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Entrepreneurship and State Public Policy

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Many state and local governments have focused on enacting policies to promote entrepreneurship in an effort to enhance economic growth. This paper will test the relationship between entrepreneurial activity and state economic freedom in a Granger causality framework. We build a panel data set of freedom scores and entrepreneurial activity measures within the fifty US states from 1981 to 2003, and our results show that, as a whole, economic freedom causes entrepreneurship. However, we find evidence that once entrepreneurs are in place, they increase the size of government spending, which is contradictory to economic freedom.

Key Words: Entrepreneurship, Public Policy, Economic Freedom

I. Public Policy and the Entrepreneur

Many state and local governments have recently focused on enacting policies to promote entrepreneurship in an effort to enhance economic growth, as entrepreneurial activity has long been associated with being the driving force behind economic progress and growth. To date, research has focused mainly on the impact that state or national policies have had on entrepreneurial activity by isolating a few policy indicators or tax measures and testing their impact on entrepreneurship.

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. Thus, death taxes, which directly reduce the ability of entrepreneurs to pass on their entrepreneurial gains to fund future generations of entrepreneurs, lead to less entrepreneurial activity in the states that enact such laws.

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 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. Then, Bruce and Mohsin (2006) goes on to show that federal income, payroll, capital gains, corporate income, and estate taxes can have significant but small effects on entrepreneurial activity in the US states. Bruce's results highlight the overall findings of the previous literature that have

not presented conclusive evidence on the relationship between income tax rates and entrepreneurial activity.

A recent strand of literature has used economic freedom indexes to gauge how effective the local policy environment is to create, or encourage, entrepreneurship. 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. Kreft and Sobel (2005) model the growth of sole proprietorships in the US states and conclude that underlying economic freedoms, measured by a state economic freedom index scores, generate growth in entrepreneurship because there is an institutional environment that is conducive to entrepreneurs.

The aim of the current paper is to extend Kreft and Sobel (2005) to include causality tests between economic freedom indicators and measures of entrepreneurial activity. Specifically, we run Granger causality test between economic freedom and two measures of entrepreneurship: sole proprietors and patent activity in the fifty US states from 1981-2003. Our results suggest that economic freedom does cause entrepreneurship, especially in regard to two of the major components of economic freedom: labor market flexibility and low taxation. However, we also find that entrepreneurial activity causes growth in the size of government spending, which is correlated with a reduction in economic freedom. Thus, we demonstrate that proper tax construction and labor market regulation can attract and promote entrepreneurship; however, once a base of entrepreneurs is generated within a given state, they will effectively elicit financial support form the governing body.

II. Economic Freedom

Generally economic freedom 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. The freedom index that we use is developed by Karabegovic, McMahon, and Black (2006), and is a composite index measure of many public policies that affect the economic freedom of individuals in the fifty US states. Within this index, a higher freedom score in one state signals more economic freedom exist in that state relative to others.

The authors construct two different freedom indexes that differ by what government levels are included in the index's coverage. First, an index is created that reflects the policies that are put in place by federal, state, and local governments (what is referred to as the all-government economic freedom index). Second, an index is created that reflects the policies that are put in place by state and local governments only (what is referred to as the state and local government economic freedom index). Furthermore, each freedom index can be broken down into three major components: (1) size of government, (2) takings and discriminatory taxation, and (3) labor market freedom. First, the size of government is based on general government expenditures, transfer payments, and subsidies. Second, government taxation incorporates total government revenue from own sources, income tax rates and thresholds, indirect taxes, and sales taxes. Third, the labor market flexibility is based on minimum wage earnings, government employment, occupational licensing, and union density.

Given this structure of the economic freedom index, there are eight different freedom scores to analyze for each state as both the all-government index and the state and local index can be analyzed in terms of the overall composite index and its three component scores. What we intend to do within this paper is test for the direction of causality between entrepreneurial activity and the various economic freedom scores within the fifty US states. In line with Kreft and Sobel (2005) we expect that economic freedom will cause entrepreneurship in a given state because there is an institutional environment that is conducive to entrepreneurs. Stated another way, we believe that entrepreneurial activity will flow to the areas of highest economic freedom, so it is freedom that proceeds entrepreneurship.

