Public Policy, Entrepreneurship, and Economic Growth[*]

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Abstract

With the recognition that entrepreneurial activity is a key factor in economic growth, many local governments have begun to enact policies targeted at promoting entrepreneurship. One frequently cited strategy for promoting entrepreneurial activity is to attract large amounts of venture capital, in the hopes of inducing more entrepreneurial activity. In this paper we test the direction of causality between venture capital and entrepreneurial activity and find that it is the presence of entrepreneurial activity that draws venture funding to an area, and not vice versa. Thus, enacting policies consistent with economic freedom, which provide a good environment for attracting or developing individual entrepreneurs, are the appropriate economic development policies.

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I. Introduction

An entrepreneur is an individual who assumes the financial risk of developing or managing a new venture, where the venture is based on a new idea or an innovative way of performing a task. The 'entrepreneurial spirit' is something that has long been associated with the driving force behind economic progress and growth. Joseph Schumpeter (1942) stated that the key to the success of markets lies in the spirits of entrepreneurs who persist in developing new products and technologies, and succeed at ultimately reducing production costs. Kaiser (1990) modeled the entrepreneur based on many historical characterizations, including the Schumpeterian innovator, and concluded that the major characteristics of the entrepreneur—innovator, risk taker, and resource allocator—are complementary and inseparable facets of entrepreneurship. Kirzner (1997) argues that the entrepreneurial discovery process is vital to the effectiveness of markets, where discovery entails entrepreneurs discovering profit opportunities by trial and error. In this same respect, Jenner (1998) models the Schumpeterian entrepreneurial process as a dynamic process were entrepreneurs search for new combinations of products and production techniques that will led to increased productivity and economic growth.

Recently, the conceptual link between entrepreneurship and economic growth has received renewed interest by economists. The finding that increased entrepreneurial activity leads to greater economic growth is now well founded at both the national and local level. For example, Reynolds, Hay, and Camp (1999) show that a country's level of entrepreneurial activity explains a significant portion of the differences in national economic growth rates. In addition to the national link between entrepreneurship and economic growth, recent studies have focused more attention on the local level. According to Henderson (2002), entrepreneurs significantly

impact local economies by fostering localized job creation, increasing wealth and incomes, and ultimately helping to connect local economies to the larger, global economy.

Based on the increasing awareness of the role of entrepreneurs in driving economic growth, state and local economic development efforts have been more heavily directed toward promoting entrepreneurship. These development efforts have mainly focused on reducing the financial constraints that entrepreneurs face either through preferential loans to new businesses, as those supported by the Small Business Administration, or preferential tax treatment for new or small businesses. One such policy that has recently gained popularity is to devote public resources toward attracting and building a larger amount of venture capital to encourage entrepreneurial activity. This development strategy is largely based on casual observation that areas with larger amounts of entrepreneurial activity generally tend to also have a larger amount of venture capital.

A recent, controversial policy alternative has been popularized by Richard Florida (2002) in his book *The Rise of the Creative Class*. The author proposes that instead of focusing on developing capital inputs, development efforts should be focused toward making areas more attractive to bring in and nourish creative, entrepreneurial *individuals.* Florida (2002) traces the growing role of creativity in our economy by documenting many fundamental changes in American society.

In this paper we propose that the main difference between these competing development strategies is a question of the direction of causation between entrepreneurial activity and the quantity of venture capital. We then proceed to answer this 'which comes first, the chicken or the egg' question with an empirical test to determine whether it is more venture capital that causes more entrepreneurial activity in an area, or whether the presence of more entrepreneurial activity

simply, and automatically, causes more venture capital to flow into an area.[1] Not only is this an interesting academic question, but it also has significant implications for how best to direct the limited resources available for state and local economic development efforts. Quite simply put, the question is whether it is best to devote development efforts toward bringing in venture funds (or alternatively, focusing on building formal angel investment groups) or to focus on efforts to encourage more entrepreneurial activity among individuals in an area (or alternatively, to attract entrepreneurs to the area). Even more interesting is the possibility that there is causation running simultaneously in both directions between venture capital and entrepreneurial activity. If these two phenomenon have this type of relationship, development efforts will only be successful if resources are devoted *simultaneously* to promoting both larger venture funds and encouraging entrepreneurial activity among individuals.

Section II of the paper proceeds by discussing the relationship between entrepreneurial activity and economic growth. In Section III we then proceed to uncover the direction of causality between venture capital and entrepreneurial activity. Based on these results, Section IV considers the issue of which government policies best stimulate the underlying causal factors that promote entrepreneurship. Finally, Section V will present concluding remarks.

II. The Relationship Between Entrepreneurial Activity and Economic Growth

Entrepreneurship is increasingly becoming recognized as a key factor contributing to economic growth. As argued by Minniti (1999), entrepreneurs are the catalysts for economic growth because they create a networking externality that promotes the creation of new ideas and new

[1] Thurman and Fisher (1988) attempt to empirically answer the question of which came first the chicken or the egg, by running Granger causality tests between U.S. egg production and chicken populations and conclude that the egg came first.

market formations. The finding that increased entrepreneurial activity leads to greater economic growth has been well founded at both the national and local levels. For example, Reynolds, Hay, and Camp (1999) show that one-third of the differences in national economic growth rates can be attributed to the level of entrepreneurship in each country. Supporting these findings, Zacharakis, Bygrave, and Sheperd (2000) study sixteen developed economies and find that entrepreneurial activity explains approximately one-half of the differences in GDP growth between countries. More recently, Henderson (2002) argues that entrepreneurs significantly impact economic activity at a more local level through fostering localized job creation, increasing wealth and local incomes, and connecting local economies to the larger, global economy.

