Determinants of Entrepreneurship and Small Business Activity: A Two-Stage Regression Analysis (VERY DRAFT)

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I. Abstract

We developed a theoretical model of state-level entrepreneurship activity, as measured independently by firm creation, patent applications and presence of 500Inc. firms. We estimated the roles of innovations, financial capital, state resources and entrepreneurial climate. The empirical results suggest all of these factors are important in explaining some measure of entrepreneurial activity. Most importantly, we find that there is no single set of variables most important in explaining the three different measures of entrepreneurial activity used in this analysis, that is, with the exception of entrepreneurial climate. The parameter estimate for entrepreneurial climate was significantly different from zero for all the measures of entrepreneurial activity used.

II. Introduction

A positive relationship exists between entrepreneurship and economic growth; regions and countries with high levels of entrepreneurial activity have experienced high rates of economic growth (Birch, Haggerty & Parsons, 1999; Goetz and Freshwater, 2001; Lee, Florida and Acs, 2004; Lou, Henderson and Weiler, 2005). Entrepreneurial activity explains between one-third and one-half of differences in GDP growth between countries (Reynolds, Hay and Camp, 1999). Entrepreneurship and small business efforts have also been proposed as a means to revitalize rural and economically depressed economies through localized job and wealth creation (Henderson, 2002; Berkowitz and Dejong, 2001).

According to the Small Business and Entrepreneurship Council (2005), businesses with fewer than 500 employees account accounts for 99.7 percent of all employer firms, employ half of all private sector employees, and pay 45 percent of U.S. private payroll. These firms produce more than 50 percent of non-farm private GDP. Over the past ten years, small businesses created between 60 percent and 80 percent of net new jobs in the economy. Small employer firms also continue to play a big part in the international market as 97 percent of U.S. exporters are small firms, and account for 26 percent of export value (FY2002). Small businesses generate 13 to 14 times more patents per employee than larger patenting firms and small firms also produce twice as many product innovations per employee than large businesses. Non-employers firms (those without paid employees) accounted for more than 70 percent of all businesses in 2003, and registered receipts of $830 billion in 2003, up from $586 billion in 1997. There were 18.6 million non-employer firms in 2003, which was up by about 1 million versus 2002 - a 5.7 percent increase.

For metropolitan and non-metropolitan areas alike, investment in entrepreneurial talents presents a relatively low-cost and economically cost-efficient economic development strategy as opposed to the more conventional and costly external recruitment strategies previously pursued by many states (Dabson, 2002). To the extent that this strategy is a bottom-up approach, involving key stakeholders in the state's economy (people who stay and invest in the state are less likely to migrate), makes it economically sustainable and a

more long-term investment strategy than other recruitment strategies with potentially higher pay offs.

Much innovation exists throughout the US but states vary greatly in their levels of entrepreneurship as well as their ability to harness and bring these businesses to scale through asset building and economic opportunity strategies. Several concepts of entrepreneurship have emerged in the literature, focusing on the ability to amass the necessary resources to exploit new business opportunities for arbitrage and profit, but there are no precise theories of how entrepreneurial activity takes place. Theories of entrepreneurship have evolved from emphasis on individual characteristics to emphasis on individual characteristics supported by public policy. Central to the basic tenet of the early American model of Entrepreneurship is 'individualism', innovativeness, 'risk-taking' propensity and need for achievement, and the early models of entrepreneurship promoted entrepreneurial activity independent of public policy. Recent researchers have argued that favorable 'public policy' can do much to encourage or discourage the entrepreneurial spirit. The debate as to whether public policy at the state and local government levels can be used to effectively spur 'individual risk-taking' as a means of stimulating economic growth is still ongoing.

Previous researchers have determined the state's supply of entrepreneurship to be dependent on several key ingredients. Armington and Acs, 2002; Goetz and Freshwater. 2001; Lee et. al., 2004; Low et. al., 2005; and Ovaska and Sobel, 2006 have found regional variations in new firm formation to

be associated with factors such as population, industrial structure, human, capital, financial capital, entrepreneurial characteristics and levels of innovations. Recent studies have argued that entrepreneurship is positively associated with 'friendly entrepreneurial climates' that act as 'incubators' and promote diversity and creativity (Lee et. al., 2004; Goetz and Freshwater, 2001; and Garrett and Wall, 2005.) Conditions within each state such as government-imposed or government-related costs, or specific conditions such as crime rates, may impact the extent to which states can realize the full potential of their entrepreneurial ingredients. Studies dealing with the impact of taxes on a state's or region's entrepreneurial climate have largely focused their analyses on industrial recruitment, that is, the impact of these taxes and other regulatory burdens on attracting businesses locating from outside the business.

