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A Spatial Analysis of Entrepreneurship and Institutional Quality: Evidence from U.S. Metropolitan Areas

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Abstract. This paper uses the Stansel (2013) economic freedom index for a maximum of 375 U.S. metropolitan areas to estimate the effect of economic freedom on entrepreneurship while controlling for spatial dependence. This paper finds statistically significant evidence that increases in economic freedom in one area result in increases in entrepreneurial activity in neighboring areas. Furthermore, the total (direct plus indirect) effects of an increase in economic freedom on entrepreneurship are positive and statistically significant, indicating that a positive-sum game is present. However, these effects are small in magnitude. In order to explain a cumulative one standard deviation increase in either one of the entrepreneurial measures presented in this paper, there would have to be an increase in the freedom index equivalent to moving from the least-free area to the most-free area.

1. Introduction

It has long been noted that entrepreneurs are an important component of the market process and are key to economic growth (Bronfenbrenner, 1960; Kirzner, 1973; Knight, 1921; Schumpeter, 1934). There have been numerous studies empirically testing this idea, finding a positive relationship between entrepreneurship and economic growth (Henderson, 2002; Wiseman and Young, 2013; Hafer, 2013). Furthermore, Baumol (1990) argues that since institutions determine the rules of the game under which an entrepreneur acts, institutional quality is an important determinant of entrepreneurial activity. Consequently, there is a large body of literature that examines the relationship between institutions and entrepreneurship.

In order to test this relationship, many researchers utilize the Fraser Institute's cross-country economic freedom index, which has been cited in Social Science Citation Index journals over 402 times (Hall and Lawson, 2014), as a proxy for institutional quality. A majority of these cross-country studies that look at the relationship between economic freedom and entrepreneurship have found there to be a positive relationship (Sobel et al., 2007; Nyström, 2008; Bjørnskov and Foss, 2008). In addition, there have been many studies utilizing the analogous Economic Freedom of North America (EFNA) state-level economic freedom index to link entrepreneurship and economic freedom at the sub-national levels (Kreft and Sobel, 2005; Sobel, 2008; Hall and Sobel, 2008; Hall et al., 2013; Wiseman and Young, 2013). Economic freedom has also been shown to correlate with other economic outcomes such as income levels and growth rates (Dawson, 1998; Hall et al., 2010; Cebula, 2011; Ashby et al., 2013; Cebula et al., 2013), lower income inequality (Bennet and Vedder, 2013), overall subjective well-being (Bjørnskov et al., 2010; Belasen and Hafer, 2013), and migration patterns (Cebula and Clark, 2011; Mulholland and Hernández-Julián, 2013).[1]

Both the cross-country and state-level economic freedom scores are proxies for institutions consistent

[1] Many of the above studies appear in a special issue on economic freedom in *The Journal of Regional Analysis and Policy* (2013, Vol. 43(1)), with Joshua Hall appearing as a guest editor.

with the definition and enforcement of property rights, as well as the size and scope of the government (Gwartney et al., 2013; Stansel and McMahon, 2013). Thus, given this wealth of empirical studies, it seems that economic freedom is a crucial determinant of entrepreneurial activity, and therefore economic growth.

Following the methodology of the EFNA index, Stansel (2013) has recently developed an economic freedom index for 384 U.S. metropolitan areas.[2] This allows researchers to look at the freedom-entrepreneurship relationship at a much more localized level than was possible in previous research. As shown in Figure 1, this metropolitan area economic freedom index is positively correlated with two different measures of entrepreneurial activity, namely establishment birth rates and proprietorship growth rates.[3] The goal of this paper is to take advantage of this new index as a proxy for institutional quality and the large number of U.S. metropolitan areas to allow for spatial dependence in entrepreneurial activity, as well as spatial dependence in its determinants. This is the first paper to test for potential spillovers across metropolitan areas when looking at the relationship between economic freedom and entrepreneurship.

If institutional quality is an important determinant of entrepreneurial activity, and both entrepreneurial activity and institutional quality exhibit spatial dependence, then existing studies may be missing an important aspect of reality. Doing so may be problematic for two reasons. First, if spatial effects are important, then ignoring neighbors' changes in institutional quality will result in omitted variable bias. Second, changes in the institutional quality of an economy may have an effect on not only its own level of entrepreneurial activity, but also that of its neighbors; the latter (indirect) effects may be larger and/or qualitatively different than the former (direct) effects. Thus, it will be important to calculate both direct and indirect effects.

This idea that spillovers are likely to exist between metropolitan areas can be illustrated with an example. Erie, PA, is a single county metropolitan area located entirely in Pennsylvania; however this metropolitan borders the states of New York and Ohio. Erie also tends to have a lower sales tax rate than neighboring areas, and anecdotal evidence indicates that Erie is a regional retail center for nearby areas (Kurre, 2006). Thus, if Erie would substantially cut its sales tax rates, a significant number of consumers in New York may start traveling to Erie to make their purchases rather than going to closer metropolitan areas in New York. This increase in business activity in Erie may further spur business activity as it creates more opportunities for entrepreneurial activities, since now entrepreneurs are able to attract more consumers from neighboring areas simply due to a lower sales tax rate.

As shown in Figure 2 and Figure 3, two different measures of metropolitan area entrepreneurial activity tend to cluster across the U.S. Metropolitan areas in the northeast region of the country generally have low establishment birth rates (Figure 2) and many of the metropolitan areas in the western region of the country experience similar percentage changes in the total number of proprietors (Figure 3). The Stansel (2013) economic freedom index also seems to exhibit spatial dependence, as many of the least-free metropolitan areas are clustered in the western portion of the country and the most-free areas are clustered in the southeastern portion of the country (Figure 4). Thus, spatial dependence appears to be present in both entrepreneurial activity itself and an important determinant of entrepreneurial activity, namely economic freedom.

In general, this spatial dependence is plausible for at least two reasons. First, as Holcombe (1998) argues, the most important source of entrepreneurial activity is the presence of other entrepreneurs, thus entrepreneurial activity may cluster throughout space simply because entrepreneurial activity is dependent upon other entrepreneurial activities. Second, there may be clusters of entrepreneurs due to spatial dependence amongst potential determinants of entrepreneurship, such as institutional quality.[4]

Empirically, there have been studies suggesting that both of the above general factors may be contributing to the spatial dependence of entrepreneurs. For example, Delgado, Porter, and Stern (2010) show that clusters of economic activity increase entrepreneurship, indicating that entrepreneurial activity itself has a significant amount of spatial dependence. In regards to the second reason, Kelejian et al. (2013) re-examine the determinants of institutional quality across countries and find that institutional spillovers

[2] Stansel (2013) specifically starts from the methodology outlined in the 2011 EFNA report (Ashby et al., 2011).

[3] Data will be explained further in the data section of the paper. See Table 1 for sources and brief descriptions.

[4] For example, Audretsch and Keilbach (2007) argue that because of knowledge spillovers and cultural factors entrepreneurial capital shows significant spatial autocorrelation and does spill over to neighboring regions.

from one country to neighboring countries are both economically and statistically significant. In fact, they find that these institutional spillovers are *more* economically important than some of the previous proposed determinants of institutions, such as legal origin. Using the example from above, New York metropolitan areas may respond to lower sales tax rates in Erie by cutting sales tax rates in their own metropolitan area in order to gain back those customers.

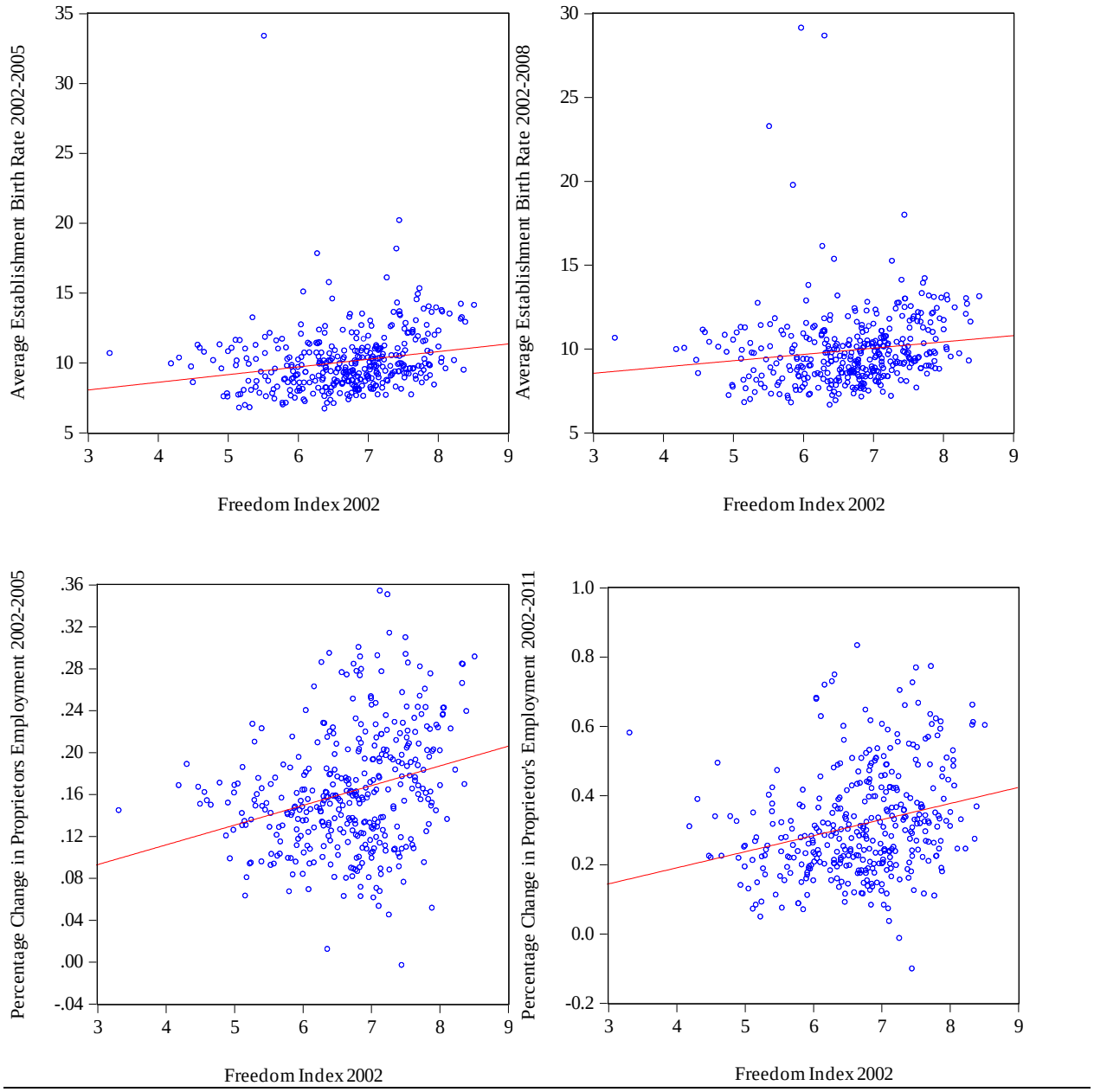

Figure 1. Freedom index and average establishment birth rate (top) and percentage change in proprietor's employment (bottom).

Source: Average establishment birth rate data from the U.S. Small Business Administration.
Proprietorship data from the U.S. Bureau of Economic Analysis. Freedom Index data from Stansel (2013).

