GROWTH IN THE NUMBER OF FIRMS AND THE ECONOMIC FREEDOM INDEX IN A DYNAMIC MODEL OF THE U.S. STATES

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ABSTRACT

The Economic Freedom of North America index (EFNA) is positively and significantly related to state economic attainment variables. Using Arrelano-Bond (Arellano and Bond, 1991) estimation, we relate the economic freedom index to growth in the number of businesses within the states. Our results are consistent with the literature: the EFNA is positively related to growth in the number of businesses.

INTRODUCTION

Freedom indices of the world have established themselves as fixtures in the social sciences literature, especially in the economic growth literature. (e.g., Atukeren, 2005; Berggren and Jordahl, 2005; Gwartney, Lawson and Clark, 2005; Powell, 2005; Gwartney, Holcombe and Lawson, 2004; Nieswiadomy and Strazichich, 2004; Cole, 2003; Gwartney and Lawson, 2003; Gwartney, Block and Lawson, 1996) Across the literature, the consistent finding is that economic freedom, as measured by the various indices, is significantly and positively related to economic well-being. Citizens of nations with more economic freedom enjoy higher incomes, and as an economy becomes freer, incomes rise. Of course, some may object that the term "economic freedom" is not value neutral. Though true, the advocacy component of the indices creators does not alter the indices' proven research usefulness in summarizing a broad variety of government activities. One could choose to think of the indices in terms of "market liberalism," or "government economic non-interventionism."

Karabegovic, Samida, Schlegel and McMahon (2003) introduced a conceptually similar index, the Economic Freedom of North America index (EFNA) featuring economic freedom differences among U.S. states and Canadian provinces. Karabegovic, et al, used their index to explain income differences among the states, offering evidence that the EFNA is significantly, positively related to state levels and growth of economic activity.

Various researchers have used the EFNA (e.g., Ashby, 2005; Kreft and Sobel, 2005; Wang, 2005) to address questions of income differentials between states, income growth, entrepreneurship, and other research questions. Similar to Kreft and Sobel (2005), Gohmann,

Hobbs & McCrickard (2008), Sobel (2008), and others, we apply the EFNA to questions of entrepreneurship. Specifically, we ask whether the political outcomes summarized by the EFNA are significantly related to growth in the number of businesses. Karabegovic, et al, argue that the EFNA measures economic freedom in states; furthermore, they argued that greater economic freedom results in higher income levels for state residents because greater economic freedom consists of greater opportunity to seek and exploit economic opportunities; that is, to pursue entrepreneurial activity. Freedom to exploit economic opportunities is also the freedom to create new businesses, so economic freedom should lead to more business births. However, such freedom is a double-edged sword. The freedom to start a business is also the freedom for that business to fail. Indeed, it is business births that create the "raw material" for business failures. Therefore, the impact of economic freedom on growth in the number of businesses is ambiguous, although the impact on society—higher incomes—is not.

This paper contains two innovations not found elsewhere in this stream of the literature. The first is the dependent variable, the measure of businesses. We use the annual growth rate in the number of firms, approximated by the annual difference in the natural log of the number of firms. Therefore, this measure implicitly includes firm births and firm deaths, and captures the full range of firm launches, whether partnership, corporation, etc. The second innovation is the use of a particular dynamic panel data estimator (Arellano and Bond, 1991) not found in this literature outside of a working paper.[1]

ENTREPRENEURSHIP, ECONOMIC FREEDOM, AND ECONOMIC PERFORMANCE

Promoting entrepreneurship has emerged as a significant policy tool for regional economic growth and job creation. The relevant policy question becomes which policies best promote entrepreneurship. A literature has developed around the concept that the appropriate policies are those will increase economic freedom. "Economic freedom" may be conceptualized as:

> "Policies are consistent with economic freedom when they provide an infrastructure for voluntary exchange, and protect individuals and their property from aggressors seeking to use violence, coercion, and fraud to seize things that do not belong to them. However, economic freedom also requires governments to refrain actions that interfere with personal choice, voluntary exchange, and the freedom to enter and compete in labor and product markets." (Gwartney and Lawson, 2002 Annual Report, 5)