This study adds builds on this line of thinking in that it incorporates a measure of state-level entrepreneurial climate in explaining the determinants of entrepreneurship and small business activity. Before proceeding, we should note that previous studies on entrepreneurship have used two different definitions of an entrepreneur, both of which are rooted in self-employment. The first definition identifies an entrepreneur as simply a person who undertakes a commercial venture in response to income and population growth. The second definition relates to the Schumpeterian entrepreneur, an innovator who undertakes fundamental change in an economy by developing new products and technologies in pursuit of capitalist profit. Schiller and Crewson (1997), although interested only in Schumpeterian entrepreneurship, proxy for it with self-

employment, arguing that self-employment is a "pragmatic if not compelling index of entrepreneurial creativity" (p. 525). They argued that, while not all of the self-employed are innovators, self-employment and entrepreneurial creativity are highly correlated. Further attempting to bridge the gap between small businesses and innovation, Noteboom (1994) concluded that 10-20% of small business owners are Schumpeterian entrepreneurs. Throughout this paper, we restrict ourselves to simple definition of entrepreneurship, and try to explain regional variations in self-employment. However, as Wall and Georgellis (2000) concluded, "if one agrees with Schiller and Crewson's argument that self-employment is a useful proxy for business innovation, the results are also directly applicable to explaining regional variations in Schumpeterian entrepreneurship" (p.3).

In this analysis, a two-stage regression process is used to investigate the independent effects of innovations, human and financial capital, state infrastructure and entrepreneurial climate on entrepreneurial and small business activity in each of the 50 U.S. states. The first stage identifies state-level factors affecting a states entrepreneurial climate and this resultant variable feeds into the second stage regression. State-specific time series data from 1994-2004 from various sources is used for this analysis. The dependant variable modeled is the state's entrepreneurship and small business activity level. The hypothesis states the level of entrepreneurship and small business activity is a function of five categories of independent variables: ideas and innovations, human capital, financial capital, state resources and entrepreneurial climate. The first-stage

models the state's entrepreneurial climate as a function of the state's tax and regulatory burdens. The second-stage uses the predicted entrepreneurial climate and other variables (innovations, financial and human capital, and state resources) to analyze the state's entrepreneurship and small business activity level. The two-stages are necessary in order to correct for regressor endogeneity in the entrepreneurial regression model.

In general, the results will help isolate state-level determinants of entrepreneurship and small business activity in terms of state characteristics and entrepreneurial climate. This information can be used to help states identify strategies and recommendations for stimulating entrepreneurial and small business activity as a means of promoting rural economic development.

The remainder of the paper is organized as follows. Section II reviews the empirical model and method of analysis. In Section III, we justify the variables used and the sources data for the analysis. Section IV summarizes the preliminary results, and offers discussions and conclusions based on the findings. The paper concludes with some limitations of the study and issues to be addressed in future research.

III. The Empirical Model and Method of Analysis

Our empirical model extends that of Goetz and Freshwater (2001) and Wall and Georgellis (2000) by adding a vector of variables that controls for state-level entrepreneurial climate (a state's tax and regulatory environment). Goetz and Freshwater (2001) suggested the continued search for a measure of

entrepreneurial climate that can be explicitly introduced into the model. The purpose of this study is to identify and isolate the effects of state-level determinants of entrepreneurship and small business activity by including entrepreneurial climate as a contributor. The foundation of the model parallels a simple production function; the output being entrepreneurial activity and the inputs being a mix of different entrepreneurial ingredients. The production model specifies entrepreneurial activity as a linear function of five categories of independent variables: innovations, human and financial capital, state resources and entrepreneurial climate. As in any production model, the residual value may be interpreted as "unexplained variation attributed to unmeasured knowledge or systematic behavior that is not incorporated in the set of exogenous variables", according to Goetz and Freshwater (2001). In this case, the residual may include what these authors refer to as 'soft factors', that is, beyond the general state-level tax and regulatory burdens, what other subtle factors serves to enhance the state-level entrepreneurial climate. For example, Birch, Haggerty and Parsons (1999) suggests that the extent to which entrepreneurs are recognized or engaged in community economic development plans or generally made to feel ' a sense of belonging' can be used as a measure of a state's entrepreneurial climate.