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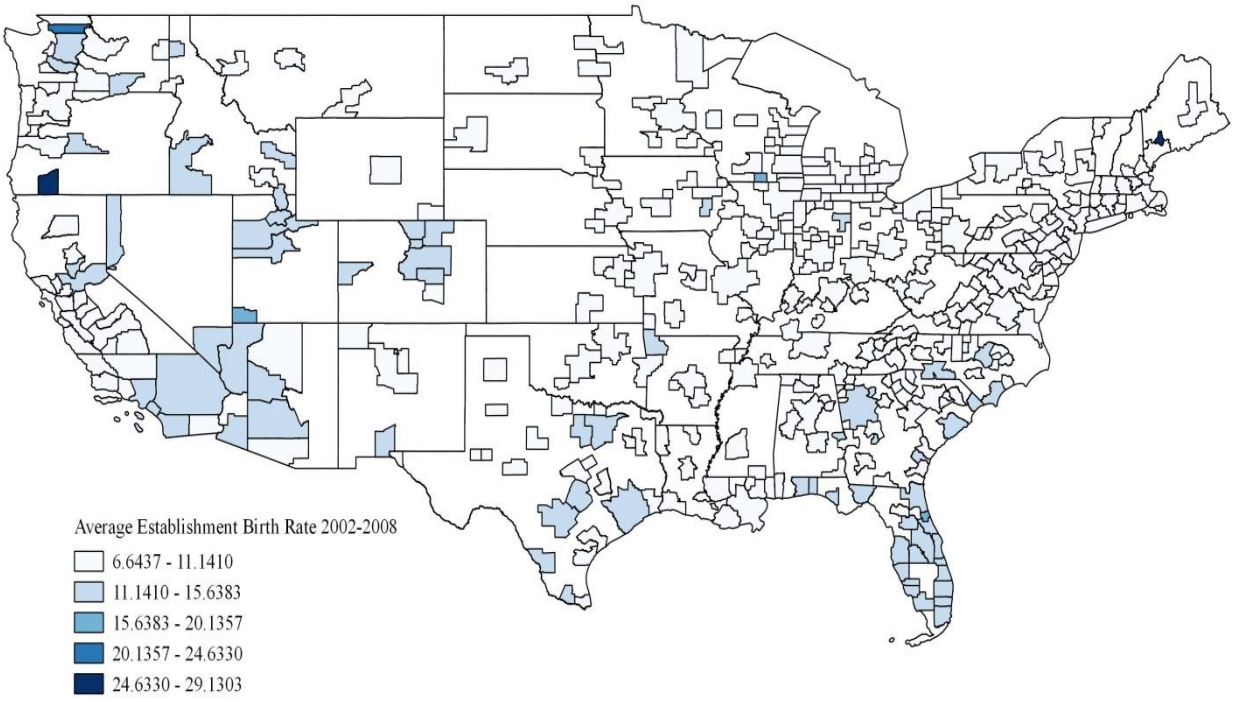

Figure 2. Average establishment birth rate from 2002-2008 by metropolitan area.
Source: U.S. Small Business Administration. Average annual number of new establishment births as % of existing firms (2002-2008 period).

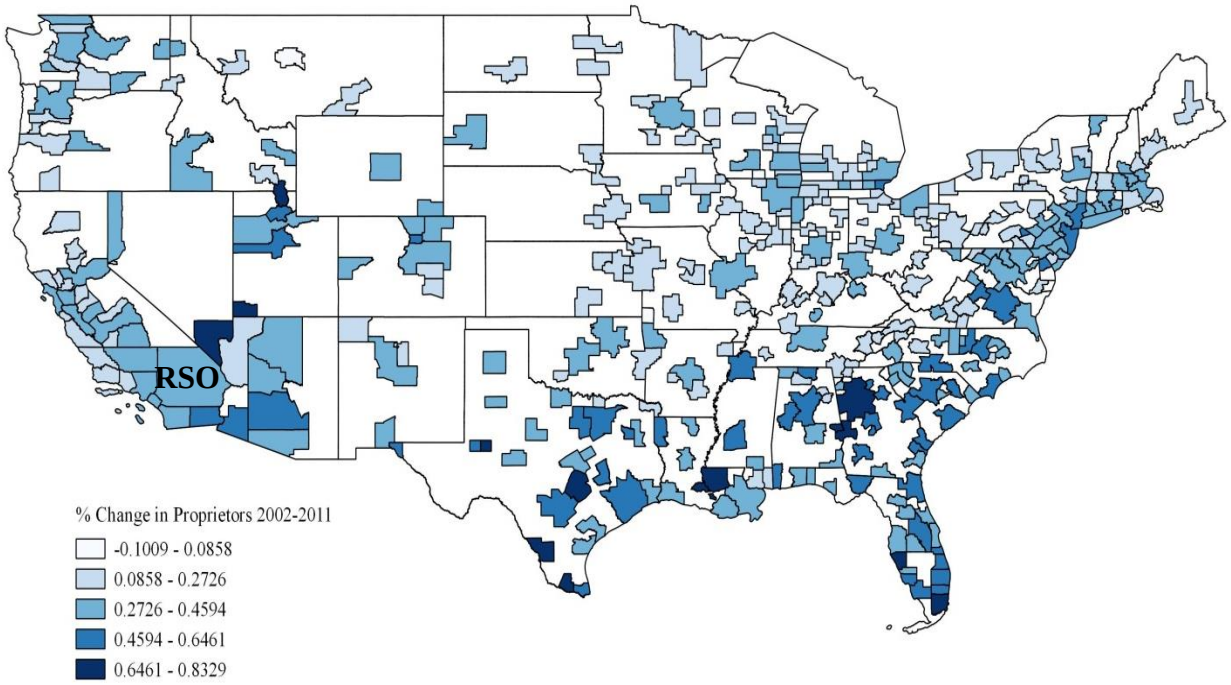

Figure 3. Cumulative percentage change of proprietors from 2002-2008 by metropolitan area.
Source: U.S. Bureau of Economic Analysis. Percentage change in nonfarm proprietors employment from 2002-2011.

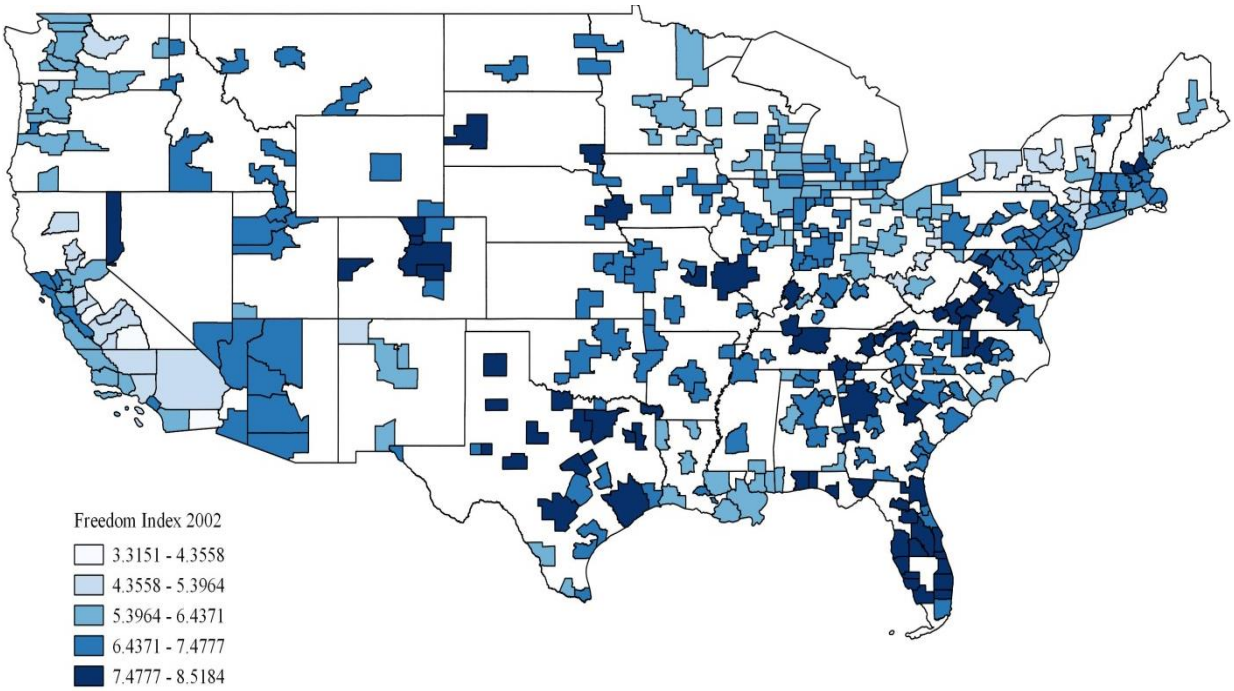

Figure 4. Freedom Index by metropolitan area in 2002.
Source: Stansel (2013) metropolitan area economic freedom index for the year 2002. Index is on a scale of 0-10 with 10 meaning more economic freedom.

In addition, Cebula and Clark (2011) find that people tend to migrate to areas with a greater amount of economic freedom. This increase in migration may further increase business activity in those more economically free areas. Thus, entrepreneurial activity may be clustered in space simply because the factors that determine entrepreneurial activity cluster in space and because people in general are attracted to areas with more economic freedom.

It is likely that both of these factors are important in determining entrepreneurial activity. LeSage and Pace (2009) show that a seemingly non-spatial model (OLS) can lead to a common spatial econometric model, a Spatial Durbin Model (SDM), if there is *any* omitted variable that is spatially dependent and correlated with an included variable.[5] This is highly plausible in the case of entrepreneurship, as entrepreneurs are defined as agents acting on *unknown* profit opportunities, and it is impossible to predict their actions with complete accuracy. Thus, it will be important to control for spatial dependence of entrepreneurial activities on other entrepreneurial activities, as well as spatial dependence in determinants of entrepreneurial activities, in order to minimize the bias.

The analysis by Hall and Sobel (2008) seems to be the only study that attempts to estimate the impact economic freedom has on entrepreneurial activity while incorporating spatial dependence into the model. However, their paper does not allow for spatial dependence in the explanatory variables and does not interpret the difference between direct and indirect effects, both of which have been recently emphasized in the literature as being important in spatial models (LeSage and Pace, 2009). In addition, the paper by Hall and Sobel (2008) is conducted using state-level data. Therefore, this paper expands upon Hall and Sobel (2008) by using Stansel's (2013) metropolitan area economic freedom index to analyze the effect of institutional quality on entrepreneurial activity across a large number of U.S. metropolitan areas while explicitly allowing for spatial dependence in both the dependent and independent variables. This paper will also present both the properly calculated direct *and* indirect effects.

In doing so this provides answers to two questions. First, is institutional quality in a metropolitan area positively associated with entrepreneurial activity in that area? Second, is institutional quality

[5] A Spatial Durbin Model (SDM) assumes there is spatial dependence in both the dependent variable and the explanatory variables. This model is thought to minimize bias. Different types of spatial econometric models will be discussed in the methodology section of this paper.

in a metropolitan area also positively associated with entrepreneurial activity in neighboring areas, or, alternatively, is it unrelated or even negatively associated with that neighboring activity? Conditional on an affirmative answer to the first question, the answer to the second question is critical to understanding whether changes in institutional quality have positive-, zero-, or negative-sum effects on entrepreneurial activity across U.S. metropolitan areas. For example, increases in an area's institutional quality may increase entrepreneurship in that area, but largely because entrepreneurs are being attracted *away* from neighboring areas. By estimating the indirect effect on neighboring areas (as well as the direct effect on the own-area) this paper provides evidence on whether the total effect is positive-, zero-, or negative-sum.[6]

The measures of entrepreneurial activity used are constructed following the previous literature. The first measure is the average establishment birth rate and the second is the cumulative growth rate of proprietors.[7] Furthermore, there are several controls included in addition to the economic freedom index that are standard in the literature. This data is then used to estimate the effect economic freedom has on subsequent entrepreneurial outcomes, after controlling for spatial dependence.

Previewing the results, this paper reports statistically significant evidence of positive spillovers in entrepreneurial activity associated with changes in institutional quality. In addition, while the direct effects are positive, they are statistically insignificant and smaller in magnitude than the cumulative spillovers resulting from a change in institutional quality. This indicates that spillovers from institutional quality may be cumulatively *more* important in determining entrepreneurial activity than direct effects, suggesting the previous literature has missed a key part of the analysis.