In order to enhance the existing evidence on the link between entrepreneurship and economic growth for our current purposes, we perform state level panel causality tests on state annual gross state product (GSP) growth rates and two measures of entrepreneurial activity (sole proprietorships and patent activity).[2] The first measure of entrepreneurial activity, sole proprietorships, has been widely supported in the literature as a good proxy for the level of entrepreneurship. The Bureau of Economic Analysis reports the number of sole proprietors based on federal income tax forms filed by individuals of each state. The second measure of entrepreneurship, patent activity, is new to this paper, and is measured as the number of utility patents (those received for general inventions or innovations) granted annually in each state. The logic behind patent activity as a measure of entrepreneurship rests in the notion that the most direct and visible outcome of the entrepreneurial process is innovation, which should be reflected in the quantity of patents.

[2] Our analysis, using causality tests, add to the robustness of the observations made by the previous literature that link high entrepreneurial activity to increased economic growth because the causality tests allow for reverse causation running from economic growth to the level of entrepreneurial activity.

The causality test procedure used here builds on the Granger (1969) and Sims (1972) causality framework by modifying the test to incorporate the pooled time-series properties of all the fifty states. One problem that may arise in using the pooled state data is that the differences across states may be significant enough to bias the true time series information that is available in the data. Following the approach of Blomstrom, Lipsey, and Zejan (1996) and Farr, Lord, and Wolfenbarger (1998), state intercept dummies were included in each regression specification to avoid the possible bias by controlling for any state-specific influences.[3] Specifically, the effect of the state intercept dummies is to remove the cross-sectional differences of the states, while leaving only the time series variations to be analyzed.

The general Granger-Sims causality test of two variables X and Y, modified for state panel data can be seen in the following equations, where equation (1) tests causality running from X to Y, and equation (2) tests causality running from Y to X. [4]

$$Y_{t,i} = \alpha_i + \sum_{m=1}^{M} \alpha_m Y_{t-m,i} + \sum_{n=1}^{N} \alpha_n X_{t-n,i} + \varepsilon_{t,i} \qquad (1)$$

$$X_{t,i} = \beta_i + \sum_{v=1}^{V} \beta_v X_{t-v,i} + \sum_{w=1}^{W} \beta_w Y_{t-w,i} + \delta_{t,i} \qquad (2)$$

Note that the subscript *i* refers to the corresponding state observation; the error terms $\varepsilon_{t,i}$ and $\delta_{t,i}$ are assumed to be white noise; and, the number of lagged values (M and N or V and W) of the independent variables are chosen to adequately capture the relationship between X and Y.

[3] The state intercept dummy parameter estimates are not reported with the causality regression results but are available on request.

[4] The modified Granger-Sims framework will be used in this section to test the causality between entrepreneurship and economic growth, and will also be used in Section III to test the causality between entrepreneurship and venture capital investment.

To check for a one-way causal relationship, both directions of causality have to be investigated. In order to test if X Granger causes Y, equation (1) is estimated with and without the lagged X variables, and then an F-test is performed to test the null hypothesis that $\alpha_n = 0$ for n=1,…,N. Rejecting the null hypothesis would show that X Granger causes Y. In order to test if Y Granger causes X, equation (2) is estimated with and without the lagged Y variables, and then an F-test is performed to test the null hypothesis that $\beta_w = 0$ for w=1,…,W. Rejecting the null hypothesis would show that Y Granger causes X.

[Table 1 about here]

This general framework was used to run causality tests between annual GSP growth, sole proprietorships, and patent activity in the United States between 1980-2000. Descriptions of all variables used in this paper, along with the sources of this data, are given in Appendix 1. The causality tests results between the measures of state entrepreneurship and economic growth are presented in Table 1.[5] The results show that there exists a one-way causal relationship between entrepreneurship and economic growth at the state level. Specifically, the level of sole proprietors was found to Granger cause GSP growth (specifications 1 and 3 in Table 1), and the level of patent activity was shown to Granger cause GSP growth (specifications 2 and 5 in Table 1). Also, tests were performed to determine the direction of causality between the two measures of entrepreneurship, and the tests revealed that dual causality exists between sole proprietors and patent activity (specifications 4 and 6 in Table 1). The dual causality result is not surprising considering they are used to measure the same thing—entrepreneurial activity.

[5] The Granger-Sims test structure reported in Table 1 includes only one lag of the independent variables, in part, because of the limited number of observations and also to conserve on degrees of freedom. However, causality tests were run using two lags of the independent variables and the results are virtually identical to the results presented in Table 1. It should be noted that a more simplified t-test can be run in the causality tests that incorporate only one lag, however, the more general F-test is also acceptable.

The causality results, showing a one-way causal relationship running from state entrepreneurship to economic growth strengthen the already well-documented link between entrepreneurship and economic growth. Also, our state-level analysis seems to bridge the gap between the national and local links between entrepreneurs and economic growth. The next question that has to be addressed then is "what factors contribute to the formation, or attraction, of entrepreneurial activity that is the driving force behind economic growth?"

III. The Direction of Causality Between Venture Capital and Entrepreneurial Activity

One variable that has been widely supported in the literature as a major determinant of entrepreneurial activity is the amount of venture capital investment, or lending to small businesses, that is available to entrepreneurs. The Corporation for Enterprise Development (2001), lists eight core elements of an infrastructure necessary for supporting entrepreneurship, where six of the eight elements revolved around the financing that was available for potential entrepreneurs. Also, highlighting the importance of financing, Henderson (2002) states that the availability of financial resources in an area, especially venture capital investment, is vital to developing entrepreneurs. However, one important idea that has generally been over looked by previous authors is the notion that venture capital investment may be endogenous to the model of entrepreneurial activity. More specifically, it is hard to determine if the venture capital investment is creating entrepreneurship, or if the investment is simply flowing to the states that already have significant levels of entrepreneurial activity.

The causal relationship between entrepreneurial activity and venture capital investment is important for policy makers, because if venture capital causes entrepreneurship, policy makers should target their limited development resources toward promoting venture capital investment

in their state. However, if venture capital investment simply follows entrepreneurial activity, then policy makers should focus attention on creating a positive environment that encourages individual entrepreneurs, and the venture funding will take care of itself as a consequence.