We hypothesize that there are five main categories of ingredients that jointly determines a state's entrepreneurial output (E): innovations (I), human capital (H), financial capital (F), state infrastructure (S) and entrepreneurial climate (EC), and a random error component (ε).

$$E_i = \tau_i + aI_i + bH_t + cF_t + dS_i + eEC_t + \varepsilon_t \qquad (1)$$

E_{it} is the rate of entrepreneurship in state *i*, and *τ, a, b, c, d, and e* are parameters to be estimated. The vector I_i measures the innovations needed to drive the entrepreneurship process. The vector H_t *and* F_t measures the human and financial capital, respectively, necessary to sustain the entrepreneurial process. The vector S_i captures state infrastructure that is needed to complement human and financial capital in helping to translate innovative ideas into tangible products and services. The state-level policy environment is captured by the vector of policy variables, $\boldsymbol{EC}_i$. This vector of variables jointly determine the efficiency of the entrepreneurial process, that is, whether the state's entrepreneurial climate supports or stifles the entrepreneurial process in living up to the full entrepreneurial potential commensurate with the level of other entrepreneurial inputs.

To derive the impact of entrepreneurial climate on rate of entrepreneurship, a 2-stage approach was used to control for the interdependence of the factors affecting entrepreneurial climate and, subsequently, rate of entrepreneurship. The first stage of the analysis calculates the rate of business terminations by modeling rate of business terminations as a function of tax burdens, energy costs and crime rate per state, and includes a total of eight variables.

$$T_i = \mu_i + fPT_i + gIIT_i + hCT_i + iDGT_i + jUT_i + kWC_i + lEC_i + mCR_i + \varepsilon_I \qquad (2)$$

Based on the results of the first-stage regression, the expected rate of business termination is used as a proxy for the state-level entrepreneurial climate in the second-stage.

The second-stage production function can be though of as analogous to estimating a frontier production function (Goetz and Freshwater, 2001), or for simplicity, creating an entrepreneurial 'pie', with the main ingredients being innovations, human and financial capital, and state infrastructure. The vector of policy variables ($\boldsymbol{EC}_i$) can be thought of as the 'temperature inside the oven in which this pie will bake'. If the temperature is favorable, the states may be able to increase the size of their 'entrepreneurial pie', that is, the entrepreneurial output from the given ingredients/inputs. Unfavorable temperatures reduce the size of the entrepreneurial pie, or prevent states from achieving their full entrepreneurial potential. If however, the temperature is 'ideal', states will be closer to reaching their full production possibility from their total inputs.

>Table 1 about here<

IV. Justification of variables:

We define the dependant variables in terms of three different measures (500 Inc. Companies, Number of New Firm Start-Ups, and the Number of Patents Issued per State) (See Table 1). We exclude farming operations, as do previous researchers, on the basis that the decision to become a farm proprietor is influenced by different factors than the decision to become a non-farm proprietor. The first measure, 500 Inc. firms per state provides an idea of

entrepreneurial dynamism and highlights entrepreneurial firms with significant potential for growth. Another measure alternatively used as the dependent variable is number of new firm start-ups per state. New company formation is one of the principal ways most researchers measure entrepreneurial energy. The last alternative measure for the dependent variable is number of patents issued per one million people in each state. This measure aims to capture the rate of innovation in a state. It is imperfect in that patents generally are issued at the location of the company headquarters, not necessarily at the location of the lab where the innovation is developed. We have included several measures here since each measures a different dimension of entrepreneurial activity. For example, new firm start-ups tends to measure the start-up of all new businesses, while patent activity is reflective of high-tech entrepreneurial growth generally undertaken by larger firms, and the presence of Inc. 500 firms represent high revenue-growth activity.