The missing link in the argument is the one that ties together economic freedom and entrepreneurship:

> "…underlying economic freedoms generate growth primarily *because* they promote underlying entrepreneurial activity, which is then the source of economic growth. …. In areas with institutions providing secure property rights, a fair and balanced judicial system, contract

> enforcement, and effective limits on government's ability to transfer wealth through taxation and regulation, creative individuals are more likely to engage in the creation of new wealth through productive market entrepreneurship." (Kreft and Sobel, 2005, 9)

Neither the literature nor policy makers have consistently defined either the differences or the overlap between entrepreneurship and business formation. Indeed, in popular parlance, entrepreneurship and business formation are used nearly synonymously. We choose to focus on business creation and business destruction—measured as the growth rate in the number of firms—as the proxy for entrepreneurship.

ECONOMIC FREEDOM OF NORTH AMERICA

The EFNA is constructed from ten variables clustered into three categories: size of government; takings and discriminatory taxation; and labor market freedom. For *size of government*, the EFNA considers general consumption expenditures by government as a percentage of GDP, transfers and subsidies as a percentage of GDP, and Social Security expenditures as a percentage of GDP. For *takings and discriminatory taxation*, the EFNA considers total government revenue from own sources as a percentage of GDP; top marginal income tax rate and the income threshold at which it applies; indirect tax revenue as a percentage of GSP; and sales taxes collected as a percentage of GSP. For *labor market freedom*, the EFNA considers minimum wage legislation, government employment as a percentage of total state employment, and union density.

The EFNA is constructed on a scale from zero to 10 to represent the underlying distribution of the 10 variables in the index, with higher values indicating higher levels of "economic freedom." In the final construction each area was equally weighted and each variable within each area was equally weighted. The freedom index is a relative ranking of economic freedom across jurisdictions and across time. The EFNA is available in two variants, one which includes local, regional and national government outcomes, and one which considers only sub-national governments.

FIRM BIRTHS, FIRM DEATHS AND PANEL DATA WITH LAGGED DEPENDENT VARIABLES AS INDEPENDENT VARIABLES

Johnson and Parker (1994, 1996) discussed the need to scale the dependent variable to account for differences in the economies of the cross-sectional units. For example, directly comparing the number of firms formed in North Dakota with the number of firms formed in California would be inappropriate due the vast size differences of these states' economies. To control for differences in size, we use the growth rate in the number of firms as the dependent variable. Johnson and Parker demonstrate that researchers cannot study firm births and firm deaths in isolation. Although not separately estimating (with lags) the impact of firm births and

deaths on firm births—as Johnson and Parker did—the annual growth rate of the number of firms in a state implicitly captures firm births and firm deaths. (Moreover, the variable we collected is the total number of firms by year by state, and does not separate annual observations by firm births and firm deaths.) Lags of this variable will allow previous values of firm births and deaths to affect current values of firm births and deaths.

Though some of the literature focuses on sole proprietorships, we chose to focus on new businesses regardless of organizational structure. Many small businesses may be formed as S-corporations to provide their owners with the limited liability benefits of the corporate form while allowing for the preferential tax treatment of the sole proprietorship. Wong, Ho, and Autio (2005) and Friar and Meyer (2003), among others, demonstrated that new growth ventures stimulate economies; but new ventures in general do not. Many new growth ventures tend to form around an entrepreneurial *team* with significant industry experience (Friar and Meyer, 2003; Bygrave, 1997; Timmons and Spinelli, 2006). Counting only sole proprietorships may miss the most economically significant entrepreneurship.