III. Data and Granger Causality Model

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), Farr, Lord, and Wolfenbarger (1998), and Kreft and Sobel (2005) state fixed effects are included in each regression specification to avoid the possible bias by controlling for any state-specific influences.[1] Specifically, the effect of the state fixed

[1] The state fixed effects coefficient estimates are not reported with the causality regression results but are available on request to the authors.

effects is to remove the cross-sectional differences of the states, while leaving only the time series variations to be analyzed.[2]

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.

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

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

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.

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

[2] The Granger causality framework and the testing procedures involved are still somewhat controversial in economics. Obvious limitations to the methodology (like Christmas card sales causing Christmas) are discussed and highlighted in Bishop (1979).

that $\beta_w = 0$ for w=1,…,W. Rejecting the null hypothesis would show that Y Granger causes X.

(Insert Table 1 about here)

This modified Granger-Sims causality framework is used to run causality tests between the various economic freedom scores and our two measures of entrepreneurial activity: sole proprietorships and patent activity in the United States between 1981 and 2003. The first measure, sole proprietors, is widely supported in the literature as a viable indicator of entrepreneurial activity; however the second measure, patent activity, was introduced by Kreft and Sobel (2005). Descriptions of all variables used in this paper, along with the sources of this data, are given in Table 1.

IV. Granger Causality Test Results

First we performed tests to determine the direction of causality between the two measures of state entrepreneurship: patent activity and sole proprietors, and the results are presented in Table 2. Our results reveal that dual causality exists between sole proprietors and patent activity. The dual causality result is not surprising considering that sole proprietors and patent activity are intended to measure the same thing—the level of entrepreneurial activity.

(Insert Table 2 about here)

Next we perform tests to determine the direction of causality between entrepreneurship and the overall composite freedom scores for both the all-government index and the state and local index, and the results are presented in Table 3. Examining the all government index, specifications (1 and 3) together reveal that economic freedom

causes patent activity, while specifications (2 and 4) together reveal no causal relationship exists between economic freedom and sole proprietors. These results are slightly different when examining the state and local index. Specifications (5 and 7) together reveal that no casual relationship exists between patent activity and economic freedom, while specifications (6 and 8) together show us that economic freedom causes sole proprietors.

(Insert Table 3 about here)

Taken as a whole, our results from the composite index causality tests gives some support that economic freedom is causing entrepreneurship; however the support is not overwhelming as the casual relationship between the two measures of entrepreneurship is impacted by which freedom index you are examining. This prompted us to analyze the individual components of economic freedom: (1) size of government, (2) government taxation, and (3) labor market freedom, to see if stronger casual relationships can be found between entrepreneurship and the components of economic freedom. We will present the results of this exercise next.

The causality test results between entrepreneurship and the economic freedom component 1 (size of government) scores for both the all-government index and the state and local index presented in Table 4. Examining the all government index, specifications (1 and 3) together reveal that patent activity causes the size of government component of economic freedom and specifications (2 and 4) together confirm this finding when using sole proprietors. Furthermore, when examining the state and local index, the results remain the same: specifications (5 and 7) together reveal that patent activity causes the

size of government component of economic freedom and specifications (6 and 8) together reveal the same relationship when using sole proprietors.

(Insert Table 4 about here)

The coefficient estimates of patent activity in specification (1 and 5) and sole proprietors in specification (2 and 6) being negative suggest that higher levels of entrepreneurial activity lead to a decrease in the freedom score generated by the size of government. A decrease in freedom component 1 signals an increase in government spending, subsidizing, and transfer payments. So basically, our results suggest that once entrepreneurship is prevalent in a given state there is a higher rate of government spending that follows, which we feel shows the lobbying presence of entrepreneurs and the ability of them to elicit higher transfers from government. This follows closely the literature on entrepreneurial survival rates, such as Holtz-Eakin, Joulfaian, and Rosen (1994), Blanchflower and Oswald (1998), and Kreft and Sobel (2005) that present evidence that financial support is vital to the survival of entrepreneurial ventures.