The dependent variables, their definitions and sources are given in Table 2. Among the variables representing the degree of innovation per state, we include SBIR (Small Business Innovative Research) grants, patents issued, University spin-outs and number of business incubators per state. In terms of SBIR grants awarded, study after study reveals that small businesses drive innovation and are more efficient innovators than large firms. The federal government recognizes the importance of small business in overall industrial research and development by requiring that all federal agencies with annual research and development budgets of over $100 million set aside 1.25 percent of

these funds to assist small businesses. The level of Small Business Innovation Research (SBIR) grants in a state indicates the state's level of technological sophistication. The number of patents issued and the number of university spin-outs measures capture both the innovative capacity of universities and how well they support the development of commercial resources. The number of business incubators per state provides a measure of the Universities' commitment to entrepreneurial development.

>Table 2 about here<

The variables in the category of human capital include college attainment and racial diversity. In today's economy, knowledge is itself a traded commodity; the higher the percentage of college-educated individuals in the population, the greater the capacity of the state's economy to compete. Previous research have found significant and positive effects of immigrants on new firm formation (Kirchhoff et. al.' 2002; and Saxenian, 1999). The share of foreign-born individuals as well as higher levels of educational attainments is positively associated with a region's entrepreneurial dynamics.

The variables representing financial capital include venture capital investments, SBIC (Small Business Investment Companies) loans and private loans. Venture capital firms provide early-stage capital for businesses with high growth potential and, as a consequence, can be instrumental in the formation and expansion of growth industries. Active venture capital is an indicator of a rapidly developing economy and multiple investment opportunities. It is useful to note that although the venture capital industry has grown sharply in recent years,

it is still quite small and is focused in only a handful of states. The amount of venture capital investments made in a state is adjusted by the state's employment. Most states boast a number of public or nonprofit business investment or loan funds. SBICs are federally licensed investment companies that target financing to economically and socially disadvantaged entrepreneurs. Small businesses make a great contribution to their state's economy—employing over half of its workforce (on average) and leading the way in new job growth, innovation, and productivity. For these businesses to prosper, they must have adequate access to credit from financial institutions. Private loans capture the extent to which commercial bank branches within each state provide loans to these companies and have a positive effect on small business formation rates.

The variables representing state resources comprise highway deficiency, digital infrastructure, population density and per capita income. Income per capita controls for the impact of wealth on entrepreneurial activity; higher incomes will lead to new firm formation by providing additional capital resources to start new firms, or will provide the demand that drives new firm formation. Population density has a similar effect in generating demand for product and services of entrepreneurs. Both variables are predicted to have positive coefficients. Deficient highways are predicted to be negatively correlated with entrepreneurial activity and the opposite is expected for higher investments in digital infrastructure.

Variables impacting entrepreneurial climate are included in the analysis with the recognition that entrepreneurship is not a strict function of the

individual's characteristics. Property and gift taxes, individual and corporate incomes taxes, crime rate and energy costs per state taken together create an environment that dictates the rate of entrepreneurship. The higher the crime rate the less safe people are likely to feel and the less likely entrepreneurs are to locate in this area. The rate of serious crimes per 100,000 inhabitants, 2002 Electrical energy continues to increase in importance as economies become more technology-intensive. Energy costs vary substantially from state to state and affect both business and living costs. These variables should have negative coefficients. For the most parts, the effect of personal-income tax rates on entrepreneurship is expected to be negative (a labor-supply effect), although some studies have found positive relationships (the tax-avoidance effect). High corporate-income tax rates reduce future profitability and might dissuade some potential entrepreneurs from becoming unincorporated entrepreneurs, so a negative coefficient is predicted. Workers' compensation costs impact the economy in much the same way as high unemployment tax rates; the cost of labor relative to capital is increased in both instances, and incentives for labor-intensive businesses to flee from higher-tax to lower-tax states are clear. As such, negative coefficients are expected for both variables.