Furthermore, the estimated total (direct plus indirect) effect of an increase in a metropolitan area's economic freedom score on entrepreneurship, while small in magnitude, is positive and statistically significant. Thus, there is evidence of a positive-sum game. Improvements in institutional quality in an area increase entrepreneurial activity in that area because the new institutional environment is conducive to entrepreneurial activity (direct effect) and the new institutional environment and increased entrepreneurial activity result in *positive* spillovers in neighboring areas (indirect effects).

Lastly, while the positive relationship between economic freedom and entrepreneurship is fairly robust, the results seem sensitive to the area of the country being studied. Specifically, when comparing the effects of economic freedom on entrepreneurship in metropolitan areas east of the Mississippi River versus metropolitan areas west of the Mississippi River, the magnitude and statistical significance of the direct, indirect, and total effects change. This suggests that there may be important differences in the effect economic freedom has on entrepreneurship throughout different regions of the country.

The remainder of the paper is organized as follows. Section 2 provides a further review of the relevant literature. Section 3 provides a description of the data, with an emphasis on the time period being studied. Model specification and testing are offered in Section 4, while the results using the properly specified model are given in Section 5. Conclusions are offered in Section 6.

2. Institutional quality and entrepreneurship

At the national level, there have been several studies linking specific qualities of institutions to entrepreneurial activity. Nyström (2008), Bjørnskov and Foss (2008), and Sobel et al. (2007) all use the Economic Freedom of the World (EFW) Index, published by the Fraser Institute, as their measure of institutional quality. This index has five components and is designed to measure the extent to which institutions in each country,protect individuals and their property from aggression from others (Gwartney et al., 2013).

Using a panel data set and self-employment as a measure of entrepreneurial activity, Nyström (2008) finds that the EFW index components representing institutions that have a smaller government sector, less regulation, better legal structure, and secure property rights tend to increase entrepreneurship. Bjørnskov and Foss (2008) and Sobel et al. (2007) analyze the relationship using cross-country data from the Kauffman Foundation's Global Entrepreneurship Monitor (GEM) as their entrepreneurship

[6] The estimates of effects are explained in the results section of the paper.

[7] For example, Sobel (2008) uses both average establishment birth rate and cumulative percentage change of sole proprietorships as a proxy for productive entrepreneurship in a state-level study. The establishment birth rate data comes from the U.S. Small Business Administration. The sole proprietorship data comes from the U.S. Bureau of Economic Analysis's estimate of total nonfarm proprietorship employment.

measures. Bjørnskov and Foss (2008) find that the size of government has a negative impact on entrepreneurship, while access to sound money has a positive impact. Similarly, Sobel et al. (2007) find that productive entrepreneurship depends on both the freedom to succeed and the discipline of failure that free markets provide. All of these results indicate that economic freedom has a positive impact on productive entrepreneurial activity.

In addition, there have also been several studies linking institutional quality to entrepreneurship at the sub-national level. Kreft and Sobel (2005) use U.S. state-level economic freedom data from the Economic Freedom of North American (EFNA) index as a proxy for institutional quality and both sole proprietorships and patent activity as measures of entrepreneurship to find a positive relationship between the EFNA index and these entrepreneurial activities. In addition, they find that certain demographic and economic control variables, such as median age, employment industry structure, and educational indicators, were important in determining entrepreneurial activities within a state.

Sobel (2008) also uses U.S. state-level scores to examine the impact the EFNA index has on entrepreneurship. However, Sobel's paper explicitly distinguishes between both productive and unproductive entrepreneurial activities. Productive entrepreneurship is measured using venture capital investments per capita, patents per capita, the growth rate of self-employment, and establishment birth rates, while unproductive entrepreneurship is calculated using three measures developed in Sobel and Garrett (2002). Sobel (2008) finds that the EFNA index is positively related to productive entrepreneurship and negatively related to unproductive entrepreneurship. The focus of this paper will be exclusively on productive entrepreneurship.

Hall et al. (2013) complete a U.S. state-level analysis similar to those given above; however, they use a more general measure of freedom than those included in the EFNA index to proxy for institutional quality. They use the Freedom in the 50 States index developed by Ruger and Sorens (2011). This index includes variables that proxy for both personal and economic freedoms. Hall et al. (2013) find that there is a positive and statistically significant relationship between overall freedom and entrepreneurship.

Overall, these studies suggest that there is a positive relationship between institutional quality and entrepreneurial activities. However, as mentioned above, these studies ignore spatial dependence. The only known study that examines the impact economic freedom has on entrepreneurship, while including spatial dependence, is an analysis by Hall and Sobel (2008).

Using the Kaufman Foundation's state-level measure of entrepreneurship, the *Kauffman Index of Entrepreneurial Activity* (KIEA), and the EFNA index, Hall and Sobel (2008) find a positive relationship between economic freedom and entrepreneurial activity at the U.S.-state level of analysis. They estimate this relationship using ordinary least squares (OLS), a spatial autoregressive model (SAR model), and a spatial error model (SEM model). However, the paper did not estimate the relationship using the Spatial Durbin Model (SDM) or a Spatial Lag of X (SLX) model. The SAR model only accounts for spatial dependence in the dependent variable, the SEM model only accounts for spatial dependence in the error term, and the SDM model accounts for spatial dependence in both the dependent and independent variables. Since many of the determinants of entrepreneurial activity are likely to exhibit some sort of spatial dependence, the SDM model is likely to be most appropriate.

In addition, Hall and Sobel (2008) did not calculate direct, indirect, or total effects estimates for the variables included in their model. This is important since they are using a SAR model. Since the time of the paper's publication, LeSage and Pace (2009) have emphasized that in any spatial model that includes a spatial lag of the dependent variable, such as the SDM or SAR models, spillover and feedback effects can arise, causing the interpretations of these models to be more complex than in the simple OLS case.

For example, an increase in economic freedom in one region may positively influence entrepreneurial activity in that region, but, as described in the previous section, this increase in entrepreneurial activity may cause an increase in entrepreneurial activities in surrounding areas. The increase in entrepreneurial activity in surrounding areas may then through a feedback effect further increase entrepreneurship in the region that initially experienced an increase in institutional quality. Since it is important to know the spillovers associated with a change in economic freedom, it is essential to be calculating these effects correctly.

As will be explained in the methodology section of this paper, LeSage and Pace (2009) developed three scalar summaries that will be used to determine the direct, indirect, and total effects of the variables in question. These scalar summaries properly incorporate the feedback effects that can arise in the SAR or SDM models. Therefore, the goal of this

paper is to expand upon the previous literature to estimate the impact economic freedom has on entrepreneurial activity while properly incorporating the possibility of spatial dependence. By doing so, both the direct impact of economic freedom on entrepreneurial activity and the indirect or spillover impact of economic freedom on entrepreneurial activity will be estimated. In addition, examining the total effect (direct plus indirect effects) will provide some evidence of a positive-sum, zero-sum, or negative-sum game.

3. Data

The measure of institutional quality that is the focus of this paper is an economic freedom index developed by Stansel (2013) and is available only for the year 2002 for a total of 384 metropolitan areas. The goal of this index is to provide a more comprehensive measure of restrictions that government places upon economic freedom than do the basic government expenditure measures. The index measures the extent to which property rights are protected and individuals are free to engage in voluntary transactions.

The index is constructed on a scale from 0 to 10, with 10 indicating most free. The comprehensive index is an average of the scores that metropolitan areas receive in three separate areas of economic freedom (each also on a scale of 0 to 10). Each area of economic freedom is itself scored based on a number of related components:

- *Area 1: Size of Government*: (a) government consumption expenditures by government; (b) transfers and subsidies; (c) social security payments.
- *Area 2: Takings and Discriminatory Taxation*: (a) total tax revenue; (b) individual income tax revenue; (c) indirect tax revenue; (d) sales taxes collected.
- *Area 3: Labor Market Freedom*: (a) minimum wage annual income; (b) state and local government employment; (c) union density.

The 384 areas include 355 metropolitan statistical areas (MSAs) and 29 metropolitan divisions (MDs). The 29 metropolitan divisions are portions of their respective 11 metropolitan statistical areas. Stansel (2013) breaks these 11 MSAs down into their MD definition components so that all of the metropolitan areas are of a comparable size.

The economic freedom measure is then related to entrepreneurial activity occurring after the year 2002. This paper follows Sobel (2008) and uses 1) percentage changes in total nonfarm proprietors' employment from the U.S. Bureau of Economic Analysis (BEA) as a measure of change in sole proprietors; and 2) establishment birth data from the U.S. Small Business Administration (SBA) to estimate entrepreneurial activity in each metropolitan area. Although Baumol (1990) distinguishes between productive and unproductive entrepreneurs, this paper focuses exclusively on the productive entrepreneurship measures as described in Sobel (2008). These measures of entrepreneurial activity are calculated over a time period (2002-2005)where they will be avoiding most of the effects from the recent recession, and subsequently including effects of the recession (2002-2008 and 2002-2011 periods).[8]

In addition to the institutional measure, a variety of other control variables are included that are standard in the literature and have data available at either the metropolitan or county level.[9] These data are all available from either the U.S. Census Bureau or the BEA.[10] Control variables include (i) a number of industry employment shares; (ii) three different educational attainment population shares (high school diploma, some college, and bachelor's degree or higher); (iii) a number of demographic population shares; and (iv) property and violent crime rates. In order to control for initial levels that match the time period of the economic freedom index, the data for (i), (ii), (iii), and (iv) are all based on either the year 2000 or the year 2002 given that the data from the Census is only available in the year 2000.[11] It is assumed that these Census variables are slow to change overtime, such that they can be used as a proxy for their initial levels in 2002. The success of already established businesses in an area is also

[8] Establishment birth rate data is only available at the county level and only available until the year of 2008. The county-level data is summed to its respective metropolitan area level using the 2009 U.S. Office of Budget and Management metropolitan area definitions.

[9] See, e.g., Hall and Sobel (2008) and Hall et al. (2013).

[10] All data from the BEA and the Census Bureau were extracted from February to April of 2013. The Census does not update the relevant data according to new metropolitan area definitions. Also, data from the Census is often only available at the county level. The 2009 metropolitan area definitions provided by the BEA are used to aggregate the county level components. The data from the BEA are most often available at the metropolitan level and always constructed based on the 2009 metropolitan area definitions.

[11] A significant number of these variables were not available at the metropolitan level, but they were available at the county level. Therefore, the 2009 definitions of the metropolitan areas, as provided by the BEA, were used to add up the county level components.

controlled for using the log of per capita income. With these controls included, there are a total of 24 explanatory variables and a total of 375 observations. All of the variables, their definitions, and their sources are available in Table 1, and descriptive statistics are shown in Table 2.