[Table 2 about here]

The modified Granger-Sims causality framework presented in the previous section was used to run causality tests between venture capital investment, sole proprietorships, and patent activity in the United States between 1992-2001.[6] The measure of venture capital investment is constructed by PricewaterhouseCoopers / Thomson Venture Economics / NVCA Moneytree (2002) and includes cash-for-equity investments by professional venture capital firms in private emerging companies in the United States, where the venture capital firm can be based in the United States or abroad.[7]

The causality tests results between the measures of state entrepreneurship and venture capital investment are presented in Table 2.[8] The results show that a one-way causal relationship exists between state entrepreneurship and venture capital investment. Specifically, the level of sole proprietors was found to Granger cause venture capital (specifications 1 and 3 in Table 2),

[6] Due to data limitations on venture capital investment Alaska, Hawaii, North Dakota, South Dakota, Vermont, West Virginia, and Wyoming were not included in the causality tests between entrepreneurship and venture capital investment. Also, the California observations were suppressed because standard outlier tests revealed that California is a statistical outlier in venture capital investment. Specifically, California's observations had standardized residuals that were greater than 2.5 standard deviations from the mean in absolute value. Casual observation of California's annual share of U.S. venture capital investment reveals that the state receives roughly 35% of the total investments, on average over the sample period. The next two states receiving the next largest levels of venture capital (Texas and Massachusetts) combine to only account for roughly 12% of the total investments, on average over the sample period.

[7] Professional venture capital firm refers to the following types of firms: Small Business Investment Companies (SBICs), venture arms of corporations, institutions, investment banks, and similar entities whose primary activity is venture capital investing.

[8] Again, the Granger-Sims structure includes only one lag of the independent variable for the reasons stated earlier, but also, this one-lag relationship seems to best reflect the highly mobile characteristics of venture capital investment, which freely and rapidly respond to ever-changing market conditions. It should be noted that the causality tests were run using two-lags of the independent variables and the results were not substantially different from the ones reported in Table 2. The only difference is that there is a weak dual-causality relation found between patent activity and venture capital investment at the 10% confidence level.

and the level of patent activity was shown to Granger cause venture capital (specifications 2 and 5 in Table 2). Again, tests were performed to determine the direction of causality between the two measures of state entrepreneurship, and the tests revealed that dual causality exists between sole proprietors and patent activity (specifications 4 and 6 in Table 2).

The causality results, showing a one-way causal relationship running from state entrepreneurship to venture capital investment shows that venture capital investment funds are simply flowing to the areas with already established entrepreneurial activity. In other words, the answer to this chicken and egg problem is that entrepreneurs come first, and venture capital follows. One explanation of our finding is that venture capital investment is inherently more mobile than labor; which would imply that, as entrepreneurship rises in a particular geographic area, new venture capital tends to automatically, and freely, flow from all parts of the United States to fund the entrepreneurial activity in the area.[9]

It is important to note that our results do not contradict the idea that venture capital is important in the entrepreneurial process. In fact, our results are most consistent with the literature on entrepreneurial survival suggesting that once an entrepreneurial venture is started, that venture funding significantly increases the chances of survival for the new venture.[10] What our results do say, however, is that focusing development efforts on bringing in more venture or angel funding will not be an effective method of encouraging the higher levels of entrepreneurial

[9] This finding that entrepreneurial activity causes financing, and the earlier finding that entrepreneurial activity causes economic growth may help to shed light on a puzzle that is prevalent in another strand of the economic growth literature. As noted by Shan, Morris, and Sun (2001), the puzzle is over the causal relationship between financial development and economic growth, were the authors report that no conclusive evidence exists on the direction of causality. More specifically, Shan, Morris, and Sun (2001) find dual causality between the financial development of OECD countries and their corresponding economic growth rates. Our results suggest that entrepreneurial activity causes both economic growth and financial investment flows; therefore, the finding of dual causality may come from the fact that the entrepreneurial activity is driving both measures simultaneously.

[10] Bates (1990), Holtz-Eakin, Joulfaian, and Rosen (1994), and Blanchflower and Oswald (1998) all present evidence that financing is key to the survival of entrepreneurial ventures.

activity necessary for economic growth. Rather, attracting and promoting underlying entrepreneurial activity must be the focus of development efforts and venture funding will automatically, and naturally, flow into the area to support this activity.

IV. State Policies that Promote Entrepreneurship

Our empirical results from Section III suggest that entrepreneurial activity (measured by patents and sole proprietorships) tends to be the underlying factor that attracts more venture capital to an area. The remaining question is then how to structure government policy to encourage more entrepreneurial activity among individuals in an area (either by making current residents more entrepreneurial or by attracting new entrepreneurs to the area). One such structure for government policy is suggested by another strand of literature attempting to explain economic growth differentials across countries by differences in a well-constructed 'index of economic freedom.' Generally these indexes attempt to condense into a single number the degree of economic freedom individuals have in a geographic area in several key categories such as low taxes, low regulations, and secure property rights. Studies using these indices such as Gwartney and Lawson (2002), Farr, Lord, and Wolfenbarger (1998), and Gwartney, Lawson, and Holcombe (1999), have generally found that countries with a higher economic freedom score not only have larger per capita incomes, but also tend to have higher *rates* of economic growth.

In this paper we propose that the 'missing link' that has yet to be demonstrated between economic freedom and economic growth is entrepreneurial activity. That is, underlying economic freedoms generate growth *because* they promote underlying entrepreneurial activity which is then the source of economic growth. While this has never directly been tested in the literature, this view is highlighted by Lee (1991) who writes:

> no matter how fertile the seeds of entrepreneurship, they wither without the proper economic soil. In order for entrepreneurship to germinate, take root, and yield the fruit of economic progress it has to be nourished by the right mixture of freedom and accountability, a mixture that can only be provided by a free market economy. The productivity of all economic activity is enhanced greatly by the freedom and discipline found only in market economies. [Lee (1991), p. 50]

To verify our hypothesis we have gathered data across U.S. states on the growth of entrepreneurial activity in each state, other key factors that have previously been shown to be correlated with entrepreneurial activity for that state, and the degree of economic freedom in the state.

