-0.594)	(-2.192)	(-2.088)
FIN	0.174**		0.178***	
	(2.405)		(3.380)	
RESID_FIN				0.174**
				(2.405)
MES	0.008	0.192***		0.200***
	(0.109)	(3.734)		(3.543)
POPCH	-14.053	-2.914	-14.223	-14.053
	(-1.114)	(-0.196)	(-1.183)	(-1.114)
RPICH	3.268	4.945	3.092	3.268
	(0.378)	(0.480)	(0.366)	(0.378)
U	-0.029	0.110	-0.034	-0.029
	(-0.321)	(0.890)	(-0.401)	(-0.321)
WEB	0.008	0.010	0.008	0.008
	(1.278)	(1.461)	(1.285)	(1.278)
ENV	-0.473**	-0.353*	-0.481**	-0.473**
	(-2.258)	(-1.997)	(-2.674)	(-2.258)
C	3.609	3.994	3.606	3.335
	(1.182)	(1.378)	(1.207)	(1.079)
N = 49				
Adjusted R-squared	*0.64*	*0.50*	*0.65*	*0.64*
F-statistic	*9.42*	*6.29*	*10.73*	*9.42*

*** *indicates significance at the 1% level*
** *indicates significance at the 5% level*
* *indicates significance at the 10% level*

FIN, a 10% increase in the dollar amount of venture capital financing provided is associated with a nearly 2% increase in both small and medium firm formation.

Table 5
Regression Results: New Medium Firms as Dependent Variable (20 to 99 Employees)

Independent Variable	Model 1	Model 2	Model 3	Model 4
CLIM	-0.005 (-0.897)	0.000 (0.027)	-0.006 (-1.050)	-0.005 (-0.897)
DIV	-0.003*** (-3.005)	-0.004*** (-3.506)	-0.003*** (-2.988)	-0.003*** (-3.005)
EDUC	-0.072*** (-3.123)	-0.036 (-1.103)	-0.078*** (-3.441)	-0.072*** (-3.123)
FIN	0.176** (2.659)		0.205*** (3.955)	
RESID_FIN				0.176*** (2.659)
MES	0.058 (0.879)	0.244*** (4.904)		0.253*** (4.865)
POPCH	-22.143* (-1.943)	-10.837 (-0.750)	-23.421** (-2.188)	-22.143* (-1.943)
RPICH	4.549 (0.522)	6.251 (0.624)	3.223 (0.381)	4.549 (0.522)
U	-0.047 (-0.524)	0.094 (0.784)	-0.085 (-1.036)	-0.047 (-0.524)
WEB	0.005 (0.936)	0.008 (1.137)	0.006 (1.059)	0.005 (0.936)
ENV	-0.569*** (-2.756)	-0.447** (-2.603)	-0.625*** (-3.696)	-0.569*** (-2.756)
C	-0.464 (-0.154)	-0.074 (-0.026)	-0.484 (-0.170)	-0.743 (-0.243)
N = 49				
Adjusted R-squared	*0.71*	*0.58*	*0.71*	*0.71*
F-statistic	*12.76*	*8.48*	*14.11*	*12.76*

*** *indicates significance at the 1% level*
** *indicates significance at the 5% level*
* *indicates significance at the 10% level*

The significant negative coefficient for education level, EDUC, appears to be counterintuitive at first, but makes more sense when considering that certain industries, especially manufacturers, rely on a large, less-educated workforce

(Lee, Florida, and Acs 2004). The small business owner might need a college education to have the knowledge and expertise to form a new business, but the presence of lower-educated, and therefore cheaper, labor inputs may have more influence on the start-up decision. Reynolds, Storey, and Westhead (1995) also found that higher education levels were negatively associated with new firm formation.

Recall that the a priori expectation for industrial diversity, DIV, was ambiguous. Reynolds, Storey, and Westhead (1995) found higher firm formation rates to be associated with industry specialization, but Friedman (1995) found new firms to be associated with diversity rather than specialization. In this model, DIV turns out to be a statistically significant negative determinant of new firm formation. Noting that a higher Herfindahl index value indicates industrial specialization, which appears to be associated with lower firm formation rates. Greater diversity promotes new small firm formation and new medium firm formation according to the results of these models, and this is consistent with the findings of Friedman (1995). New small firms probably find it easier to compete when they can exploit niche markets and serve a wide variety of industries. In an industrially concentrated state, a new firm may be unable to either compete with a large number of existing businesses in the same industry or to overcome barriers to entry.