Table 1. Variable Descriptions

Variable	Description	Year	Source
Dependent Variables			
Average Growth Rate:			
BIRTH_RATE_05	Avg. annual number of new establishments as % of existing firms (2002-05) *100	2002-05	SBA
BIRTH_RATE_08	Avg. annual number of new establishments as % of existing firms (2002-08) *100	2002-08	SBA
Cumulative Growth Rate:			
PROPRIETOR_05	Cumulative percent change in nonfarm proprietor employment from 2002-2005	2002-05	BEA
PROPRIETOR_11	Cumulative percent change in nonfarm proprietor employment from 2002-2011	2002-11	BEA
Independent Variables			
Measure of Institutional Quality and Initial Level of Income:			
FREEDOM	Economic freedom index for United States metropolitan areas	2002	Stansel (2013)
INCOME_02	Personal income per capita (excluding transfer payments, 2005 constant $)	2002	BEA
Demographic and Economic Controls:			
MALE	Percent of population that is male	2000	Census
TEEN	Percent of population ages 15-19 years old	2000	Census
WORKING	Percent of population ages 20-64 years old	2000	Census
ELDER	Percent of population ages 65 plus	2000	Census
BLACK	Percent of population that are of a black race	2000	Census
HISPANIC	Percent of population that are of a Hispanic race	2000	Census
UNEMP	Unemployment rate	2002	BLS
DENSITY	People per square mile	2002	Census
Educational Attainment:			
HSDIPLOMA	Percent of population 25 years and over with a high school diploma	2000	Census
COLLEGE	Percent of population 25 years and over with some college	2000	Census
BACHELORS	Percent of population 25 years and over with a bachelors degree or above	2000	Census
Employment Structure (% of population 15 years and over employed in sector):			
WHOLESALE	wholesale trade	2000	Census
RETAIL	retail trade	2000	Census
TRANSPORT	transportation, warehousing, utilities	2000	Census
INFORMATION	information	2000	Census
FIRE	finance, insurance, real estate	2000	Census
PROFESSIONAL	professional and related services	2000	Census
EDU-HEALTH	education, health and social services	2000	Census
RECREATION	arts, entertainment, recreation, accommodation, and food services	2000	Census
OTHERSERVICE	other services (except public administration)	2000	Census
Crime Rates:			
VIOLENT	Violent crime rate per 100,000 people	2002	NAJCD
PROPERTY	Property crime rate per 100,000 people	2002	NAJCD

Notes: Personal income per-capita enters regressions as natural logs of income values in 2005 dollars; violent crime rate, property crime rate, and density also enter regressions as natural logs. NAJCD stands for National Archive of Criminal Justice Data.

Table 2. Summary Statistics of Variables Included in Regression Analysis.

Variable	Mean	Std. Dev.
BIRTH_RATE_05	10.096	2.267
BIRTH_RATE_08	9.936	2.341
PROPRIETOR_05	0.163	0.057
PROPRIETOR_11	0.314	0.153
FREEDOM	6.692	0.861
INCOME	26574	6306
MALE	48.803	2.778
TEEN	7.534	1.133
WORKING	58.422	2.637
ELDER	12.710	3.507
BLACK	10.413	10.707
HISPANIC	9.541	14.143
UNEMP	5.661	1.652
DENSITY	335.8	545.7
HSDIPLOMA	30.044	5.976
COLLEGE	28.417	4.490
BACHELORS	22.788	7.451
WHOLESALE	1.996	0.570
RETAIL	7.202	0.899
TRANSPORT	2.796	0.752
INFORMATION	1.479	0.637
FIRE	3.503	1.274
PROFESSIONAL	4.620	1.720
EDU-HEALTH	12.384	2.745
RECREATION	4.802	1.606
OTHERSERVICE	2.832	0.358
VIOLENT	444.6	226.8
PROPERTY	3920	1223

Notes: Personal income per-capita, violent crime rate, property crime rate, and density enter regressions as natural logs.

4. Methodology and model specification Testing

This paper employs the Elhorst (2010) testing procedure to try to uncover the true data generating process of the data. Using this procedure there are five models that the data could potentially fit: (1) Ordinary Least Squares (OLS), (2) Spatial Autoregressive Model (SAR), (3) Spatial Error Model (SEM), (4) Spatial Lag of X Model (SLX), or (5) Spatial Durbin Model (SDM). This testing procedure will indicate whether or not spatial dependence is present in the data. Furthermore, if spatial dependence is found to be present, the procedure will suggest which spatial model is the most appropriate to use.

The SAR model only considers spatial dependence in the dependent variable; however, as explained previously it is likely that the explanatory variables, such as institutional measures, are spatially dependent as well. The SEM model assumes that there is no spatial dependence in the dependent variable or the explanatory variables, and only dependence in the error term. The SLX model includes only a spatial lag of the explanatory variables in addition to the non-spatially lagged explanatory variables.[12] However, since these models are not controlling for all types of spatial dependence, they are more likely to be biased.

The SDM model includes a spatial lag of both the explanatory variables and the dependent variable, in addition to non-spatially lagged explanatory variables. The SAR, SEM, and SLX models are all nested within the SDM model. To see this, the general structure of the SDM model is provided below:

$$y = a + \rho Wy + X\beta + WX\theta + \varepsilon, \quad (1)$$

where y is an $n \times 1$ vector of cross-sectional observations of the dependent variable, X is an $n \times m$ matrix

[12] A spatial lag refers to spatially-weighted variables, i.e., multiplied by a weight matrix. Non-spatially lagged variables would be typical regressors included in an OLS regression.

of control variables weighted by the $m \times 1$ vector of coefficients β, and ε is an $n \times 1$ vector of errors. In (1), W is an $n \times n$ weight matrix that defines neighbor relations and ρ and θ are scalar parameters defining spatial effects across neighbors.

Therefore, from equation (1) the SAR model is estimated when $\theta = 0$, SEM when $\rho = \theta = 0$, and SLX when $\rho = 0$. As LeSage and Pace (2009) explain, given that the true data generating process (DGP) is uncertain, in the presence of spatial dependence, the SDM is the only model that consistently produces unbiased coefficients as it is a generalization of the other DGPs. Consequently, SDM is likely the appropriate model unless significant evidence is presented otherwise.

To test for spatial dependence, the first step is to specify the weight matrix, W. Neighbor relations are defined according to a k-nearest neighbors weight matrix. As explained in LeSage and Pace (2010), if estimates are interpreted properly for spatial models that include a ρ parameter, the results are not sensitive to the definition of the weight matrix. Therefore, k is specified as the average number of metropolitan areas contiguous to a given metropolitan area. This simply means that k is the average number of metropolitan areas that share a border with one another. For example, the geographically largest metropolitan area in California, Riverside-San Bernardina-Ontario (labeled "RSO" in Figure 3), shares a border with exactly seven metropolitan areas. However, as can also be seen in Figure 3 there are some areas that do not border any other metropolitan areas, such as all of the areas in Montana, and some areas that border more than seven other metropolitan areas, such as the metropolitan areas found in the eastern part of the country.

Overall, the average number of contiguous neighbors turns out to be $k = 6$. Based on this, the six "closest" neighbors of any given metropolitan area are the six other metropolitan areas that are closest to the center of its geographic mass.[13] Based on the six closest neighbors, entries in the W matrix are assigned a '1' to indicate metropolitan area neighbor pairs (while all other elements of W are assigned '0'). The entries are then row normalized by convention so that each row sums to 1. Thus, any vector multiplied by the weight matrix results in an average of the neighboring values for each area.

[13] Hawaii and Alaska metropolitan areas are not included in our sample. The reasons for this is that those metropolitan areas have such large distances from their closest neighbors that estimating the same spatial relationships as assumed for the contiguous states is unreasonable.

Following Elhorst (2010), the first step is to conduct Lagrange multiplier (LM) tests to determine if there is any spatial dependence in the model. The appeal of these tests is that they only require the residuals of the OLS estimation and a spatial weight matrix. The LM lag tests if there is spatial dependence present in the dependent variable and whether SAR is appropriate, while the LM error tests if there is spatial dependence in the error term and whether SEM is appropriate.

A drawback of the LM tests is that it is sometimes hard to distinguish where the spatial dependence is coming from. The LM lag test may actually be including some of the spatial dependence in the error term, while the LM error test may be including some of the spatial dependence in the dependent variable. Therefore, the robust versions of these LM tests take into account that the other form of spatial correlation may be present.

The results of these tests for both periods of the birth rate regressions are given in Table 3, and for both periods of the proprietorship regressions results are given in Table 4. As these tables show, all specifications were found to exhibit spatial dependence according to the LM tests. Since the null hypothesis of no spatial dependence can be rejected, the next step is to estimate the Spatial Durbin Model.

Estimates of the SDM model are used to conduct a likelihood ratio (LR) test to determine if SDM is more appropriate than either SAR or SEM. Specifically, the following hypotheses are tested: H_0: $\theta = 0$ and H_0: $\theta + \rho\beta = 0$, where θ, β, and ρ are as defined in equation 3.1. The first hypothesis tests whether the SDM model can be collapsed into the SAR model, while the second hypothesis tests whether the SDM model can be collapsed into the SEM model. The likelihood ratio tests are calculated as follows:

$$LR = 2\,[L(\hat{y}_U) - L(\hat{y}_R)] \tag{2}$$

where $L(\hat{y}_U)$ is the value of the unrestricted model's likelihood function and $L(\hat{y}_R)$ is the value of the restricted model's likelihood function. Both tests follow a chi-squared distribution with R degrees of freedom, where R is the number of restrictions.

If both hypotheses are rejected, then SDM is the most appropriate model. If H_0: $\theta = 0$ is not rejected, then the SAR model is appropriate as long as the robust LM tests point to SAR. Similarly, if H_0: $\theta + \rho\beta = 0$ is not rejected, then the SEM model is appropriate as long as the robust LM tests point to SEM. If one of these conditions is not satisfied then the SDM

model is used as it is a generalization of both the SEM and the SAR models.

As can be seen from Table 3 and Table 4, the hypotheses that SDM can be collapsed into either the SAR or SEM models can be rejected in all cases. Therefore, the SDM specification is the most appropriate to use for both periods and for both the establishment birth rate and proprietorship regressions. In addition, SDM estimates are made using Maximum Likelihood, as it avoids the simultaneity bias in the spatially lagged dependent variable that would have been present if estimated using a least-squares method.

Table 3. Model specification testing results for 2002-2005 period for the establishment birth rate measures only, full sample and all controls included.

	LM LAG	LM ERROR	SDM VS SAR	SDM VS SEM	Suggested Model
BIRTH_ RATE_05	18.391***	2.667	0.055	0.004	SDM
BIRTH_RATE_08	14.559***	6.532**	0.082	0.016	SDM

Note: Table gives LM value for the LM lag and LM error tests. Table gives relevant p values that resulted from the remaining tests. ***, **, and * indicate statistically significant at 1%, 5%, and 10% levels, respectively.

Table 4. Model specification testing results for 2002-2008 and 2002-2011 periods for the proprietorship measures only, full sample and all controls included.

	LM LAG	LM ERROR	SDM VS SAR	SDM VS SEM	Suggested Model
PROPRIETOR_05	45.822***	0.756	0.009	0.000	SDM
PROPRIETOR_11	24.751***	0.000	0.000	0.000	SDM

Note: Table gives LM value for the LM lag and LM error tests. Table gives relevant p values that resulted from the remaining tests. ***, **, and * indicate statistically significant at 1%, 5%, and 10% levels, respectively.

5. Empirical specification and results

Given the results of the above section, this paper estimates the entrepreneurship-freedom relationship using the following SDM model:

$$y_t = a + \rho W y_t + X\beta + WX\theta + \varepsilon_t, \quad (3)$$

where y is one of the measures of entrepreneurial activity from 2002 until 2005 and subsequently from 2002 until 2008 or 2011, ρ is the spatial lag of entrepreneurial activity, X is a matrix of controls as defined in Table 1, W is the weight matrix defining neighbor relationships, and ε is an error term. As mentioned above, the SDM model requires special care when interpreting the coefficients. To see why, drop the time subscript in (3), let r index the individual vectors in the X matrix, and put the SDM model into reduced form:

$$y = (I_n - \rho W)^{-1}(a\iota_n + X\beta + WX\theta + \varepsilon) \quad (4)$$

$$y = \Sigma_{r=1} S_r(W)x_r + V(W)\iota_n a + V(W)\varepsilon \quad (5)$$

$$S_r(W) = V(W)(I_n\beta_r + W\theta_r) \quad (6)$$

$$V(W) = (I_n - \rho W)^{-1} = I_n + \rho W + \rho W^2 + \rho W^3 + \ldots \quad (7)$$

Thus, β no longer represents the marginal impact of an explanatory variable on the dependent variable. In this model, a change in the explanatory variable in one region not only impacts the outcomes in its own region but also results in a feedback effect arising from the impact its outcome has on surrounding regions. Due to these additional complexities, the results are presented using the estimates of the three scalar summaries as proposed by LeSage and Pace (2009): average direct effect, average indirect effect, and average total effects.