In determining the state control variables we relied heavily on those variables proposed in the literature. However, in modeling entrepreneurship, the existing literature has mainly focused on the question of what characterizes an individual entrepreneur. So our analysis, which aggregates up to the state level, will be the first attempt to model the existing states' environments for entrepreneurship.

There are three somewhat different strands of literature aiming to explain entrepreneurs. First, there are the studies looking at different demographic characteristics of the individuals pursuing entrepreneurship. Second there are the studies that have looked at more economic influences leading to entrepreneurship. Finally, there are those studies that aim to analyze which policies affect entrepreneurial activities.

Evans and Leighton (1989) model individual entrepreneurs and find that an individual's age, gender, and work experience affect the decision to enter or stay in entrepreneurial activities. Bates (1990) shows that an individual's human capital, in other words educational background, is a significant determinant in the entrepreneurial process. Schiller and Crewson (1997) also conclude that demographics matter, showing that the influences of age, education, and experience affect men and women differently in the decisions to supply entrepreneurial activity.

Most recently, Cowling (2000) confirms that age, gender, and education are key variables in determining what individuals become entrepreneurs.

The economic influences on entrepreneurial activity have mainly focused on an individual's inheritance or financial gifts received, or the incentives to be your own boss. Note that the financial inheritances do not work in the same manner as venture capital. The inheritance matters more in the decision to become an entrepreneur, while the venture capital matters more once that decision is made. The importance of an individual's personal finances is found to hold true in Holtz-Eakin, Joulfaian, and Rosen (1994), who analyze the behavior of a group of sole proprietors that received significant inheritances and found that they are more likely to start and survive in an entrepreneurial endeavor than those proprietors without substantial personal finances. Blanchflower and Oswald (1998) used various micro data sets of the self-employed to answer the question of what makes an entrepreneur. The authors show that personal financing is one of the most important factors leading to self-employment, noting that the probability of self-employment depends positively on an individual's inheritance or financial gifts received. In regards to the managerial gains of entrepreneurship, Wiggins (1995) focuses on the incentives of ownership in explaining small business entrepreneurial activity. In line with this argument, Hamilton (2000) claims that many individuals choose to be entrepreneurs because self-employment offers significant non-pecuniary benefits such as "being your own boss."

More relevant to the aims of our research is the strand of literature focusing on policy influences on entrepreneurship. Blau (1987) uses time series data on U.S. self employment and generally concludes that high marginal tax rates produce higher rates of self employment because the higher taxes give workers the incentive to leave wage-and-salary jobs and move into entrepreneurial activity where they can more easily evade the taxes. Kayne (1999) performs a

general state policy inventory survey to report on what state policies are in place to support entrepreneurial activities. The author finds that certain states are making efforts to reduce taxes and business regulations, improve venture capital networking, and increase support for education in support of entrepreneurship. Returning the focus to tax influences, Bruce (2000) examines income and payroll taxes of the self-employed and wage-and-salary workers to see if tax differentials affect the choice to be self employed. The author finds that the differential tax treatment of wage-and-salary and self-employment income significantly affects the probability of leaving self employment for a wage-and-salary job. Bruce (2002) extends his original work to allow for the endogeneity of individual tax rates, and the author finds that taxes have mixed effects on the level of entrepreneurial activity. Bruce's results highlight the overall findings of the previous literature that have not presented conclusive evidence on the relationship between tax rates and entrepreneurial activity, and have at best, shown only a weak relationship holds.[11]

Building on the existing literature, our analysis will be the first to perform a comprehensive study of state policies in the fifty states and their effects on the environment for entrepreneurship. Annual growth rates of sole proprietorships, as a measure of state entrepreneurial growth, will be estimated empirically based on various explanatory variables that are supported by the literature. For example, the demographic make up and the underlying economic characteristics of each state should influence the state's ability to generate entrepreneurial activity.

The variables included to capture the demographic characteristics of entrepreneurs are population statistics on the median age, percent males, percent white, percent receiving a high school education, and percent receiving a college education are controlled for in each regression

[11] For a good revue of the literature on the relationship between taxes and entrepreneurship refer to Bruce (2002).

specification. The median age could have either a positive or negative effect on entrepreneurship. One argument is that as age increases you become more likely to become an entrepreneur because you have more built up human capital, and you have more business experience that might lead you into starting your own business. However, as an individual's age increases they may also become more income-risk-averse. Since entrepreneurial ventures are characterized by increased risk, they may be undertaken by younger, more risk-loving individuals.

The percent males and percent white could also carry either a positive or negative sign. Past studies have not shown conclusive evidence in either direction for either variable, but more evidence has supported the notion that women and minorities are less likely to become entrepreneurs. However, recent market trends have shown a movement towards women and minority owned businesses, particularly since the Small Business Administration has devoted efforts towards targeting women and minorities for new entrepreneurial ventures.[12] So, this might drive the estimates of percent males and percent white to carry a negative sign.

Finally, the influence of an individual's level of education has also had mixed results in the literature. In particular, there has been some evidence that entrepreneurial activity is heightened by both low levels of education (high school diploma) and very high levels of education (advanced degrees, such as doctors and lawyers that are usually classified as proprietors). Therefore, the signs on percent high school and percent college could be either positive or negative. However, evidence might point to the finding that high school education

[12] For more information on the Small Business Administrations efforts towards women and minorities, and more generally on the increasing role of women and minority owned businesses, refer to U.S. Small Business Administration, *Women in Business, 2001* and *Minorities in Business 2001*.

leads to greater entrepreneurial activity, while college education leads to less entrepreneurial activity.[13]

Also, other state demographic variables were incorporated in each regression to capture the economic differences in the states, which include such variables as the unemployment rate, percent union members, percent employed in service industries, and crime rates. The unemployment rate is expected to exert a positive influence on state entrepreneurship because less employment opportunities would give more incentives for individuals to start their own businesses. The percent union membership is expected to carry a negative sign because union members are more prone to seek wage-and-salary jobs in the unionized industries. As noted by Blau (1987), the industries in which entrepreneurship is more relatively common are typically the service and retail trade sectors. Thus, the percent in services industry is expected to carry a positive sign because it is more attractive, and somewhat easier, for entrepreneurs to pursue ventures in a service industry.[14] The crime rate is expected to carry a negative sign because crime is a direct threat to the rewards of entrepreneurship. Entrepreneurs will inherently gravitate to those areas that have better property right protection; more specifically, those areas that have a greater probability of being able to keep and enjoy the benefits of entrepreneurship.