Preliminary Estimation Results and Discussion

Using data on three dimensions of entrepreneurship for 2000-2004, linear regressions corrected for heteroscedasticity, using White's (1980) method, was conducted and is reported in Tables 3 and 4. Following the efforts of Wall and

Georgellis (2000), we used Generalized Least Squares for the regressions to handle the possibility of non-spherical error terms. This allows us to correct for within-region heteroskedascity and cross-region correlation. According to Wall and Georgellis (2000), "the latter of these arises where there is cross correlation of regional disturbance terms, due either to spatial autocorrelation or because regions have similar responses to shocks, even if they are not spatially related." [1]

In the first-stage regression, we have used 'rate of firm termination' as a proxy for a state's entrepreneurial climate; states with more 'friendly' entrepreneurial climates will have lower rates of termination. We find that income taxes (personal and corporate) have a negative relationship with firm terminations. Although a 'labor-supply' (positive) relationship was predicted, we find the 'tax-avoidance' effect to be dominant here. This may be due to the fact that being an entrepreneur affords greater opportunity for tax avoidance than does wage-salary employment, or that higher corporate taxes forces corporations to terminated employees which pushes them into entrepreneurship. In other words, high personal and corporate income taxes might have the effect of pushing people out their jobs and into entrepreneurship. However, only the coefficient for personal income tax was found to be significant indicating some tendency for tax avoidance by remaining in business.

Workers' compensation costs, energy costs and crime rate are all significant and positively correlated with firm termination rates, as expected. Taken together, these variables act as disincentives to entrepreneurs in that they

[1] See Greene (1997, ch. 15) for a detailed description of the estimation procedure.

increase the costs of operation in states where they are high, and cause businesses to locate to a 'more friendly' operating climate.

In the second stage regression, two things are immediately apparent. Firstly, the set of variables that tends to be the most significant in explaining one measure of entrepreneurial activity (say new firm formation) is generally not the same as the set of variables that tends to be most significant in explaining another (say patent applications or presence of 500 Inc. firms'). Having said that, the second thing that is apparent is that the entrepreneurial climate measure (from the first-stage regression) is consistently significant in explaining entrepreneurial activity regardless of the measure being used. From a policy perspective, these indicators should point to where government priorities should focus.

As expected, a larger pool of innovations and human capital significantly affects one or more measures of entrepreneurial activity. With respect to the financial capital variables, only one, venture capital availability, was significantly different from zero, and this was only with respect to new firm start-ups. Financial capital variables in all other instances were not statistically different from zero. The inclusion of squared and interaction terms here, as in Goetz and Freshwater (2001), may have yielded better results. Studies have show that the different forms of financial capital are used to fund specific phases of entrepreneurial activity, for example most venture capital investments are made for expansion or later stages of operation and most SBIC investments are made

at start-up. Inclusion of squared and interaction terms for financial capital would have made these effects visible.

Some results are yet to be explained, such as the positive relationship between population diversity and the presence of 500 Inc, firms, but negative relationships between population diversity the other measures of entrepreneurial activity, patent applications and new firm start-ups. Another result that is yet to be explained is the negative relationship between the number of business incubators per state and entrepreneurial activity by all three measures.

Conclusion

We developed a theoretical model of state-level entrepreneurship activity, as measured independently by firm creation, patent applications and presence of 500Inc. firms. We estimated the roles of innovations, financial capital, state resources and entrepreneurial climate. The empirical results suggest all of these factors are important in explaining some measure of entrepreneurial activity.

Most importantly, we find that there is no single set of variables most important in explaining the three different measure of entrepreneurial activity used in this analysis, that is, with the exception of entrepreneurial climate. We find that the parameter estimate for entrepreneurial climate was significantly different from zero for all the measures of entrepreneurial activity used.

Other than entrepreneurial climate, we find that different variables explain each of the different measures of entrepreneurial activity, or have a different impact at least. For example, venture capital investments are highly important in

explaining new firm start-up, but not in explaining any of the other measures. Similarly, college attainment is important in explaining presence of 500 Inc. firms and new firm start-ups (albeit at different levels of significance – 10% and <1%, respectively) but not patent applications.

The results points to an important policy consideration for states wanting to promote economic growth through entrepreneurial job and wealth creation – "one size does not fit all." Having policies that promote new firm start-ups may not necessarily translate into high rates of technical innovations, which are necessary for economic growth. However, providing 'friendly' entrepreneurial climates works for everyone.

Limitations and Future Improvements

Several limitations are present in the current analysis and some measures for improvements are included.