The direct effects estimate is intended to capture the effects of a change in a variable in the X matrix for location i on the dependent variable y in location i; thus, it is an own effect. This effect includes the feedback that may arise as the spillover effect of observation i impacts entrepreneurial outcomes in neighboring regions, which in turn impact region i. It is measured as the average of the diagonal elements of the $S_r(W)$ matrix given above.

The indirect effects estimates are intended to capture any spillovers to region *j* that may arise from a change in a variable in *X* for observation *i*, where *j* does not equal *i*. It is important to note that the indirect effects measure is cumulative, so it may often be larger than the direct effect measure. The indirect effects are calculated as the average of the off-diagonal elements of the S_r matrix given above. As described by LeSage and Pace (2009), the indirect impact estimates may be interpreted two ways: (1) how the change in the economic freedom index in all regions by some constant amount would change entrepreneurial activity in a typical region; or (2) how the change in the economic freedom index in one region cumulatively affects all of the other regions. The second interpretation will be used throughout this section. Lastly, the average total effect is the sum of the average indirect and direct effects.

For brevity, the focus is only on the measure of institutional quality, *FREEDOM,* when discussing results. Table 5 shows the results when using average establishment birth rates as measures of entrepreneurial activity. *FREEDOM* does not exhibit statistically significant direct, indirect, or total effects for either period. In addition, *RHO* is not statistically significant in either period, indicating that there is no spatial dependence in the dependent variable. However, as can be seen in Figure 1, this average birth rate measure has some extreme outliers that may be biasing the impact of *FREEDOM* on *BIRTH_RATE_05* and *BIRTH_RATE_08* downwards. Therefore, it may be important to re-estimate this relationship without these outliers.

In the 2002-2005 period Mount Vernon-Anacortes, WA, is excluded since the average birth rate during this time period was 33.37 firm births as a percent of total of establishments, where the second highest during this time period was Palm Coast, FL, with 20.18 firm births as a percent of total establishments. In addition, there were many other metropolitan areas in the average birth rate range of 15-20. In the 2002-2008 period three metropolitan areas seemed to be outliers and therefore were excluded: Mount Vernon-Anacortes, WA, Medford-Ashland, OR, and Lewiston-Auburn, ME. The three birth rates for these metropolitan areas were above 23, when the next highest birth rate was only 19.75.

Once the outliers are removed, the indirect effect and total effect of *FREEDOM* on *BIRTH_RATE_05* and *BIRTH_RATE_08* become statistically significant (Table 6). In addition, *RHO* is statistically significant at the one percent level. Therefore, this indicates that spatial dependence is important, and increases in economic freedom in one metropolitan area have a positive impact on entrepreneurial activity in its own region (direct effect) and in neighboring areas (indirect effect). In other words, a positive sum game is present.

However, for small changes in *FREEDOM*, both of these effects are economically small. For example, a one standard deviation increase in *FREEDOM* (0.861) in one region will cumulatively increase the establishment birth rate of all other regions by only 0.377 percentage points, or about 16 percent of a one standard deviation increase in *BIRTH_RATE_05*. A 0.861 increase in *FREEDOM* is approximately equivalent to moving from the least free area (El Centro, CA) to the second least free area (Visalia-Porterville, CA). In order to explain a cumulative one standard deviation increase in *BIRTH_RATE_05* there would have to be an increase in the *FREEDOM* of 5.16 points, equivalent to moving from the least free area (El Centro, CA) to the most free area (Naples-Marco Island, FL).

Table 7 shows the results using the cumulative growth rate of proprietors as the measure of entrepreneurial activity. Once again the indirect and total effects for *FREEDOM* are positive and statistically significant in both time periods. In addition, *RHO* is statistically significant in both time periods. The direct effects of *FREEDOM* are positive and statistically significant when looking at *PROPRIETOR_05*, although this effect becomes negative and insignificant in the following time period.

However, as before, all of these effects are economically small. For example, a one standard increase in *FREEDOM* in one area results in only a cumulative increase of *PROPRIETOR_05* of about 0.861 percentage points in all other areas, or less than 15 percent of a one standard deviation increase in *PROPRIETOR_05*. Thus, in order to explain a cumulative one standard deviation increase in *PROPRIETOR_05*, *FREEDOM* would have to increase by about 5.7 points in the index, again equivalent to moving from the least free area (El Centro, CA) to the most free area (Naples-Marco Island, FL).

Table 5. Direct, indirect, and total effects estimates of *FREEDOM* on average establishment birth rate from 2002-2005 and 2002-2008; full set of controls and full sample included.

	2002-2005			2002-2008		
	Direct	Indirect	Total	Direct	Indirect	Total
FREEDOM	0.115	0.322	0.437	-0.112	0.304	0.192
	(0.169)	*(0.313)*	*(0.268)*	*(0.206)*	*(0.333)*	*(0.268)*
INCOME	-2.782***	-1.737	-4.520*	-1.559	-1.82	-3.38
	(1.066)	*(2.393)*	*(2.376)*	*(1.284)*	*(2.489)*	*(2.422)*
MALE	-0.012	0.011	-0.001	0.000	0.091	0.091
	(0.033)	*(0.112)*	*(0.127)*	*(0.041)*	*(0.125)*	*(0.143)*
TEEN	-0.152	0.211	0.059	-0.149	0.032	-0.117
	(0.166)	*(0.453)*	*(0.491)*	*(0.189)*	*(0.478)*	*(0.496)*
WORKING	-0.195***	-0.066	-0.261	-0.152*	-0.12	-0.274
	(0.070)	*(0.172)*	*(0.174)*	*(0.086)*	*(0.188)*	*(0.180)*
ELDER	-0.050	0.138	0.088	-0.053	0.166	0.113
	(0.061)	*(0.127)*	*(0.127)*	*(0.072)*	*(0.139)*	*(0.129)*
BLACK	-0.006	0.019	0.013	0.008	-0.01	0.001
	(0.017)	*(0.030)*	*(0.025)*	*(0.020)*	*(0.033)*	*(0.027)*
HISPANIC	0.011	-0.028	-0.017	0.017	-0.07	-0.048*
	(0.020)	*(0.035)*	*(0.027)*	*(0.025)*	*(0.041)*	*(0.029)*
UNEMP	-0.027	-0.035	-0.062	-0.053	0.213	0.161
	(0.087)	*(0.206)*	*(0.212)*	*(0.101)*	*(0.221)*	*(0.221)*
DENSITY	-0.007	0.103	0.096	0.148	-0.03	0.12
	(0.155)	*(0.363)*	*(0.364)*	*(0.185)*	*(0.378)*	*(0.375)*
HSDIPLOMA	-0.102**	0.000	-0.102	-0.020	-0.271**	-0.291***
	(0.051)	*(0.098)*	*(0.085)*	*(0.060)*	*(0.107)*	*(0.091)*
COLLEGE	0.079**	-0.006	0.073	0.012	-0.12	-0.107
	(0.039)	*(0.083)*	*(0.083)*	*(0.046)*	*(0.088)*	*(0.089)*
BACHELORS	0.095*	0.20	0.302**	0.012	0.054	0.066
	(0.049)	*(0.128)*	*(0.132)*	*(0.060)*	*(0.129)*	*(0.130)*
WHOLESALE	0.069	0.930	0.999	-0.225	-0.54	-0.767
	(0.231)	*(0.621)*	*(0.655)*	*(0.264)*	*(0.629)*	*(0.662)*
RETAIL	0.312**	-0.366	-0.053	0.629***	-0.12	0.512
	(0.145)	*(0.395)*	*(0.430)*	*(0.172)*	*(0.413)*	*(0.444)*
TRANSPORT	0.073	0.051	0.123	-0.111	0.109	-0.002
	(0.140)	*(0.426)*	*(0.461)*	*(0.160)*	*(0.466)*	*(0.493)*
INFORMATION	0.474**	1.009	1.482**	0.398	0.256	0.654
	(0.227)	*(0.661)*	*(0.705)*	*(0.271)*	*(0.706)*	*(0.740)*
FIRE	0.158	-0.312	-0.153	0.186	-0.09	0.094
	(0.106)	*(0.302)*	*(0.318)*	*(0.122)*	*(0.301)*	*(0.312)*
PROFESSIONAL	-0.070	-0.480	-0.55	0.189	-0.02	0.166
	(0.131)	*(0.342)*	*(0.369)*	*(0.156)*	*(0.364)*	*(0.373)*
EDU-HEALTH	-0.189***	-0.566***	-0.755***	-0.037	-0.357**	-0.393**
	(0.069)	*(0.174)*	*(0.186)*	*(0.084)*	*(0.171)*	*(0.180)*
RECREATION	0.173***	0.294	0.467**	0.118	0.116	0.233
	(0.066)	*(0.182)*	*(0.196)*	*(0.077)*	*(0.181)*	*(0.190)*
OTHERSERVICE	-0.933***	-0.453	-1.386*	-1.237***	0.886	-0.351
	(0.299)	*(0.784)*	*(0.821)*	*(0.344)*	*(0.784)*	*(0.815)*
VIOLENT	-0.206	-0.204	-0.410	-0.548*	-1.02	-1.567**
	(0.275)	*(0.674)*	*(0.649)*	*(0.325)*	*(0.710)*	*(0.669)*
PROPERTY	-0.055	0.252	0.198	0.649	1.354	2.003*
	(0.436)	*(0.944)*	*(0.976)*	*(0.520)*	*(1.099)*	*(1.068)*
RHO		0.135			0.015	
		(0.086)			*(0.092)*	
Obs.		375			375	
R^2		0.567			0.410	

Note: ***, **, and * indicate statistically significant at 1%, 5%, and 10% levels, respectively. Standard errors given in parentheses.

Table 6. Direct, indirect, and total effects estimates of *FREEDOM* on average establishment birth rate from 2002-2005 and 2002-2008; full set of controls included, excluding outliers.