As with industrial diversity, recall that the a priori expectation for mean existing establishment size, MES, was indeterminate. This estimation indicates that MES has a statistically significant positive impact on new firm formation after adjusting the model for the multicollinearity between FIN and MES. This finding is consistent with Sutaria and Hicks (2004) and as they interpreted it, this means that new firms benefit in some way from the presence of larger firms in the area. In general, the presence of large firms likely offers a more stable environment in which new firms can prosper.

The above results describe the models for both size categories examined. The only difference in significant determinants between the two models is that population change, POPCH, is statistically significant and negative in the model of medium firm formation rates. Although this result is not common in the literature, only 4.3% of new firm births fall into the medium category, so it is possible that migrants to a state are moving there either to take a job with an existing business or they are starting a smaller business. Other than this variable, there was very little difference between the determinants of small and medium

firm formation rates, so it did not yield any insights. Because the vast majority of new firms are in the small category, more emphasis should be placed on those results.

It is interesting to examine why some of the variables actually turned out to be insignificant. Growth in real personal per capita income, RPICH, was insignificant; Armington and Acs (2002) suggest that this is because personal wealth is relatively less important today in starting new firms. Sutaria and Hicks (2004) further rationalize that supply chains, especially in the manufacturing industry, and markets in general are increasingly global, so it is understandable why local income is less important to new firms.

Contrary to Wang (2006), unemployment, U, was also insignificant, most likely because of countervailing influences (which are difficult to isolate in cross-sectional analysis) canceling each other out. While high unemployment may push some to start new ventures due to the ease of hiring labor, it may deter others who view it as a greater risk and a cause of lower demand for output. The insignificance of the business climate variable, CLIM, may also be a result of opposite influences. A state with a very friendly business climate may also have a very highly competitive environment, in which it would be difficult for new firms to compete. It is also possible that the measure of business climate used was too highly aggregated and a more narrow measure of the state tax structures might have yielded better results.

Finally, it was somewhat unexpected that high-speed internet access, WEB, did not have a significant impact on new firm formation rates, given all the talk about the "new economy" and how important technology and access to information are in business today. It is not easily explained why this measure of internet access failed to show an influence on business start-ups. Perhaps a different definition of internet access (other than high-speed only) would have yielded different results. Separate regressions for different industries might have provided more insight, since certain service industries may rely heavily on internet access while other manufacturing industries may not be affected by a lack of high-speed internet access.

CONCLUSIONS AND POLICY IMPLICATIONS

The objective of this paper is to learn which regional economic and socioeconomic characteristics most strongly influence new firm formation. Based on a

model of the small firm formation rates in 49 states in 2001, five characteristics are significantly associated with higher small firm formation rates: greater industrial diversity, lower education levels, greater availability of financing, larger average size of existing establishments, and fewer environmental hazardous waste sites.

As far as policy implications are concerned, the positive relationship between industrial diversity and small firm formation suggests that a state or region should be open to and encouraging of the development of all industries, not just their primary industry of expertise. This may seem to contradict the large literature on spatial agglomeration and spillover benefits among like industries, but it could be due to the larger geographic unit of observation. That is, while firms in the same industry and city may benefit from agglomeration and this contributes to growth, firms within the larger regional context may grow and prosper better when there is greater diversity and a wider variety of industries with which to do business. Basically, this relationship should be a caution to policymakers not to put all of their eggs in one basket, if they tend to believe that if their state has one particularly profitable industry, they should focus their efforts and resources on developing new firms within that industry. This research suggests that such industrial concentration may actually hinder the start-up of small firms.

Second, the negative relationship between education and new firm formation is also complex and certainly does not mean that states should stop encouraging higher education levels. One way to translate this result into policy might be to promote small business development at an earlier age and at lower education levels. For example, educational seminars on business formation for high school students may be more beneficial for overall growth than such seminars at the college level. In addition, the process of awarding state aid and grants to new businesses should not discriminate against those without college degrees. Literature from other disciplines on the personality characteristics of small business owners would tie in well with this discussion.

Third, the positive coefficient on the availability of venture capital financing is very logical and expected, and this result is the simplest to translate into policy. Small business owners are more likely to start up new businesses when they believe capital is more readily available. States can contribute their own resources, streamline application processes, or offer incentives to venture capital providers to increase the availability of financing.