In order to prevent degrees of freedom errors in selecting variables for the regressions, the different measures representing the same variable should be collapsed into single measures (as in Goetz and Freshwater, 2001). The authors used an effective way of aggregating the subset of variables for each major indicator. The firstly normalized each series into a z score by subtracting the mean and dividing by the standard error of each series. Subsequently, the normalized series was added together for use in the regression equation.

Another improvement would be to control for state and time effects in the regression as in Garrett and Wall (2005).

Including squared and interaction terms to allow for nonlinearities and interactions as in Goetz and Freshwater (2001) would also improve the validity and rigor of the results.

References

Berkowitz, Daniel and David N. DeJong (2001): "Entrepreneurship and post-socialist growth," *William Davidson Working Paper Number 406*, The William Davidson Institute, University of Michigan, Ann Arbor, Michigan.

Birch, D., Haggerty A., and & Parsons, W. (1999). *Entrepreneurial Hot Spots: The best places In America to start and grow a company.* Cambridge, MA: Corporate Demographics, Cognetics, Inc.;

Curry, Pam. 2005 Center for Economic Options. Growing Microbusiness: The West Virginia Experience

Dabson, Brian. 2002. Supporting Rural Entrepreneurship. Rural Policy Research Institute.

Edison Electric Institute. Edison Electric Institute Statistical Yearbook/2002 Data. Washington, DC: 2004.

Florida, Richard & Zoltan Acs & Sam Youl Lee, 2004. "*Creativity and Entrepreneurship: A Regional Analysis of New Firm Formation,*" Discussion Papers on Entrepreneurship, Growth and Public Policy 2004-17, Max Planck Institute of Economics, Group for Entrepreneurship, Growth and Public Policy.

Garrett, Thomas A. & Howard J. Wall, 2006. "*Creating a policy environment for entrepreneurs,*" Working Papers 2005-064, Federal Reserve Bank of St. Louis.

Gentry, William M. & R. Glenn Hubbard, 2000. "Tax Policy and Entrepreneurial Entry," *American Economic Review,* American Economic Association, vol. 90(2), pages 283-287, May.

Geotz, Stephan, J. and David Freshwater. "Determinants of Entrepreneurship and a Preliminary Measure of Entrepreneurial Climate." *Economic Development Quarterly*, 2001, vol. 15, no. 1, pp. 58-70.

Greene, W.H., (1997). Econometric Analysis, Prentice-Hall.

Henderson, Jason (2002): "Building the rural economy with high-growth entrepreneurs," *Federal Reserve Bank of Kansas City Economic Review*, v87, n3, pp. 45-70.

Keating, R. 2000-2004. Small Business Survival Index. Small Business and Entrepreneurship Council. www.sbecouncil.org. and http://www.sbsc.org/home/index.cfm?CFID

Kirchhoff, B, C. Armington, I. Hasan, and S. Newbert (2002). "*The Influence of R&D Expenditures on New Firm Formation and Economic Growth*." A Research Report for the US Small Business Administration by BJK Associate.

Lee, Sam Youl, Richard Florida, and Zoltan Acs (2004). “Creativity and Entrepreneurship: A Regional Analysis of New Firm Formation.” Jena, Germany: Discussion Papers of Entrepreneurship, Growth and Public Policy, Max Planck Institute for Research into Economic Systems, Group Entrepreneurship, Growth and Public Policy.

Macke, Don. 2000. West Virginia & Rural Entrepreneurship. Rural Entrepreneurship Initiative.

Malecki, E. J. (1990). New Firm Formation in the USA: Corporate structure, venture capital and local environment. *Entrepreneurship and Regional Development*, 2, 247-265.

Malecki, Edward (1994). “Entrepreneurship in Regional and Local Development,” International Regional Science Review, Vol 16, nos. 1&2, pp.119-53.

Markley, Deborah M. 2002. “Measuring Outcomes and Shifting Policy”. Center for Rural Entrepreneurship.

Ovaska, Tomi & Russell S. Sobel, "undated". "Entrepreneurship in Post-Socialist Economies," Working Papers 04-06, Department of Economics, West Virginia University.