	2002-2005			2002-2008		
	Direct	Indirect	Total	Direct	Indirect	Total
FREEDOM	0.128	0.439**	0.568***	0.130	0.466**	0.595***
	(0.113)	*(0.220)*	*(0.198)*	*(0.113)*	*(0.218)*	*(0.194)*
INCOME	-3.553***	0.022	-3.531**	-3.572***	0.136	-3.437**
	(0.717)	*(1.666)*	*(1.704)*	*(0.716)*	*(1.676)*	*(1.695)*
MALE	-0.016	0.025	0.010	-0.018	0.014	-0.004
	(0.023)	*(0.085)*	*(0.095)*	*(0.023)*	*(0.084)*	*(0.095)*
TEEN	-0.287***	0.216	-0.071	-0.277**	0.238	-0.039
	(0.110)	*(0.338)*	*(0.370)*	*(0.112)*	*(0.349)*	*(0.379)*
WORKING	-0.179***	-0.148	-0.328**	-0.178***	-0.133	-0.310**
	(0.046)	*(0.129)*	*(0.131)*	*(0.046)*	*(0.130)*	*(0.133)*
ELDER	-0.108***	0.133	0.025	-0.109***	0.135	0.026
	(0.037)	*(0.095)*	*(0.097)*	*(0.039)*	*(0.096)*	*(0.095)*
BLACK	-0.013	0.025	0.012	-0.013	0.023	0.010
	(0.011)	*(0.022)*	*(0.019)*	*(0.011)*	*(0.021)*	*(0.019)*
HISPANIC	0.003	-0.024	-0.021	0.002	-0.023	-0.021
	(0.013)	*(0.026)*	*(0.021)*	*(0.013)*	*(0.025)*	*(0.020)*
UNEMP	-0.064	0.027	-0.037	-0.064	0.047	-0.017
	(0.059)	*(0.149)*	*(0.157)*	*(0.059)*	*(0.151)*	*(0.154)*
DENSITY	0.073	-0.160	-0.087	0.076	-0.172	-0.096
	(0.107)	*(0.271)*	*(0.270)*	*(0.104)*	*(0.265)*	*(0.270)*
HSDIPLOMA	-0.068**	-0.064	-0.132**	-0.072**	-0.052	-0.125*
	(0.033)	*(0.068)*	*(0.063)*	*(0.033)*	*(0.071)*	*(0.065)*
COLLEGE	0.057**	-0.050	0.007	0.060**	-0.045	0.015
	(0.024)	*(0.061)*	*(0.064)*	*(0.025)*	*(0.061)*	*(0.064)*
BACHELORS	0.092***	-0.003	0.089	0.092***	-0.024	0.068
	(0.034)	*(0.091)*	*(0.098)*	*(0.033)*	*(0.092)*	*(0.098)*
WHOLESALE	-0.001	0.296	0.295	0.015	0.262	0.277
	(0.152)	*(0.453)*	*(0.503)*	*(0.148)*	*(0.471)*	*(0.504)*
RETAIL	0.304***	-0.194	0.110	0.287***	-0.213	0.074
	(0.100)	*(0.296)*	*(0.329)*	*(0.099)*	*(0.302)*	*(0.334)*
TRANSPORT	0.042	-0.25	-0.208	0.052	-0.225	-0.173
	(0.102)	*(0.331)*	*(0.370)*	*(0.097)*	*(0.341)*	*(0.374)*
INFORMATION	0.405**	1.189**	1.594***	0.418***	1.223**	1.641***
	(0.161)	*(0.493)*	*(0.538)*	*(0.156)*	*(0.496)*	*(0.539)*
FIRE	0.176**	-0.133	0.043	0.175**	-0.109	0.066
	(0.070)	*(0.219)*	*(0.232)*	*(0.072)*	*(0.223)*	*(0.239)*
PROFESSIONAL	-0.001	-0.028	-0.029	-0.014	0.018	0.004
	(0.087)	*(0.257)*	*(0.276)*	*(0.089)*	*(0.252)*	*(0.272)*
EDU-HEALTH	-0.144***	-0.374***	-0.518***	-0.149***	-0.352***	-0.501***
	(0.046)	*(0.126)*	*(0.136)*	*(0.047)*	*(0.126)*	*(0.141)*
RECREATION	0.144***	0.251*	0.395***	0.145***	0.252*	0.397***
	(0.043)	*(0.135)*	*(0.145)*	*(0.043)*	*(0.132)*	*(0.142)*
OTHERSERVICE	-0.696***	-0.983*	-1.679***	-0.680***	-1.044*	-1.724***
	(0.199)	*(0.579)*	*(0.626)*	*(0.193)*	*(0.564)*	*(0.602)*
VIOLENT	0.254	-0.672	-0.417	0.283	-0.624	-0.342
	(0.188)	*(0.501)*	*(0.502)*	*(0.180)*	*(0.483)*	*(0.487)*
PROPERTY	-0.848***	1.305*	0.457	-0.897***	1.302*	0.405
	(0.291)	*(0.743)*	*(0.765)*	*(0.293)*	*(0.738)*	*(0.763)*
RHO		0.219***			0.219***	
		(0.080)			*(0.080)*	
Obs.		374			372	
R^2		0.665			0.666	

Note: ***, **, and * indicate statistically significant at 1%, 5%, and 10% levels, respectively. Standard errors given in parentheses. Mount Vernon-Anacortes, WA, excluded from both periods; Lewiston-Auburn, ME, and Medford-Ashland, OR, excluded from 2002-2008 period.

Table 7. Direct, indirect, and total effects estimates of *FREEDOM* on cumulative proprietorship growth rate from 2002-2005 and 2002-2011; full set of controls and full sample included.

	2002-2005			2002-2011		
	Direct	Indirect	Total	Direct	Indirect	Total
FREEDOM	0.006**	0.010**	0.017**	-0.013	0.045*	0.032*
	(0.003)	*(0.005)*	*(0.008)*	*(0.010)*	*(0.020)*	*(0.018)*
INCOME	-0.026	-0.044	-0.070	0.107*	-0.118	-0.011
	(0.022)	*(0.039)*	*(0.060)*	*(0.063)*	*(0.155)*	*(0.160)*
MALE	0.000	-0.001	-0.001	-0.001	-0.018**	-0.018**
	(0.001)	*(0.001)*	*(0.002)*	*(0.002)*	*(0.008)*	*(0.009)*
TEEN	-0.002	-0.003	-0.005	0.017*	-0.009	0.008
	(0.004)	*(0.007)*	*(0.010)*	*(0.009)*	*(0.031)*	*(0.033)*
WORKING	-0.002	-0.004	-0.006	-0.020***	-0.018	-0.038***
	(0.001)	*(0.003)*	*(0.004)*	*(0.004)*	*(0.011)*	*(0.012)*
ELDER	-0.001	-0.002	-0.002	-0.013***	0.005	-0.007
	(0.001)	*(0.002)*	*(0.003)*	*(0.003)*	*(0.009)*	*(0.009)*
BLACK	0.001**	0.001**	0.002**	0.003***	0.006***	0.009***
	(0.000)	*(0.001)*	*(0.001)*	*(0.001)*	*(0.002)*	*(0.002)*
HISPANIC	0.000	-0.001	-0.001	0.001	-0.001	0.000
	(0.000)	*(0.001)*	*(0.001)*	*(0.001)*	*(0.002)*	*(0.002)*
UNEMP	-0.001	-0.002	-0.003	0.009*	-0.016	-0.007
	(0.002)	*(0.003)*	*(0.005)*	*(0.005)*	*(0.014)*	*(0.015)*
DENSITY	0.009***	0.016**	0.025***	0.019**	-0.033	-0.014
	(0.003)	*(0.006)*	*(0.009)*	*(0.008)*	*(0.024)*	*(0.025)*
HSDIPLOMA	-0.003***	-0.006***	-0.009***	-0.003	-0.012*	-0.014**
	(0.001)	*(0.002)*	*(0.003)*	*(0.003)*	*(0.007)*	*(0.006)*
COLLEGE	0.000	-0.001	-0.001	-0.004**	-0.010*	-0.014**
	(0.001)	*(0.001)*	*(0.002)*	*(0.002)*	*(0.006)*	*(0.006)*
BACHELORS	-0.001	-0.002	-0.003	0.003	-0.003	-0.001
	(0.001)	*(0.002)*	*(0.003)*	*(0.003)*	*(0.009)*	*(0.009)*
WHOLESALE	-0.003	-0.005	-0.007	0.000	0.042	0.042
	(0.005)	*(0.009)*	*(0.014)*	*(0.013)*	*(0.043)*	*(0.046)*
RETAIL	0.004	0.006	0.010	0.015*	-0.020	-0.005
	(0.003)	*(0.006)*	*(0.009)*	*(0.009)*	*(0.028)*	*(0.032)*
TRANSPORT	0.001	0.002	0.004	0.003	-0.002	0.001
	(0.003)	*(0.006)*	*(0.009)*	*(0.008)*	*(0.031)*	*(0.034)*
INFORMATION	-0.004	-0.007	-0.012	-0.014	0.068	0.054
	(0.006)	*(0.010)*	*(0.015)*	*(0.014)*	*(0.047)*	*(0.052)*
FIRE	0.003	0.005	0.008	0.016***	-0.016	0.000
	(0.003)	*(0.004)*	*(0.007)*	*(0.006)*	*(0.021)*	*(0.022)*
PROFESSIONAL	0.002	0.003	0.005	0.010	-0.004	0.005
	(0.003)	*(0.005)*	*(0.008)*	*(0.007)*	*(0.023)*	*(0.026)*
EDU-HEALTH	0.000	0.000	0.000	-0.004	-0.011	-0.015
	(0.002)	*(0.003)*	*(0.004)*	*(0.004)*	*(0.011)*	*(0.013)*
RECREATION	0.006***	0.010***	0.016***	0.013***	0.029**	0.042***
	(0.001)	*(0.003)*	*(0.004)*	*(0.004)*	*(0.012)*	*(0.013)*
OTHERSERVICE	-0.012*	-0.019	-0.031*	-0.012	0.028	0.015
	(0.007)	*(0.012)*	*(0.018)*	*(0.017)*	*(0.051)*	*(0.055)*
VIOLENT	-0.006	-0.011	-0.017	-0.010	-0.108**	-0.118**
	(0.006)	*(0.010)*	*(0.016)*	*(0.015)*	*(0.045)*	*(0.046)*
PROPERTY	0.008	0.014	0.022	-0.026	0.073	0.048
	(0.009)	*(0.015)*	*(0.024)*	*(0.025)*	*(0.067)*	*(0.070)*
RHO		0.658***			0.303***	
		(0.425)			*(0.074)*	
Obs.		375			375	
R^2		0.443			0.659	

Note: ***, **, and * indicate statistically significant at 1%, 5%, and 10% levels, respectively.

As shown in Figure 2 through Figure 4, there seems to be a wide variation in both entrepreneurial activity and economic freedom when comparing the eastern portion of the country with the western portion. In addition, the metropolitan areas in the West are much more spread out geographically than those in the East. Given that the above results are estimated using a *global* spatial model, meaning that the spillovers are not limited to immediate surrounding neighbors, but rather are able to spillover across the entire country due to the *RHO* parameter, it seems important to separate the data into two samples: east of the Mississippi River and west of the Mississippi River.[14] Tables A1 through A4 in the appendix present the results of these two samples, for both time periods and for both entrepreneurial measures.

First looking at Table A1 and Table A2, *FREEDOM* still has a statistically significant and positive indirect and total effect on both *BIRTH_05* and *BIRTH_11*, and this holds in both periods for both the East sample and West sample. However, the coefficients are now much larger in most cases. As Table A1 shows, in the 2002-2005 period the indirect effects estimates for both samples (0.798 in the East and 0.812 in the West) are nearly double what they are in the full sample results presented in Table 6 (0.439). This may be suggesting that the full sample results may be biased downwards.

In addition, as Table A2 shows, there do seem to be important differences in the indirect and total effects estimates between the East and the West during the 2002-2008 period. The indirect effect *FREEDOM* has on *BIRTH_11* in the East is much smaller than its effect in the West (0.545 in the East and 0.867 in the West). In addition, the indirect effect in the East is now only statistically significant at the 10% level, while the indirect effect in the West remains statistically significant at the 1 % level. It is also important to note that *RHO* is no longer statistically significant in either period for either sample. This suggests that there may be important relationships in establishment birth rates that reach across the Mississippi River resulting in a statistically significant *RHO* in the full sample.

Lastly, looking at Table A3 and Table A4, the effects of *FREEDOM* on *PROP_05* and *PROP_11* change significantly after splitting the sample into the East and West. It seems that the statistically significant and positive relationship between *FREEDOM* and *PROP_05* and *PROP_11* shown in Table 7 may be driven exclusively by metropolitan areas in the West. *FREEDOM* has positive and statistically significant direct, indirect, and total effects on *PROP_05* in the West and has no statistically significant relationship with *PROP_05* in the East. Similarly, for *PROP_11*, *FREEDOM* has a statistically significant and positive impact only in the West. In both periods, however, *RHO* remains positive and statistically significant in all cases.

Therefore, overall the results suggest that spatial dependence is an important component of the analysis. Economic freedom may have a positive impact on entrepreneurial activity overall, but this impact is fairly small in magnitude. In addition, the size of the effect and its statistical significance are sensitive to the sample in question.

6. Conclusion

Previous research has focused on the effect economic freedom has on entrepreneurial activity, finding there to be a positive relationship. However, even though entrepreneurial activity tends to cluster in space, much of this previous literature has ignored the possibility of spatial dependence. In addition, if spatial dependence is present it is unclear whether the positive relationship found in the previous literature is because increasing economic freedom in one area results in increased entrepreneurial activity in that area as well as other areas (positive-sum game) or if increasing economic freedom attracts entrepreneurs away from neighboring areas (zero- or negative-sum game).