As Johnson and Parker demonstrated, the impact of contemporaneous births (or deaths) on future births and deaths is highly persistent. Accordingly, they used vector autoregressive models applied to panel data—an application of the approach used by Holtz-Eakin, Newey, and Rosen (1988). Our data set is a panel of the U.S. states from 1988 through 2005. Besides Holtz-Eakin, Newey, and Rosen (1988), the standard reference for panel data models with lagged dependent variables as independent variables is Arellano and Bond (1991). Arellano and Bond consider estimating the following equation using a panel data set:

$$y_{it} = \sum_{j=1}^{p} \alpha_j y_{i,t-j} + \mathbf{x}_{it}\beta_1 + \mathbf{w}_{it}\beta_2 + v_i + \varepsilon_{it}; i = 1,...N; t = 1,...T_i \qquad (1)$$

Alpha, rho, and the betas are parameters to be estimated. The vector, x, is composed of strictly exogenous covariates, while the vector, w, is composed of pre-determined covariates. Arellano and Bond first-difference the equation to remove the *v* and produce an equation that can be estimated using instrumental variables and a generalized method of moments estimator. This estimator allows the use of lagged independent variables and lagged values of exogenous variables as regressors in a panel data setting. For our purposes, this allows us to exploit the panel nature of our data set while including lags of growth rates in the number of firms. Arellano and Bover (1995) and Blundell and Bond (1998) further extend and refine these estimators. Consistent with much of the literature on growth in the number of firms, we opted to estimate models with three lags of the appropriate variables.

In addition to the EFNA, the other independent variables are real GDP per capita, the sum of agriculture's and manufacturing's percentages of real GDP, the annual state unemployment rate, population density, the percentage of the population with at least a

baccalaureate degree, the number of employees per firm, and the volume of commercial and industrial loans. When appropriate, all variables are in natural log form.

We included per capita real GDP is indicative of firms' abilities to survive and the attractiveness of launching a new venture. Wealthier customers are likely to consume more goods and services, buoying a struggling firm or providing incentive to launch new ones (see e.g., Chen and Williams, 1999; Liu, 2004). The strongest result across all of the "economic freedom" research is that income growth and/or levels are dependent upon economic freedom. To include income and the EFNA in the same model as independent variables is to court multicolinearity problems. We followed the economic freedom literature's common practice of "purging" income of the effects of the EFNA. Our ultimate solution was to take our cue from the literature; that the ultimate source of income growth was the pro-income institutions (Friedman 1962, North 1980); therefore institutions cause growth. We regressed income on EFNA and year and time effects and retained the income residuals. In Table 2 we estimated our model using real GDP per capita, while in Table 3 we used these "purged" residuals as the income variable.

High population densities indicate "thick markets," potentially attracting more entrepreneurial entry and exposing existing firms to more competition. By the same token, a high population density may mean less volatility in firm demand. Research has related education levels to firm formation and failure rates.

Acs and Armington (2004b) found a positive relationship between the share of adults with college degrees and firm formation rates. Lussier found a positive, but weak relationship between education and the failure of a firm (Lussier, 1995). Like Lussier, Chen and Williams (1999) also found a weak relationship in their study. Brown, Lambert, and Florax (2009) found that counties with a higher percentage of the population with associate's degrees increased both firm births and firm deaths.

The agriculture-manufacturing percentage of state GDP measures the agricultural and manufacturing firms are likely to have higher entry and exit costs, so states more reliant on agriculture and manufacturing may experience less volatility in the growth rate of the number of firms.

We measure the availability of capital to launch and to sustain firms with the volume of commercial and industrial (C&I) loans per capita. Much research has linked access to capital to firm launch and survivability (for example, see Platt and Platt, 1994; Chen and Willams, 1994; Liu, 2004 among others).

Unemployment has been established in the literature on firm failure as a proxy for the general "health of the economy" (Everett and Watson, 1998; Platt and Platt, 1994; Chen and Williams, 1999). Thus, one would anticipate that unemployment in a state might be related to both firm launches and firm survivability.