Reynolds, Paul D., Michael Hay and S. Michael Camp (1999): “*Global Entrepreneurship Monitor*,” Kauffman Center for Entrepreneurial Leadership, Kanssas City, Missouri.

Saxenian, A. (1999): “Silicon Valley’s New Immigrant Entrepreneurs, Public Policy Institute of California.

Schumpeter, Joseph (1934): “*The Theory of Economic Development*,”. Harvard University Press, Cambridge, MA.

The Looming Highway Condition Crisis: Performance of State Highway Systems, 1984-2002. David T. Hartgen, Department of Transportation Studies, University of North Carolina at Charlotte, February 10. 2004.

Wall, Howard J. & Yannis Georgellis, 2000. "What makes a region entrepreneurial? Evidence from Britain," *The Annals of Regional Science*, Springer, vol. 34(3), pages 385-403

Table 1: List of Independent Variables and State Rankings (2003)

State	New Firm Start-Ups Rank	Patents Issued Rank	500 Inc. Firms Rank	State	New Firm Start-Ups Rank	Patents Issued Rank	500 Inc. Firms Rank
Alabama	45	43	27	Montana	2	39	21
Alaska	11	48	5	Nebraska	41	38	25
Arizona	35	19	28	Nevada	7	28	26
Arkansas	24	49	6	New Hampshire	16	6	40
California	15	5	39	New Jersey	13	11	42
Colorado	3	9	46	New Mexico	17	27	17
Connecticut	37	7	23	New York	14	15	22
Delaware	9	10	49	North Carolina	29	25	15
Florida	8	29	37	North Dakota	44	44	4
Georgia	26	31	44	Ohio	48	16	32
Hawaii	21	47	1	Oklahoma	32	36	14
Idaho	6	1	36	Oregon	10	8	41
Illinois	39	17	31	Pennsylvania	33	22	34
Indiana	43	24	29	Rhode Island	20	20	30
Iowa	49	26	12	South Carolina	27	37	10
Kansas	28	30	8	South Dakota	50	42	2
Kentucky	46	41	19	Tennessee	18	34	35
Louisiana	40	45	7	Texas	36	21	33
Maine	23	40	18	Utah	4	18	48
Maryland	12	23	45	Vermont	19	2	13
Massachusetts	25	3	47	Virginia	22	32	50
Michigan	42	12	24	Washington	1	13	38
Minnesota	34	4	43	West Virginia	31	46	3
Mississippi	38	50	11	Wisconsin	47	14	16
Missouri	30	35	20	Wyoming	5	33	9

Source: http://www.inc.com/500, http://www.cfed.org/, and http://patents.uspto.gov

Table 2: List of Variables, Definitions and Sources

Independent Variables	Measurement	Source
500 Inc. Firms	500 Inc. firms per state	http://www.inc.com/500
No. of Patents Issued	Number of patents issued per one million people, 2003.	http://www.cfed.org/ and http://patents.uspto.gov
New Firm Start-Ups	Number of companies applying for new employment identification numbers per 1,000 workers	http://www.cfed.org/ **http://www.census.gov**
Dependent Variables	**Measurement**	**Source**
SBIR Investments	SBIR grants awarded, in dollars, per worker	http://www.cfed.org/ and http://sbaonline.sba.gov
University Spin-outs	Number of University spin-outs per $10 million university R&D spending	http://www.cfed.org/
Property taxes	State and local property tax ratio (property taxes per $100 of personal income)	http://www.sbsc.org/home/index.cfm?CFID
Individual income tax	State's top personal income tax rate	http://www.sbsc.org/home/index.cfm?CFID
Corporation net income Tax	State's top corporate income tax rate	http://www.sbsc.org/home/index.cfm?CFID
Death and gift taxes	State death taxes (states levying death taxes beyond the federal pick-up tax receive a score of "1" and states that do not receive a score of "0")	http://www.sbsc.org/home/index.cfm?CFID
Unemployment Taxes	Average state employer unemployment tax rate	http://www.sbsc.org/home/index.cfm?CFID
Workers Compensation Taxes	State workers' compensation costs (benefit costs as a share of state personal income),	http://www.sbsc.org/home/index.cfm?CFID
Energy Costs	Average cost in cents of electricity per kilowatt hour (measured by average revenue per kilowatt hour sold), 2003.	Edison Electric Institute.
Crime Rate	FBI Index, rate of serious crimes per 100,000 inhabitants	Department of Justice, Federal Bureau of Investigation, Crime in the United States, 2000-2004
Venture Capital Investments	Venture capital investments, dollars per worker, 2000-2004	http://www.cfed.org/
SBIC Financing	Total SBIC financing, per worker, 2000-2004.	http://www.cfed.org/ http://sbaonline.sba.gov