There are two key reasons that entrepreneurial activity may cluster together: (1) entrepreneurial activities themselves spur subsequent entrepreneurial activities; and (2) specific determinants of entrepreneurial activity, such as institutional quality, tend to cluster together. This paper finds evidence of both. Using data from U.S. metropolitan areas, this paper finds that entrepreneurial activity itself is spatially dependent and finds positive and statistically significant spillovers (indirect effect) in entrepreneurial activity caused by changes in institutional quality.

In addition, this paper finds that the direct effects of changes in institutional quality, while positive in all cases except for one, are smaller than the indirect effects and statistically insignificant. This is plausible since the indirect effect captures the cumulative spillovers resulting from the change in institutional quality. However, even though the direct effect has no statistical significance, the estimated total (direct

[14] For metropolitan areas that cross state borders, the state in which the principal city resides is used.

plus indirect) effect of an increase in institutional quality is positive and statistically significant, suggesting a positive-sum game. Improvements in institutional quality in an area increase entrepreneurial activity in that area because the new institutional environment is conducive to entrepreneurial activity (direct effect) and because the new institutional environment and entrepreneurial activity result in *positive* spillovers in neighboring areas (indirect effects).

These effects, however, are all small in magnitude. In order to explain a cumulative one standard deviation change in either of the entrepreneurial measures presented in this paper, there would have to be an increase in the *FREEDOM* index equivalent to moving from the least free area to the most free area. Thus, in order to see effects that are large in magnitude there would need to be very large increase in economic freedom throughout the U.S.

Furthermore, these effects may be sensitive to the sample region. When breaking the sample down into two separate groups, east of Mississippi River and west of Mississippi River, the magnitude and statistical significance of the above results seem to change greatly. It seems that the indirect effect economic freedom has on average establishment birth rates is biased downwards when including the full sample; this effect nearly doubles when the sample is broken down. In addition, it seems that the West may be driving the positive relationship found between economic freedom and proprietorship growth rates, thus suggesting there may be important differences through regions of the country. Further analysis is needed to uncover what these differences are.

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Appendix

Table A1. East versus West direct, indirect, and total effects estimates of *FREEDOM* on average establishment birth rate from 2002-2005; full set of controls included, excluding outliers.

	EAST			WEST		
	Direct	Indirect	Total	Direct	Indirect	TOTAL
FREEDOM	0.145	0.798***	0.942***	0.002	0.812***	0.814***
	(0.154)	*(0.252)*	*(0.192)*	*(0.164)*	*(0.283)*	*(0.247)*
INCOME	-3.502***	-0.664	-4.166*	-4.720***	-3.041	-7.761***
	(1.025)	*(2.312)*	*(2.462)*	*(1.018)*	*(2.250)*	*(2.403)*
MALE	-0.002	0.064	0.062	0.021	-0.854***	-0.834***
	(0.022)	*(0.068)*	*(0.078)*	*(0.113)*	*(0.267)*	*(0.287)*
TEEN	-0.101	-0.311	-0.413	-0.469**	0.846*	0.376
	(0.152)	*(0.401)*	*(0.438)*	*(0.181)*	*(0.505)*	*(0.585)*
WORKING	-0.013	-0.043	-0.056	-0.324***	0.427**	0.103
	(0.075)	*(0.197)*	*(0.208)*	*(0.080)*	*(0.197)*	*(0.207)*
ELDER	0.064	0.048	0.112	-0.250***	0.265	0.015
	(0.056)	*(0.134)*	*(0.142)*	*(0.069)*	*(0.165)*	*(0.183)*
BLACK	0.001	0.053**	0.054**	-0.030	-0.011	-0.041
	(0.013)	*(0.026)*	*(0.021)*	*(0.025)*	*(0.036)*	*(0.025)*
HISPANIC	0.051**	0.038	0.089*	-0.031*	0.029	-0.002
	(0.022)	*(0.050)*	*(0.048)*	*(0.018)*	*(0.030)*	*(0.023)*
UNEMP	-0.224**	-0.505**	-0.729***	0.009	0.190	0.199
	(0.098)	*(0.207)*	*(0.199)*	*(0.074)*	*(0.199)*	(0.207)
DENSITY	-0.268	0.560	0.292	0.411***	0.202	0.613***
	(0.175)	*(0.479)*	*(0.505)*	*(0.126)*	*(0.229)*	*(0.215)*
HSDIPLOMA	-0.026	0.053	0.028	-0.005	0.067	0.062
	(0.044)	*(0.088)*	*(0.082)*	*(0.068)*	*(0.116)*	*(0.107)*
COLLEGE	0.126***	0.023	0.149*	0.070	0.041	0.111
	(0.036)	*(0.073)*	*(0.079)*	*(0.044)*	*(0.072)*	*(0.071)*
BACHELORS	0.110**	-0.029	0.082	0.144**	0.117	0.261**
	(0.043)	*(0.113)*	*(0.116)*	*(0.058)*	*(0.105)*	*(0.110)*
WHOLESALE	0.324	-0.039	0.284	0.210	0.904**	1.114**
	(0.230)	*(0.668)*	*(0.744)*	*(0.186)*	*(0.403)*	*(0.432)*
RETAIL	0.026	-0.031	-0.004	0.514***	-0.700**	-0.185
	(0.144)	*(0.391)*	*(0.428)*	*(0.134)*	*(0.304)*	*(0.340)*
TRANSPORT	0.080	-0.404	-0.325	0.030	-0.443	-0.413
	(0.127)	*(0.378)*	*(0.410)*	*(0.136)*	*(0.314)*	*(0.361)*
INFORMATION	0.454*	1.756***	2.210***	0.166	-0.203	-0.037
	(0.261)	*(0.640)*	*(0.628)*	*(0.183)*	*(0.436)*	*(0.493)*
FIRE	0.171*	-0.162	0.009	0.181*	0.039	0.220
	(0.089)	*(0.235)*	*(0.253)*	*(0.099)*	*(0.195)*	*(0.185)*
PROFESSIONAL	0.040	-0.407	-0.367	-0.081	-0.070	-0.151
	(0.143)	*(0.353)*	*(0.369)*	*(0.101)*	*(0.286)*	*(0.319)*
EDU-HEALTH	-0.186***	-0.228	-0.414**	-0.129*	-0.536***	-0.665***
	(0.064)	*(0.151)*	*(0.166)*	*(0.065)*	*(0.156)*	*(0.177)*
RECREATION	0.103*	0.338**	0.442**	0.319***	0.115	0.435***
	(0.053)	*(0.163)*	*(0.177)*	*(0.062)*	*(0.118)*	*(0.112)*
OTHERSERVICE	-0.597**	-0.674	-1.271*	-1.177***	-0.749	-1.925***
	(0.256)	*(0.664)*	*(0.741)*	*(0.314)*	*(0.628)*	*(0.690)*
VIOLENT	0.349	-0.736	-0.387	0.108	-0.092	0.015
	(0.222)	*(0.580)*	*(0.555)*	*(0.299)*	*(0.616)*	*(0.594)*
PROPERTY	-0.730*	0.835	0.105	-1.161**	-1.738*	-2.899***
	(0.381)	*(0.859)*	*(0.819)*	*(0.442)*	*(0.960)*	*(1.035)*
RHO		-0.011			-0.446	
		(0.117)			*(0.160)*	
Obs.		221			153	
R^2		0.789			0.746	

Note: ***, **, and * indicate statistically significant at 1%, 5%, and 10% levels, respectively. Standard errors given in parentheses.
Mount Vernon-Anacortes, WA excluded.

Table A2. East versus West direct, indirect, and total effects estimates of *FREEDOM* on average establishment birth rate from 2002-2008; full set of controls included, excluding outliers.

	EAST			WEST		
	Direct	Indirect	Total	Direct	Indirect	Total
FREEDOM	-0.033	0.545*	0.511**	-0.024	0.867***	0.844***
	(0.190)	*(0.295)*	*(0.215)*	*(0.145)*	*(0.271)*	*(0.258)*
INCOME	-3.475***	-2.134	-5.609**	-3.647***	-2.559	-6.206***
	(1.213)	*(2.533)*	*(2.740)*	*(0.872)*	*(2.165)*	*(2.336)*
MALE	0.008	0.056	0.064	-0.029	-0.669**	-0.697**
	(0.026)	*(0.073)*	*(0.084)*	*(0.108)*	*(0.274)*	*(0.308)*
TEEN	-0.081	0.135	0.054	-0.407**	0.629	0.222
	(0.179)	*(0.451)*	*(0.484)*	*(0.166)*	*(0.500)*	*(0.592)*
WORKING	-0.021	0.096	0.075	-0.253***	0.345*	0.093
	(0.086)	*(0.221)*	*(0.223)*	*(0.074)*	*(0.193)*	*(0.213)*
ELDER	0.012	0.186	0.198	-0.238***	0.129	-0.109
	(0.065)	*(0.152)*	*(0.154)*	*(0.060)*	*(0.171)*	*(0.191)*
BLACK	-0.001	0.023	0.022	-0.022	-0.014	-0.037
	(0.016)	*(0.029)*	*(0.023)*	*(0.021)*	*(0.035)*	*(0.026)*
HISPANIC	0.032	0.114**	0.146***	-0.016	0.001	-0.015
	(0.026)	*(0.055)*	*(0.051)*	*(0.015)*	*(0.030)*	*(0.025)*
UNEMP	-0.174	-0.164	-0.337	0.035	0.177	0.212
	(0.110)	*(0.230)*	*(0.218)*	*(0.064)*	*(0.199)*	*(0.215)*
DENSITY	-0.074	0.397	0.323	0.405***	-0.029	0.375*
	(0.197)	*(0.510)*	*(0.537)*	*(0.111)*	*(0.222)*	*(0.218)*
HSDIPLOMA	0.012	-0.065	-0.054	-0.007	0.019	0.012
	(0.052)	*(0.097)*	*(0.085)*	*(0.058)*	*(0.115)*	*(0.112)*
COLLEGE	0.094**	-0.022	0.072	0.063*	-0.003	0.060
	(0.040)	*(0.080)*	*(0.085)*	*(0.034)*	*(0.074)*	*(0.076)*
BACHELORS	0.152***	-0.025	0.127	0.096*	0.049	0.145
	(0.052)	*(0.122)*	*(0.124)*	*(0.049)*	*(0.099)*	*(0.107)*
WHOLESALE	0.183	-0.744	-0.561	0.150	0.686	0.836*
	(0.268)	*(0.700)*	*(0.767)*	*(0.164)*	*(0.426)*	*(0.465)*
RETAIL	0.102	0.080	0.182	0.375***	-0.581*	-0.206
	(0.165)	*(0.425)*	*(0.451)*	*(0.121)*	*(0.305)*	*(0.352)*
TRANSPORT	0.179	0.271	0.451	0.014	-0.380	-0.366
	(0.148)	*(0.413)*	*(0.441)*	*(0.124)*	*(0.335)*	*(0.386)*
INFORMATION	0.536*	0.822	1.358*	0.119	-0.299	-0.180
	(0.298)	*(0.685)*	*(0.698)*	*(0.158)*	*(0.431)*	*(0.487)*
FIRE	0.123	0.078	0.202	0.138	0.156	0.294
	(0.104)	*(0.254)*	*(0.271)*	*(0.085)*	*(0.192)*	*(0.189)*
PROFESSIONAL	-0.084	-0.040	-0.124	0.017	0.005	0.022
	(0.170)	*(0.395)*	*(0.410)*	*(0.087)*	*(0.285)*	*(0.316)*
EDU-HEALTH	-0.203***	-0.203	-0.406**	-0.096	-0.463***	-0.559***
	(0.075)	*(0.165)*	*(0.176)*	*(0.059)*	*(0.157)*	*(0.180)*
RECREATION	0.088	0.162	0.249	0.270***	0.111	0.381***
	(0.062)	*(0.159)*	*(0.174)*	*(0.056)*	*(0.117)*	*(0.112)*
OTHERSERVICE	-0.706**	0.315	-0.390	-0.887***	-0.576	-1.462**
	(0.287)	*(0.743)*	*(0.816)*	*(0.270)*	*(0.656)*	*(0.717)*
VIOLENT	0.134	-1.016	-0.882	-0.248	0.219	-0.030
	(0.254)	*(0.652)*	*(0.642)*	*(0.247)*	*(0.628)*	*(0.621)*
PROPERTY	-0.155	1.929**	1.774*	-0.886**	-1.506	-2.392**
	(0.451)	*(0.972)*	*(0.899)*	*(0.386)*	*(0.941)*	*(1.061)*
RHO		-0.091			-0.257	
		(0.124)			*(0.016)*	
Obs.		220			152	
R^2		0.677			0.755	

Note: ***, **, and * indicate statistically significant at 1%, 5%, and 10% levels, respectively. Standard errors given in parentheses.
Lewiston-Auburn, ME, Medford-Ashland, OR, and Mount-Vernon Anacortes, WA excluded.