Fourth, while mean existing establishment size is positively associated with new firm formation, it does not mean that a state must have a high number of very large businesses. Rather it indicates that the potentially beneficial relationships between the existing large businesses and the new start-ups should be fostered. Policymakers could increase awareness among larger businesses of the potential benefits of their interactions with small start-ups. For example, one such benefit may be that small start-ups are lower-cost suppliers of intermediate inputs (Sutaria and Hicks, 2004). A mentoring program of sorts could encourage small business formation and the larger businesses themselves would eventually benefit from the overall growth in their state's economy.

Finally, the negative relationship found between hazardous waste sites and new firm formation should further motivate policymakers to minimize the prevalence of environmental risks in their states. Besides the health and safety reasons, a cleaner environment is a signal of long-term viability for businesses and individuals. Cleaning up polluted neighborhoods and revitalizing old contaminated industrial areas provides new business locales for business start-ups. This trend is already popular and should be continued, according to the results of this research. As discussed at the beginning of this paper, small business contributes to regional economic growth in various important ways and therefore policies to encourage new firm formation are warranted.

The possibilities for future research on this topic are numerous and varied. The obvious direction for further research is to study panel data over time. The main limitation of this study is that it uses 2001 data only, for reasons mentioned earlier. This makes it difficult to compare it to studies that span different decades. Another appealing topic for future research would be an analysis of the cost-effectiveness of the various suggested policies for promoting new business start-ups. Also, further investigation as to the nature of the link between environmental (dis)amenities would be valuable. For instance, our analysis does not shed light on which types of new small business startups (for example, service versus manufacturing) are likely to be sensitive to environmental attributes. We leave these issues for future research.

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APPENDIX
Table A.1
Data Descriptions and Sources for Table 3

Variable	Description	Source
NEW_SM	Annual new firm establishments (log form).	Statistics of U.S. Businesses www.census.gov/csd/susb/susb.htm
NEW_MD	SM (small) = 1–19 employees MD (medium) = 20–99 employees	
CLIM	Annual rankings of state policy climate for small business and entrepreneurship (lag=1). Index based on 17 major government-related costs: personal income tax, capital gains tax, corporate income tax, property tax, sales tax, death tax, unemployment tax, health insurance tax, electricity costs, workers' compensation costs, crime rates, right to work status, number of bureaucrats, tax limitation status, Internet tax, gas tax, and state minimum wage.	Small Business and Entrepreneurship Council www.sbsc.org/LatestNews_Action.asp?FormMode=Releases&ID=195
DIV	Industrial diversity in a state (lag=1). Measured as the Herfindahl Index.	County Business Patterns www.census.gov/epcd/cbp/view/cbpview.html
EDUC	Percentage of state population with at least a bachelor's degree (lag=1).	U.S. Census Bureau, Statistical Abstract of the United States.
FIN	Dollar amount of venture capital financing provided in a state (average of lag=1, lag=2, and lag=3; log form). Sum of venture capital provided during "seed" stage (<18 months) and "early" stage (< 3 years).	PricewaterhouseCoopers Moneytree Survey www.pwcmoneytree.com/moneytree/index.jsp
MES	Mean establishment size (lag=1). Calculated as employment divided by total establishments.	Statistics of U.S. Businesses www.census.gov/csd/susb/susb.htm

Variable	Description	Source
POPCH	Rate of population growth in a state (lag=1). Change calculated as log difference in annual population.	Regional Economic Information System www.bea.doc.gov/bea/regional/reis/
RPICH	Change in state real per capita personal income (lag=1). Change calculated as log difference in real income. Real income calculated from nominal income using annual CPI based on All Urban Consumers.	Regional Economic Information System www.bea.doc.gov/bea/regional/reis/ (income) Bureau of Labor Statistics www.bls.gov/cpi/home.htm (CPI)
U	State unemployment rate (lag=1).	Bureau of Labor Statistics www.bls.gov/sae/home.htm
WEB	Percentage of zip codes in a state with at least one provider of high-speed Internet access (lag=1).	Federal Communication Commission www.fcc.gov/web/iatd/comp.html
ENV	Number of hazardous waste sites on National Priority List in each state (lag=1). Calculated as number of sites divided by state population (log form).	U.S. Census Bureau, Statistical Abstract of the United States.