The causality test results between entrepreneurship and the economic freedom component 2 (government taxation) scores for both the all-government index and the state and local index are presented in Table 5. Examining the all government index, specifications (1 and 3) together reveal that economic freedom causes patent activity, while specifications (2 and 4) together reveal no causal relationship exists between economic freedom and sole proprietors. Again, these results are slightly different when examining the state and local index. Specifications (5 and 7) together reveal that no casual relationship exists between patent activity and economic freedom, while specifications (6 and 8) together show us that economic freedom causes sole proprietors.

(Insert Table 5 about here)

These results suggest that there is some evidence that low taxation causes entrepreneurship, however the support is not overwhelming as the casual relationship between the two measures of entrepreneurship is impacted by which freedom index you are examining. This would seem to support the overall findings of the taxation literature thus far, which has had trouble conclusively showing that taxation has a significant impact on entrepreneurship. See Bruce and Mohsin (2006) for a discussion on the mixed results concerning the link between taxation and entrepreneurial activity.

The causality test results between entrepreneurship and the economic freedom component 3 (labor market freedom) scores for both the all-government index and the state and local index are presented in Table 6. Examining the all government index, specifications (1 and 3) together reveal that the labor market freedom component causes patent activity and specifications (2 and 4) together confirm this finding when using sole proprietors. Furthermore, when examining the state and local index, the results remain the same: specifications (5 and 7) together reveal that the labor market freedom component causes patent activity and specifications (6 and 8) together reveal the same relationship when using sole proprietors.

(Insert Table 6 about here)

This result that labor market freedom causes entrepreneurial activity demonstrates that policies directed towards flexibility in the labor market could be successful tools in attracting and promoting entrepreneurship in the states. For example, “right to work states” or states without increased minimum wage laws over the federal level would enhance the environment for entrepreneurship.

V. Conclusions

Within this paper we extended the work of Kreft and Sobel (2005) to include causality tests between economic freedom indicators and measures of entrepreneurial activity. Specifically, we ran Granger causality test between economic freedom and two measures of entrepreneurship: sole proprietors and patent activity in the fifty US states from 1981-2003. Our results suggest that economic freedom does cause entrepreneurship, especially in regard to two of the major components of economic freedom: labor market flexibility and low taxation. However, we also find that entrepreneurial activity causes growth in the size of government spending, which is correlated with a reduction in economic freedom. Thus, we demonstrate that proper tax construction and labor market regulation can attract and promote entrepreneurship; however, once a base of entrepreneurs is generated within a given state, they will effectively elicit financial support form the governing body.

The direction that we would like to pursue next would be to gather international data on entrepreneurial activity and see if the same directions of causality hold with the different economic freedom indexes and components. The difficulty in this extension rests in finding a consistent measure of entrepreneurial activity across several nations over time.

Table 1: Data Description and Sources

Variable Name *(source)*	Description	Mean	St. Dev
Measures of Entrepreneurial Activity			
Sole Proprietors *(1)*	Annual Non-farm proprietors employment as revealed through income tax data	419288.5	504617.8
Patent Activity *(2)*	Number of annual utility patents granted in the U.S., which are received for all general U.S. inventions	1150.8	1870.1
Economic Freedom Scores			
All Government Economic Freedom Index *(3)*	Composite index measure of federal, state, and local policies that affect individual economic freedom	6.5	0.6
All Government Component 1	Size of Government	7.3	0.8
All Government Component 2	Takings and Discriminatory Taxation	5.8	0.9
All Government Component 3	Labor Market Freedom	6.5	0.8
State and Local Government Economic Freedom Index *(3)*	Composite index measure of state and local policies that affect individual economic freedom	6.9	0.7
State Government Component 1	Size of Government	7.4	1.0
State Government Component 2	Takings and Discriminatory Taxation	6.9	0.8
State Government Component 3	Labor Market Freedom	6.5	0.9

(1) U.S. Department of Commerce, Bureau of Economic Analysis, *State and Local Area Data*, Washington, D.C.
(2) U.S. Patent and Trademark Office, *Utility Patent Counts by Country/State and Year*, Washington, D.C.
(3) Karabegovic, McMahon, and Black *Economic Freedom of North America* (2006).