Private Lending to Small Businesses	The dollar amount of private loans under $1 million made in 2000-2004, per worker	http://www.cfed.org/ http://www.census.gov
College Attainment	Educational Attainment of the Population 25 Years and Over	http://www.census.gov
Population Diversity	Percent of population that is non-white	http://www.census.gov
University Spinouts	Number of university spin-outs per $10 million university R&D spending, fiscal year 2001	http://www.cfed.org/
Incubators	Number of small business incubators per state	http://www.cfed.org/
Population Estimates	Estimated population(in million)	http://www.census.gov
Income	Per capita net income per US and States: Median Household Income (in inflation-adjusted dollars). Includes households; not persons living in institutions.	US Census Bureau 2004 American Community Survey
Digital Infrastructure	Score based on Government's adoption of digital technology to improve delivery of services to citizens.	http://www.cfed.org/
Highway Deficiency	Ratio of cost effectiveness of the state-owned road system to national average. Cost effectiveness includes both financial and condition measures	Performance of State Highway Systems, 1984-2004.
Business Termination	Percent rate of firm terminations	U.S. Census Bureau and U.S. Department of Labor (ETA).

Table 3: GLS Results for the 1st Stage Regression: Independent Variable - Rate of Firm Termination

1st Stage Regression Results - Independent Variable - Percent Rate of Firm Terminations (2000-2004)	*coefficient*	*s.e.*
Entrepreneurial Climate Variables		
Property Taxes	-0.00014	0.0012
Personal Income taxes	-0.0015	0.000626
Corporate Income Taxes	-0.0034***	0.00326
Death & Gift Taxes	0.02	0.0156
Unemployment Taxes	-0.07	0.064
Workers Comp. Taxes	0.55	0.217
Energy Costs	0.278***	0.121
Crime Rate	0.0075***	0.0002
Adj R-Sq	0.18***	

Table 4: GLS Results for the 2nd Stage Regression

	Model 1 - Independent variable - Rate of New Firm Start-Ups per I million (2000-2004)		Model 2 - Independent variable – # of 500 Inc. Firms per State		Model 3 - Independent variable - Rate of Patents Applications	
	coefficient	***s.e.***	***coefficient***	***s.e.***	***coefficient***	***s.e.***
Financial Capital Variables						
Venture Capital Financing	0.00124***	0.0004	-0.000089	0.00025	0.0028	0.04
SBIC Financing	0.000262	0.009	0.00151	0.0051	0.977	0.814
Private Lending	0.001	0.00023	-0.000026	0.00015	-0.00062	0.0024
Innovation Variables						
SBIR Grants	0.012	0.017	0.028***	0.0096	3.545*	1.518
University Spin-Outs	-1.633	1.5	1.839**	0.84	-208.56*	133.989
# of Incubators	-0.007**	0.003	-0.003*	0.0018	-0.15	0.289
Patents Issued	0.0078	0.0009	-0.00092*	0.00053	-	-
Human Capital Variables						
College Attainment	0.14***	0.05	0.052**	0.028	-2.637	4.44
Racial Diversity	-0.001	0.014	0.21***	0.0078	-6.83*	1.101
State Resources and Infrastructure						
Population Density	0.00027	0.000238	-0.000304	-0.0033	0.000074*	0.0000204
Per Capita Income	-0.005*	0.035	0.000063***	0.00002	0.015*	0.0029
Digital Infrastructure	-0.007	0.0077	0.0047	0.0043	-0.31	0.695
Highway Deficiency	0.0227*	0.013	0.00429	0.0074	0.839	1.19
Entrepreneurial Climate						
Rate of Business Termination	0.362***	0.137	-0.212***	0.077	22.62*	12.21
Adj R-Sq	0.21		0.57		0.61	