In addition to the basic model of entrepreneurial activity, several state policy variables were incorporated in the estimation process to see which, if any, significantly affect the state's ability to generate underlying entrepreneurial activity. For example, different state laws and taxes, such as tax limitation laws, inheritance or death taxes, and minimum wage laws were

[13] A further, informal, explanation, which came in part from conversations with Don Bruce, may be that a high school education gives an individual the basic training and understanding needed to start his or her own business without specifying a certain way of thinking or performing tasks, while a college education trains an individual to think in a more specialized field, which maybe better suited for a wage-and-salary job.

[14] The BLS refers to a service industry as the following: transportation, communications, electric, gas, and sanitary services; wholesale trade; retail trade; finance insurance, and real estate; and services.

included as possible influences on the state environment for entrepreneurship. Tax limitation laws require a supermajority of votes to increase or impose taxes, which can serve as a means to keep the growth of taxes, and government in general, in check. Less involvement of government may lead to a more suitable environment for creativity and entrepreneurial activity, so the tax limitation law is expected to be positively correlated with entrepreneurship.

Recall that Holtz-Eakin, Joulfaian, and Rosen (1994) and Blanchflower and Oswald (1998) find evidence that an individual's inheritance increases the probability of entering and succeeding in an entrepreneurial venture. Thus, death taxes and inheritance taxes, which directly reduce the ability of entrepreneurs to pass on their entrepreneurial gains to fund future generations of entrepreneurs, should lead to less entrepreneurial activity in the states that enact such laws. More directly related to our analysis of death taxes, Holtz-Eakin (1999), in a survey of the literature on estate taxes, concludes that entrepreneurs are more likely to bare the burden of estate taxes because they are inherently more exposed to the taxation of wealth accumulation. This direct affect of estate taxes on the rewards of entrepreneurship should lead to less entrepreneurial activity. In other words, the presence of higher state death taxes is expected to be negatively correlated with entrepreneurial activity in the states.

Finally, some states have elected to adopt minimum wage laws that set their minimum wage at a higher level than the national minimum wage. The minimum wage may have two effects on entrepreneurial ability. First, it serves as a disincentive to transition from wage employment to entrepreneurship, because the pay is higher. Second, it serves as a proxy for the labor costs of opening your own business. Essentially, entrepreneurs starting their own business will have to pay their employees the higher minimum wage if they start their business in one of

the states with the higher minimum wage. Thus, the minimum wage is expected to carry a negative sign.

As noted earlier, one of the propositions of this paper is that a state's underlying economic freedom is an essential determinant of the state's ability to create and attract entrepreneurial activity. Karabegovic, McMahon, and Samida (2002) have developed an economic freedom index score for each state, which is a composite index measure of many state policies that affect the economic freedom of individuals in that state. More specifically, the index is based on the size of government, discriminatory taxation, the degree of business regulation, and labor market flexibility.[15] The economic freedom index is expected to carry a positive sign showing that more economic freedom will create and attract more entrepreneurial activity.

In order to be consistent with the earlier casaulity analysis, the testing of which state policies and characteristics influence entrepreneurship will involve a unique method of modeling. Specifically, we are interested in what policies and characteristics were in place in each state that led to their different experiences of growth in entrepreneurial activity during our sample period. To implement this methodology, we take only the values of the state explanatory variables in the initial year, and see which variables significantly impact each state's growth rate of entrepreneurship over the following five years. This technique still tries to get at the heart of causality, in that it takes the existing state characteristics at one point in time and asks what characteristics lead to entrepreneurial growth in the next time period. For example, it tests whether those states with more economic freedom in 1996 experienced more entrepreneurial growth over the next five years relative to those states with less economic freedom.

[15] The three index areas include the following indicators: the size of government is based on general government purchases, transfer payments, and subsidies; the discriminatory taxation is based on total government revenue, income tax rates and thresholds, indirect taxes, and sales taxes; and the labor market flexibility is based on minimum wage earnings, government employment, and occupational licensing.

[Table 3 about here]

The estimated determinants of entrepreneurial growth are presented in Table 3, and the formal estimated regression takes the following general functional form.

$$\text{Entrepreneur Growth} = \alpha + \sum \beta(\text{Demographics}) + \sum \delta(\text{Policies}) + \phi(\text{Economic Freedom}) \quad (3)$$

where the regression specifications presented in Table 3 differ by what state policies are included in addition to the economic freedom index.

In all four specifications, the economic freedom index is significant at the 1% level or better. Thus, the states with the most economic freedom in 1996 had the highest subsequent growth of entrepreneurial activity over the next five years. Therefore, states policy makers need to ensure economic freedom exists in their state in order to promote entrepreneurial growth. It is important to point out, however, that economic freedom consists of an environment of low taxes, low regulations, and secure private property rights, and these factors do not simply work individually, but rather only as a complementary group.