Table 2:
Patent Activity and Sole Proprietors, 1981-2003
(absolute t-stats)

	Patent Activity	Sole Proprietors
	(1)	(2)
Patent Activity (t-1)	913.072***	2926.063*
	(63.60)	(1.92)
Sole Proprietors (t-1)	88.613***	97866.586***
	(9.94)	(103.38)
F-statistic [1, 1048]	98.79***	3.68*
Results	Sole Proprietors Causes Patent Activity	Patent Activity Causes Sole Proprietors
R-squared	0.99	0.99
Number of Observations	1100	1100

Significance Levels are represented by the following: ***1%, **5%, *10%
Notes: State Fixed effects were included in each regression specification and the coefficient estimates are available upon request.

Table 3:
Entrepreneurship and Composite Economic Freedom, 1981-2003
(absolute t-stats)

	Economic Freedom		Patent Activity	Sole Proprietors
All Government Economic Freedom Index	(1)	(2)	(3)	(4)
Freedom (t-1)	0.802***	0.800***	44.581***	819.089
	(63.43)	(60.47)	(2.98)	(0.51)
Patent Activity (t-1)	0.005		1030.026***	
	(0.81)		(130.18)	
Sole Proprietors (t-1)		0.001		99325.216***
		(0.84)		(189.13)
F-statistic [1, 1048]	0.66	0.71	8.87***	0.26
Results	Patent Activity Does Not Cause Freedom	Sole Proprietors Does Not Cause Freedom	Freedom Causes Patent Activity	Freedom Does Not Cause Sole Proprietors
R-squared	0.93	0.93	0.98	0.99
Observations	1100	1100	1100	1100
State and Local Government Economic Freedom Index	(5)	(6)	(7)	(8)
Freedom (t-1)	0.759***	0.759***	27.323	3992.445*
	(44.75)	(44.86)	(1.29)	(1.86)
Patent Activity (t-1)	0.001		1033.750***	
	(0.18)		(131.96)	
Sole Proprietors (t-1)		0.002		99293.763***
		(0.40)		(201.49)
F-statistic [1, 1048]	0.03	0.16	1.67	3.47*
Results	Patent Activity Does Not Cause Freedom	Sole Proprietors Does Not Cause Freedom	Freedom Does Not Cause Patent Activity	Freedom Causes Sole Proprietors
R-squared	0.95	0.95	0.98	0.99
Observations	1100	1100	1100	1100

Significance Levels are represented by the following: ***1%, **5%, *10%
Notes: State Fixed effects were included in each regression specification and the coefficient estimates are available upon request.

Table 4:
Entrepreneurship and Freedom Component 1: Size of Government, 1981-2003
(absolute t-stats)

	Economic Freedom		Patent Activity	Sole Proprietors
All Government Economic Freedom Component 1	(1)	(2)	(3)	(4)
Freedom (t-1)	0.879***	0.877***	26.300	-428.637
	(57.63)	(57.61)	(1.64)	(0.26)
Patent Activity (t-1)	-0.023***		1035.024***	
	(3.08)		(133.87)	
Sole Proprietors (t-1)		-0.017***		99422.095***
		(3.63)		(203.46)
F-statistic [1, 1048]	9.49***	13.16***	2.69	0.07
Results	Patent Activity Causes Freedom 1	Sole Proprietors Causes Freedom 1	Freedom 1 Does Not Cause Patent Activity	Freedom 1 Does Not Cause Sole Proprietors
R-squared	0.95	0.95	0.98	0.99
Observations	1100	1100	1100	1100
State and Local Government Economic Freedom Component 1	(5)	(6)	(7)	(8)
Freedom (t-1)	0.851***	0.844***	-1.097	-323.823
	(55.109)	(53.94)	(0.09)	(0.27)
Patent Activity (t-1)	-0.024**		1035.323***	
	(2.39)		(133.46)	
Sole Proprietors (t-1)		-0.021***		99398.956***
		(3.24)		(199.81)
F-statistic [1, 1048]	5.69**	10.49***	0.01	0.07
Results	Patent Activity Causes Freedom 1	Sole Proprietors Causes Freedom 1	Freedom 1 Does Not Cause Patent Activity	Freedom 1 Does Not Cause Sole Proprietors
R-squared	0.93	0.93	0.98	0.99
Observations	1100	1100	1100	1100

Significance Levels are represented by the following: ***1%, **5%, *10%
Notes: State Fixed effects were included in each regression specification and the coefficient estimates are available upon request.