Table A3. East versus West direct, indirect, and total effects estimates of *FREEDOM* on cumulative proprietorship growth rate from 2002-2005; full set of controls included.

	EAST			WEST		
	Direct	Indirect	Total	Direct	Indirect	Total
FREEDOM	0.002	0.003	0.005	0.015***	0.014**	0.029***
	(0.004)	*(0.007)*	*(0.010)*	*(0.004)*	*(0.006)*	*(0.009)*
INCOME	0.050	0.080	0.129	-0.085***	-0.083**	-0.168**
	(0.032)	*(0.055)*	*(0.086)*	*(0.030)*	*(0.041)*	*(0.065)*
MALE	0.000	0.000	0.000	-0.003	-0.003	-0.006
	(0.001)	*(0.001)*	*(0.002)*	*(0.004)*	*(0.004)*	*(0.008)*
TEEN	0.005	0.008	0.013	0.002	0.002	0.004
	(0.005)	*(0.009)*	*(0.014)*	*(0.005)*	*(0.006)*	*(0.011)*
WORKING	0.000	-0.001	-0.001	0.000	0.000	-0.001
	(0.003)	*(0.004)*	*(0.007)*	*(0.002)*	*(0.003)*	*(0.005)*
ELDER	0.001	0.001	0.002	0.002	0.002	0.004
	(0.002)	*(0.003)*	*(0.005)*	*(0.002)*	*(0.002)*	*(0.004)*
BLACK	0.001*	0.001*	0.002*	0.000	0.000	0.000
	(0.000)	*(0.001)*	*(0.001)*	*(0.001)*	*(0.001)*	*(0.001)*
HISPANIC	0.000	0.000	0.001	0.000	0.000	0.000
	(0.001)	*(0.001)*	*(0.002)*	*(0.000)*	*(0.000)*	*(0.001)*
UNEMP	-0.009***	-0.015**	-0.024**	0.004*	0.004	0.008
	(0.003)	*(0.006)*	*(0.009)*	*(0.002)*	*(0.003)*	*(0.005)*
DENSITY	-0.001	-0.001	-0.001	0.010***	0.011*	0.021**
	(0.006)	*(0.010)*	*(0.016)*	*(0.004)*	*(0.006)*	*(0.009)*
HSDIPLOMA	-0.003**	-0.005**	-0.008**	-0.003**	-0.003*	-0.006**
	(0.001)	*(0.002)*	*(0.004)*	*(0.002)*	*(0.002)*	*(0.003)*
COLLEGE	0.000	0.000	0.000	0.001	0.001	0.003
	(0.001)	*(0.002)*	*(0.003)*	*(0.001)*	*(0.001)*	*(0.002)*
BACHELORS	-0.003*	-0.005*	-0.008*	-0.001	-0.001	-0.001
	(0.002)	*(0.003)*	*(0.004)*	*(0.001)*	*(0.002)*	*(0.003)*
WHOLESALE	-0.002	-0.002	-0.004	0.002	0.002	0.003
	(0.008)	*(0.014)*	*(0.022)*	*(0.006)*	*(0.007)*	*(0.013)*
RETAIL	0.001	0.001	0.002	0.007	0.007	0.013
	(0.005)	*(0.008)*	*(0.013)*	*(0.004)*	*(0.005)*	*(0.009)*
TRANSPORT	0.000	-0.001	-0.001	0.002	0.002	0.005
	(0.005)	*(0.008)*	*(0.013)*	*(0.004)*	*(0.005)*	*(0.009)*
INFORMATION	-0.006	-0.009	-0.015	0.003	0.002	0.005
	(0.009)	*(0.016)*	*(0.025)*	*(0.006)*	*(0.006)*	*(0.011)*
FIRE	0.001	0.002	0.004	0.002	0.002	0.005
	(0.003)	*(0.005)*	*(0.009)*	*(0.003)*	*(0.004)*	*(0.007)*
PROFESSIONAL	0.006	0.009	0.015	0.003	0.002	0.005
	(0.006)	*(0.010)*	*(0.015)*	*(0.003)*	*(0.004)*	*(0.007)*
EDU-HEALTH	0.001	0.002	0.003	-0.001	-0.001	-0.002
	(0.002)	*(0.004)*	*(0.006)*	*(0.002)*	*(0.002)*	*(0.004)*
RECREATION	0.004*	0.006*	0.009*	0.007***	0.007**	0.015***
	(0.002)	*(0.003)*	*(0.005)*	*(0.002)*	*(0.003)*	*(0.004)*
OTHERSERVICE	-0.005	-0.007	-0.012	-0.015	-0.014	-0.029
	(0.009)	*(0.015)*	*(0.024)*	*(0.010)*	*(0.011)*	*(0.002)*
VIOLENT	0.001	0.002	0.004	0.004	0.004	0.009
	(0.008)	*(0.013)*	*(0.021)*	*(0.009)*	*(0.009)*	*(0.018)*
PROPERTY	0.018	0.028	0.046	-0.019	-0.019	-0.038
	(0.012)	*(0.022)*	*(0.034)*	*(0.013)*	*(0.015)*	*(0.028)*
RHO		0.642***			0.510***	
		(0.057)			(0.081)	
Obs.		221			154	
R^2		0.563			0.561	

Note: ***, **, and * indicate statistically significant at 1%, 5%, and 10% levels, respectively. Standard errors given in parentheses.

Table A4. East versus West direct, indirect, and total effects estimates of *FREEDOM* on cumulative proprietorship growth rate from 2002-2011; full set of controls included.

	EAST			WEST		
	Direct	Indirect	Total	Direct	Indirect	Total
FREEDOM	0.005	0.004	0.008	0.039***	0.010	0.049***
	(0.009)	*(0.007)*	*(0.016)*	*(0.012)*	*(0.006)*	*(0.015)*
INCOME	0.023	0.018	0.041	-0.007	0.000	-0.007
	(0.075)	*(0.062)*	*(0.136)*	*(0.086)*	*(0.026)*	*(0.109)*
MALE	0.001	0.001	0.002	-0.01	-0.003	-0.013
	(0.002)	*(0.002)*	*(0.003)*	*(0.011)*	*(0.003)*	*(0.014)*
TEEN	0.033***	0.026**	0.059**	0.007	0.002	0.009
	(0.012)	*(0.012)*	*(0.024)*	*(0.015)*	*(0.005)*	*(0.019)*
WORKING	-0.003	-0.002	-0.005	-0.032***	-0.008	-0.040***
	(0.006)	*(0.005)*	*(0.011)*	*(0.007)*	*(0.005)*	*(0.010)*
ELDER	0.005	0.004	0.008	-0.023***	-0.006	-0.028***
	(0.004)	*(0.004)*	*(0.008)*	*(0.005)*	*(0.004)*	*(0.007)*
BLACK	0.004***	0.003***	0.007***	0.008***	0.002	0.010***
	(0.001)	*(0.001)*	*(0.002)*	*(0.001)*	*(0.001)*	*(0.002)*
HISPANIC	0.003**	0.002*	0.006**	0.002	0.000	0.002
	(0.002)	*(0.001)*	*(0.003)*	*(0.001)*	*(0.000)*	*(0.001)*
UNEMP	-0.023***	-0.018**	-0.041***	0.022***	0.006	0.028***
	(0.008)	*(0.007)*	*(0.014)*	*(0.007)*	*(0.004)*	*(0.010)*
DENSITY	0.002	0.002	0.004	0.003	0.001	0.004
	(0.013)	*(0.011)*	*(0.024)*	*(0.011)*	*(0.004)*	*(0.014)*
HSDIPLOMA	-0.004	-0.003	-0.007	-0.002	0.000	-0.002
	(0.003)	*(0.003)*	*(0.006)*	*(0.004)*	*(0.001)*	*(0.006)*
COLLEGE	-0.003	-0.003	-0.006	-0.004	-0.001	-0.005
	(0.003)	*(0.002)*	*(0.005)*	*(0.003)*	*(0.001)*	*(0.004)*
BACHELORS	0.000	0.000	0.001	0.009**	0.002	0.012**
	(0.004)	*(0.003)*	*(0.007)*	*(0.004)*	*(0.002)*	*(0.006)*
WHOLESALE	0.029	0.023	0.052	-0.021	-0.005	-0.026
	(0.020)	*(0.018)*	*(0.037)*	*(0.018)*	*(0.006)*	*(0.022)*
RETAIL	-0.006	-0.005	-0.011	0.037***	0.010	0.047***
	(0.012)	*(0.010)*	*(0.021)*	*(0.013)*	*(0.007)*	*(0.017)*
TRANSPORT	0.002	0.002	0.004	0.008	0.002	0.011
	(0.012)	*(0.010)*	*(0.021)*	*(0.013)*	*(0.004)*	*(0.016)*
INFORMATION	-0.007	-0.006	-0.014	-0.027	-0.007	-0.033
	(0.022)	*(0.018)*	*(0.040)*	*(0.016)*	*(0.006)*	*(0.021)*
FIRE	0.016**	0.012*	0.028	0.010	0.003	0.013
	(0.008)	*(0.007)*	*(0.015)*	*(0.009)*	*(0.003)*	*(0.012)*
PROFESSIONAL	0.018	0.014	0.032	0.002	0.000	0.003
	(0.013)	*(0.011)*	*(0.024)*	*(0.010)*	*(0.003)*	*(0.013)*
EDU-HEALTH	-0.010*	-0.008	-0.017*	-0.013	-0.003	-0.016**
	(0.005)	*(0.005)*	*(0.010)*	*(0.006)*	*(0.002)*	*(0.007)*
RECREATION	0.009*	0.007	0.016*	0.024***	0.006	0.031***
	(0.005)	*(0.004)*	*(0.008)*	*(0.005)*	*(0.004)*	*(0.008)*
OTHERSERVICE	-0.027	-0.021	-0.049	0.030	0.007	0.037
	(0.022)	*(0.019)*	*(0.040)*	*(0.028)*	*(0.009)*	*(0.035)*
VIOLENT	0.002	0.002	0.004	-0.045*	-0.011	-0.056*
	(0.018)	*(0.015)*	*(0.032)*	*(0.024)*	*(0.010)*	*(0.031)*
PROPERTY	0.021	0.016	0.037	-0.049	-0.012	-0.061
	(0.029)	*(0.023)*	*(0.052)*	*(0.037)*	*(0.013)*	*(0.048)*
RHO		0.456***			0.120**	
		(0.066)			*(0.093)*	
Obs.		221			154	
R^2		0.662			0.645	

Note: ***, **, and * indicate statistically significant at 1%, 5%, and 10% levels, respectively. Standard errors given in parentheses.