Out of the remaining three policy variables, the only one that was found to significantly influence state entrepreneurial growth was the presence of state death (inheretance) taxes. In the three specifications when it is included, state death (inheritance) taxes are found to be highly significant in explaining the growth of entrepreneurial activity. Specifically, the presence of state death taxes beyond the federal level exerts a negative influence on the growth of state entrepreneurial activity. There are two possible explanations for this relationship. First, as supported by Holtz-Eakin (1999), high death taxes directly reduce the reward from entrepreneurship and lower the ability of the entrepreneur to pass on wealth to his or her children. Second, many studies, such as Holtz-Eakin, Joulfaian, and Rosen (1994) and Blanchflower and Oswald (1998), have found inheritance to be a significant factor increasing the

likelihood of an individual becoming an entrepreneur. The reason for this is that inheritance often provides the seed funding necessary to develop and finance a new venture up until the point at which it becomes possible to secure outside debt or venture funding. The other two policy variables (minimum wage rate and the presence of a tax limitation law) are insignificant in the regression specifications in which they are included.

The economic control variables that were consistently significant (and all of the expected signs) were the unemployment rate, percent union membership, and percent service-sector employment. This shows that the characteristics of the state economies are also major determinants of the growth of state entrepreneurial activity. Furthermore, our results show that states with high unemployment rates, or low availability of employment opportunities, experience more growth of entrepreneurial activity because of the added incentives for individuals to start their own business (or create their own employment opportunities). Also, our findings suggest that highly unionized states experience less growth in entrepreneurial activity, while states that are characterized as having larger service sectors in their economies experience more growth in entrepreneurial activity. The final economic control variable, the crime rate, was found to be insignificant in all the regression specifications.

The demographic control variables that were consistently significant (and all of the expected signs) were the percent with high school degree, percent with college degree, and median age. This shows that the demographic characteristics of the individuals participating in the state economies are also major determinants of the growth of state entrepreneurial activity. Specifically, the percent of the population receiving a high school education exerts a positive and significant influence on state entrepreneurial growth, while the percent of the population receiving a college education exerts a negative and significant influence on state entrepreneurial

growth. Also, younger state populations are found to experience increased entrepreneurial growth. The other two demographic variables (percent males and percent white) are insignificant in all the regression specifications.

In an effort to see whether the functional form of the regression mattered, we also ran the model in semi-log form (using the natural log of entrepreneurship growth as the dependent variable). These results are presented in Appendix 2 and show virtually identical results with those from the pure linear model in Table 3. In a final check for robustness, we decided to explore the pure correlation in the raw data between economic freedom and the growth of entrepreneurial activity across states without controlling for any other factors. Given the ease of manipulating econometric models and data, many readers tend to be more convinced of the strength of a result if the correlation can also be demonstrated in the raw data. The scatter plot of this raw data that underlies the regression model in Table 3 can be seen in Figure 1. The positive correlation can be seen clearly in the figure. This illustration is supported by a simple regression line fit between these two variables (also shown in the figure). We believe that the evidence from this section clearly demonstrates the robustness and strength of the relationship between the degree of economic freedom in a state and the level of entrepreneurial activity.

[Figure 1 about here]

Taken as a whole, the results from the previous two sections have significant policy implications for state and local development agencies. To encourage economic growth, localities must encourage entrepreneurial activity, and to do so, they must focus on creating an environment consistent with economic freedom, rather than focusing efforts on bringing in more venture capital to the area. Again, a state's economic freedom consists of an environment of low taxes, low regulations, and secure private property rights, where these factors collectively work

to produce economic freedoms. Low taxes, for example, by themselves will not encourage entrepreneurial activity without the other factors (such as low regulations and secure property rights) in place.

V. Conclusion

We began our paper by demonstrating that the previously documented link between entrepreneurial activity and economic growth also holds up in comparisons among U.S. states. Local economic development efforts have recently recognized this link and have begun to enact policies specifically targeted at increasing entrepreneurial activity. Many localities have focused these efforts toward forming formal angel networks and attracting new venture capital investment funds. The underlying, but unsubstantiated, assumption is that more venture capital will cause more successful entrepreneurial activity to arise. Recently, however, some have questioned whether the limited resources available for development efforts would be better directed toward attracting and nurturing individual entrepreneurs.

The state panel causality tests we perform in this paper conclude that there is a one-way causal relationship between state entrepreneurial activity and venture capital investment, but that the direction of this causal relationship is that entrepreneurial activity causes an inflow of venture funding, and not vice versa. Because entrepreneurial activity tends to be the underlying factor that automatically and naturally attracts more venture capital to an area, economic development policies should focus on creating an environment attractive to individual entrepreneurs, rather than on attracting venture capital.

We gathered data across U.S. states on the growth of entrepreneurial activity in each state, other key factors that have previously been shown to be correlated with entrepreneurial

activity for that state, and the degree of economic freedom in the state. Our results show that an area's degree of economic freedom significantly impacts the underlying level of entrepreneurial activity. Put simply, an environment of low taxes, low regulations, and secure private property rights is what is necessary to encourage the entrepreneurial activity that is vital to produce economic growth.

In addition to the clear implications our results have for economic development efforts, we also provide a significant contribution to the growing literature on the relationship between economic freedom and economic growth. This relationship has previously been demonstrated across countries, and we show that this relationship also holds across U.S. states. Most importantly, our results fill in the 'missing link' in this well-documented relationship. In particular we show that the conduit between economic freedom and economic growth is entrepreneurial activity. That is, underlying economic freedoms generate growth *because* they promote underlying entrepreneurial activity.

Table 1
Causality Test Results between State Entrepreneurial Activity and Economic Growth
(absolute t-statistics in parenthesis)

	Annual GSP Growth		Sole Proprietors		Patent Activity	
	(1)	(2)	(3)	(4)	(5)	(6)
Annual GSP Growth (t-1) (percent)	0.266*** (9.06)	0.281*** (9.69)	92.764 (0.65)		0.680 (0.46)	
Sole Proprietors (t-1) (thousands of proprietors)	0.004*** (3.36)		995.288*** (196.66)	955.720*** (101.36)		0.819*** (8.49)
Patent Activity (t-1) (hundreds of patents)		0.037* (1.73)		943.388*** (4.82)	107.054*** (98.93)	92.468*** (46.20)
Result/Finding	Sole Proprietors Causes GSP Growth	Patent Activity Causes GSP Growth	GSP Growth Causes Sole Proprietors	Patent Activity Causes Sole Proprietors	GSP Growth Causes Patent Activity	Sole Proprietors Causes Patent Activity
F-statistic [1, 998]	11.30***	3.00*	0.42	23.24***	0.22	72.07***
Number of Observations	1050	1050	1050	1050	1050	1050
R-squared	0.17	0.16	0.99	0.99	0.98	0.99

Significance Levels are represented by the following: ***1%, **5%, *10%
Note: State Dummy Variables were included in each regression specification, and the estimated coefficients are available upon request to the authors.