Table 5:
Entrepreneurship and Freedom Component 2: Government Taxation, 1981-2003
(absolute t-stats)

	Economic Freedom		Patent Activity	Sole Proprietors
All Government Economic Freedom Component 2	(1)	(2)	(3)	(4)
Freedom (t-1)	0.782***	0.783***	15.609*	-861.804
	(46.59)	(46.15)	(1.68)	(0.90)
Patent Activity (t-1)	0.014		1034.725***	
	(0.97)		(133.72)	
Sole Proprietors (t-1)		0.001		99488.776***
		(0.15)		(201.49)
F-statistic [1, 1048]	0.94	0.02	2.81*	0.81
Results	Patent Activity Does Not Cause Freedom 2	Sole Proprietors Does Not Cause Freedom 2	Freedom 2 Causes Patent Activity	Freedom 2 Does Not Cause Sole Proprietors
R-squared	0.83	0.83	0.98	0.99
Observations	1100	1100	1100	1100
State and Local Government Economic Freedom Component 2	(5)	(6)	(7)	(8)
Freedom (t-1)	0.713***	0.715***	-9.629	3072.780**
	(37.57)	(37.69)	(0.62)	(1.96)
Patent Activity (t-1)	0.014		1035.584***	
	(1.47)		(133.72)	
Sole Proprietors (t-1)		0.008		99463.619***
		(1.39)		(203.75)
F-statistic [1, 1048]	2.17	1.95	0.39	3.85**
Results	Patent Activity Does Not Cause Freedom 2	Sole Proprietors Does Not Cause Freedom 2	Freedom 2 Does Not Cause Patent Activity	Freedom 2 Causes Sole Proprietors
R-squared	0.91	0.91	0.98	0.99
Observations	1100	1100	1100	1100

Significance Levels are represented by the following: ***1%, **5%, *10%
Notes: State Fixed effects were included in each regression specification and the coefficient estimates are available upon request.

Table 6:
Entrepreneurship and Freedom Component 3: Labor Market Freedom, 1981-2003
(absolute t-stats)

	Economic Freedom		Patent Activity	Sole Proprietors
All Government Economic Freedom Component 3	(1)	(2)	(3)	(4)
Freedom (t-1)	0.889***	0.886***	25.548***	2369.765**
	(122.03)	(110.20)	(2.75)	(2.28)
Patent Activity (t-1)	0.001		1027.706***	
	(0.08)		(125.36)	
Sole Proprietors (t-1)		0.004		98744.297***
		(0.95)		(172.72)
F-statistic [1, 1048]	0.01	0.90	7.58***	5.17**
Results	Patent Activity Does Not Cause Freedom 3	Sole Proprietors Does Not Cause Freedom 3	Freedom 3 Causes Patent Activity	Freedom 3 Causes Sole Proprietors
R-squared	0.96	0.96	0.99	0.99
Observations	1100	1100	1100	1100
State and Local Government Economic Freedom Component 3	(5)	(6)	(7)	(8)
Freedom (t-1)	0.873***	0.868***	37.087***	3113.862**
	(87.15)	(80.38)	(2.90)	(2.22)
Patent Activity (t-1)	-0.002		1027.638***	
	(0.28)		(125.98)	
Sole Proprietors (t-1)		0.003		98830.042***
		(0.77)		(177.65)
F-statistic [1, 1048]	0.08	0.59	8.40***	4.91**
Results	Patent Activity Does Not Cause Freedom 3	Sole Proprietors Does Not Cause Freedom 3	Freedom 3 Causes Patent Activity	Freedom 3 Causes Sole Proprietors
R-squared	0.97	0.97	0.99	0.99
Observations	1100	1100	1100	1100

Significance Levels are represented by the following: ***1%, **5%, *10%
Notes: State Fixed effects were included in each regression specification and the coefficient estimates are available upon request.

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