Table 2
Causality Test Results between State Entrepreneurial Activity and Venture Capital Investment
(absolute t-statistics in parenthesis)

	Venture Capital Investment		Sole Proprietors		Patent Activity	
	(1)	(2)	(3)	(4)	(5)	(6)
Venture Capital Investment (t-1) (millions of dollars)	0.428*** (8.42)	0.214*** (4.39)	-0.441 (0.55)		0.002 (0.14)	
Sole Proprietors (t-1) (thousands of proprietors)	4.558*** (5.39)		969.335*** (72.18)	926.330*** (53.61)		1.728*** (6.15)
Patent Activity (t-1) (hundreds of patents)		146.664*** (11.60)		791.404*** (2.94)	90.124*** (23.32)	69.845*** (15.98)
Result/Finding	Sole Proprietors Causes Venture Capital	Patent Activity Causes Venture Capital	Venture Capital Causes Sole Proprietors	Patent Activity Causes Sole Proprietors	Venture Capital Causes Patent Activity	Sole Proprietors Causes Patent Activity
F-statistic [1,334]	29.11***	134.66***	0.30	8.65***	0.02	37.87***
Number of Observations	378	378	378	378	378	378
R-squared	0.61	0.70	0.99	0.99	0.98	0.98

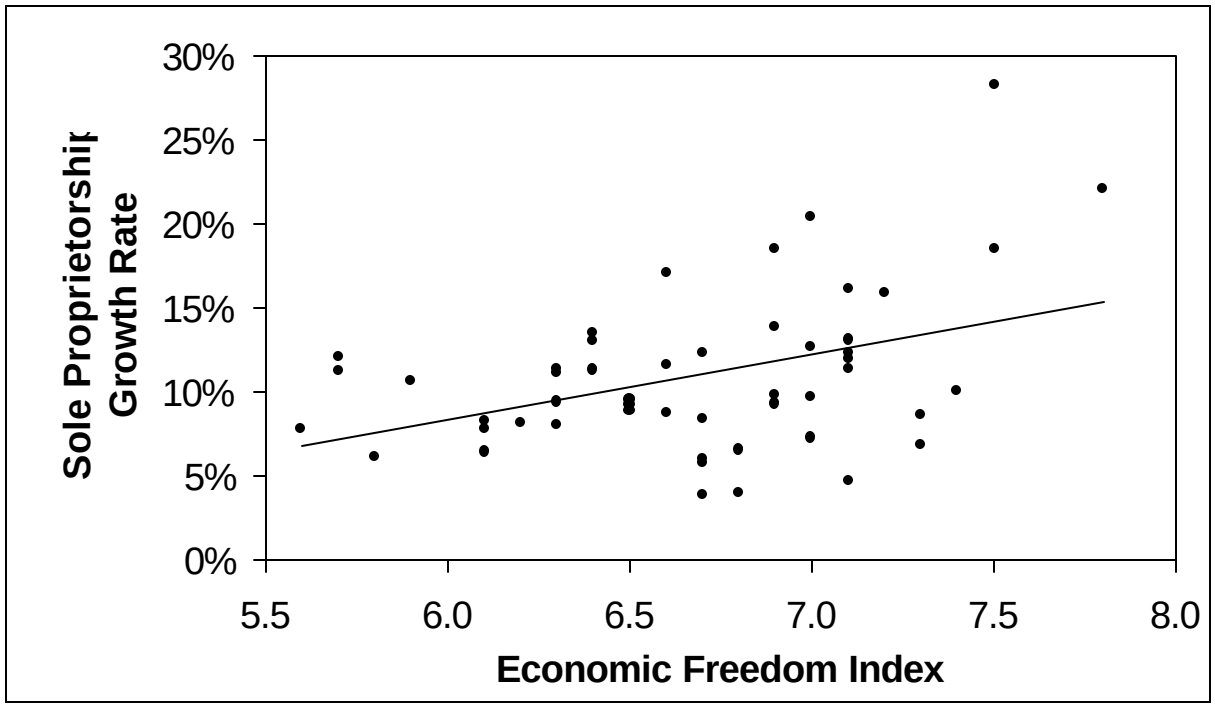
Significance Levels are represented by the following: ***1%, **5%, *10%
Note: State Dummy Variables were included in each regression specification, and the estimated coefficients are available upon request to the authors. Also, California was omitted as an outlier.

Table 3
Estimated Determinants of State Entrepreneurial Growth, 1996-2000
Dependent Variable: State Sole Proprietor Growth Rates
(absolute t-statistics in parenthesis)

	(1)	(2)	(3)	(4)
State Policy Variables				
Economic Freedom Index	3.429***	3.425***	3.625***	3.514***
	(3.18)	(3.19)	(3.44)	(3.19)
Death Tax Law	-2.087**	-2.149**	-2.164**	
	(2.11)	(2.18)	(2.20)	
Tax Limitation Law	0.877	1.060		
	(0.77)	(0.94)		
Minimum Wage	-7.134			
	(0.95)			
State Control Variables				
Constant	23.835	-10.047	-16.719	-13.436
	(0.48)	(0.29)	(0.49)	(0.37)
Percent with High School Degree	0.471**	0.378**	0.424***	0.483***
	(2.49)	(2.34)	(2.76)	(3.04)
Percent with College Degree	-0.465***	-0.441***	-0.474***	-0.510***
	(2.93)	(2.82)	(3.11)	(3.21)
Percent Males	-0.332	-0.270	-0.259	-0.366
	(0.60)	(0.49)	(0.47)	(0.64)
Percent White	-0.083	-0.043	-0.050	-0.039
	(1.21)	(0.80)	(0.93)	(0.71)
Median Age	-0.728*	-0.684*	-0.634*	-0.772**
	(1.97)	(1.87)	(1.76)	(2.07)
Unemployment Rate	1.728**	1.428**	1.541**	1.766***
	(2.59)	(2.44)	(2.69)	(2.99)
Percent Union Membership	-0.450***	-0.465***	-0.502***	-0.515***
	(3.73)	(3.90)	(4.45)	(4.36)
Percent Service Employment	0.834***	0.837***	0.866***	0.922***
	(4.65)	(4.68)	(4.91)	(5.05)
Violent Crime Rate	-0.002	-0.001	-0.001	-0.001
	(0.75)	(0.50)	(0.40)	(0.34)
Number of Observations	50	50	50	50
R-squared	0.69	0.69	0.68	0.64

Significance Levels are represented by the following: ***1%, **5%, *10

Figure 1
Relationship between State Economic Freedom and Growth of Entrepreneurial Activity



Appendix 1: Data Description and Sources

Variable Name (source)	Description	Mean (st. dev.)
Causality Test Variables		
Annual GSP Growth (1)	Annual percent change in Gross State Product, calculated as: ((GSPt – GSPt-1)/ GSPt-1)	6.67 (4.30)
Sole Proprietorship (1)	Annual Nonfarm proprietors employment as revealed through income tax data	389,608.14 (466,830.31)
Patent Activity (2)	Number of annual utility patents granted in the U.S., which are received for all general U.S. inventions	1,028.63 (1,589.51)
Venture Capital Investment (3)	Venture capital investment to U.S. companies (from all sources, including non-U.S.) in millions of current dollars	426.06 (1,012.92)
Entrepreneurial Growth Variables		
Sole Proprietor Growth (1)	Percent change in Nonfarm proprietors employment (NPE), calculated as: ((NPE2000 – NPE1996)/ NPE1996)	10.98 (4.77)
Economic Freedom Index (4)	Composite index measure of state policies that affect individual economic freedom	6.68 (0.50)
Death Tax Law (5)	Dummy=1 if the state levies an estate, inheritance, or gift tax beyond the federal rate	0.32 (0.47)
Tax Limitation Law (6)	Dummy=1 if the state has enacted some form of supermajority tax limitation law	0.28 (0.45)
Minimum Wage (7)	State minimum wage rate in dollars	4.78 (0.11)
Percent with High School Degree (8)	Percent of population receiving a high school degree as their highest level of education (%)	82.88 (4.90)
Percent with College Degree (8)	Percent of population receiving a 4-yr. college degree as their highest level of education (%)	22.99 (4.35)
Percent Males (9)	Percent of the labor force that is male (%)	53.38 (1.19)
Percent White (9)	Percent of the labor force that is White (%)	84.98 (11.78)
Median Age (8)	Median age of the population	34.15 (1.70)
Unemployment Rate (9)	Civilian unemployment rate	5.15 (1.16)
Percent Union Membership (9)	Percent of the labor force holding union membership (%)	12.75 (5.75)
Percent Service Employment (9)	Percent of the labor force that is employed in service industries (%)	21.48 (3.48)
Violent Crime Rate (10)	Number of violent crimes per 100,000 population, which includes murder, rape, robbery, and assault offenses	505.84 (251.95)

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9. U.S. Department of Labor, Bureau of Labor Statistics, *State and Area Labor Force Statistics*, Washington, D.C.
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Appendix 2:

Estimated Determinants of State Entrepreneurial Growth, 1996-2000
Dependent Variable: Natural Log of State Sole Proprietor Growth Rates
(absolute t-statistics in parenthesis)

	(1)	(2)	(3)	(4)
State Policy Variables				
Economic Freedom Index	0.218**	0.217**	0.232**	0.220*
	(2.08)	(2.05)	(2.25)	(2.00)
Death Tax Law	-0.229**	-0.238**	-0.239**	
	(2.38)	(2.44)	(2.47)	
Tax Limitation Law	0.053	0.079		
	(0.48)	(0.71)		
Minimum Wage	-1.023			
	(1.40)			
State Control Variables				
Constant	6.731	1.872	1.372	1.735
	(1.38)	(0.54)	(0.41)	(0.49)
Percent with High School Degree	0.041**	0.028*	0.031**	0.038**
	(2.24)	(1.75)	(2.08)	(2.39)
Percent with College Degree	-0.036**	-0.033**	-0.035**	-0.039**
	(2.33)	(2.11)	(2.34)	(2.46)
Percent Males	-0.035	-0.026	-0.026	-0.037
	(0.66)	(0.49)	(0.48)	(0.66)
Percent White	-0.009	-0.004	-0.004	-0.003
	(1.39)	(0.67)	(0.77)	(0.52)
Median Age	-0.063*	-0.057	-0.053	-0.068*
	(1.77)	(1.58)	(1.50)	(1.85)
Unemployment Rate	0.159**	0.116*	0.124**	0.149**
	(2.45)	(2.01)	(2.21)	(2.54)
Percent Union Membership	-0.039***	-0.041***	-0.044***	-0.046***
	(3.34)	(3.52)	(3.99)	(3.88)
Percent Service Employment	0.049***	0.049***	0.051***	0.058***
	(2.80)	(2.79)	(2.97)	(3.16)
Violent Crime Rate	-0.000	-0.000	0.000	0.000
	(0.34)	(0.06)	(0.14)	(0.17)
Number of Observations	50	50	50	50
R-squared	0.62	0.60	0.59	0.53

Significance Levels are represented by the following: ***1%, **5%, *10%

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