Audrestsch and Fritsch (1994) state that using the "ecological" method to study firm launches and survivability across regions biases results upward in regions with a relatively high

mean establishment size and downward in regions with a relatively low mean establishment size. In order to control for such bias, they suggest incorporating a measure of the mean establishment size along with other explanatory variables in one's estimates. Moreover, larger firms frequently offer better wages and more labor force "inertia than smaller firms, potentially reducing the attractiveness of self-employment. On the other hand, for new firms serving established businesses, bigger firms are likely to be better customers.

We draw our data from a variety of sources. EFNA data are from the Fraser Institute, lending data is from the FDIC, and all other data are from the U.S. Census Bureau or the U.S. Bureau of Economic Analysis. We construct a panel using the U.S. states as our cross-sectional element, covering the years 1988 through 2005. Please see Table 1 for a description of our variables.

Table 1
VARIABLE DEFINITIONS

gFirms	Annual growth rate in the number of firms
Income	Natural log of real GDP per capita
Ag MfgPct	Sum of agriculture and manufacturing percentages in real GDP
Unemply	Annual unemployment rate
Pop Den	Natural log of population density
Educatn	Population percentage with at least a baccalaureate degree
Emp/Firm	Natural log of number of employees per firm
C & I	Natural log of per capita C&I loan volume
EFNA	Natural log of EFNA

THE EMPIRICAL RESULTS

We offer our interpretation of the regression results with the caveat that inferring causality from the Arellano-Bond model is problematic, although Arellano-Bond and related estimators tend to work well with "wide but shallow" data sets such as ours. Using an Arellano-Bover and Blundell-Bond estimator could ameliorate the difficulties associated with Arellano-Bond. However, in this instance, the number of instruments approached too closely to the number of observations. When instruments are many, they tend to over-fit the instrumented variables and bias the results. The results among the various classes of estimators are qualitatively similar, but, in a judgment call, we opted to use Arellano-Bond estimators. All of our reported estimates are robust to heteroskedasticity, and reported with a correction for small sample size.

Table 2 presents our estimates using the natural log of real GDP per capita. We cannot reject the hypothesis of no AR(2) correlation in the residuals, indicating that the estimates are likely to be consistent. The F-statistic indicates a solid fit, overall. Lagged values of the growth

rate in the number of firms are significant predictors of the current growth rate in the number of firms. The first two lags have positive coefficients, indicating that more new firm launches and/or fewer firm exits in the previous two years yields a higher growth rate of new firms in the current period. The third lag is negative and significant. We speculate that this indicates that a state's economy is exhausting a semi-finite supply of entrepreneurs, as only some people will be willing to launch a new business and relatively few will launch multiple businesses within a three-year period. As more businesses are launched, some succeed and other take time to fail, be sold, or otherwise disposed of, thereby "freeing" an entrepreneur for another venture.

Current income is positively related to the current growth rate of the number of firms, while the first lag is negatively related to the current growth rate. High current income keeps firms afloat, while lower incomes in previous periods motivate more people to look for income replacement/extra income business venture opportunities. Agriculture and manufacturing's share of GDP has a negative coefficient in the current period, but a positive coefficient with one lag. Service firms and firms catering to final consumers may be easier to launch compared to firms associated with an agriculture or manufacturing economic base, so states relying on agriculture and manufacturing will appear to have a slower current number-of-firms growth rate. However, an increase in a state's manufacturing base, for example, stimulates the launch of new ventures selling services and intermediate products to the manufacturing base, but more time is required to launch those firms.

The unemployment rate has a negative and significant current coefficient, and positive and significant coefficients with a two- and three-year lag. High current unemployment makes for reduced current demand for products and services, increasing the difficulty in keeping existing firms afloat. Similar to income's effects, higher unemployment in previous periods motivate more people to look for self-employment business venture opportunities. Population density is positive in the current period and negative in the two- and three-year lags. We hypothesized that population density is a proxy for "thick markets." In the current period, thick markets help firms remain in operation and provide incentive to open new businesses. However, historically thick markets attract strong, efficient competitors from other markets, which suppress current number-of-firm growth rates.

Contrary to expectation, education had no significant effect on the growth rate of the number o firms. The average number of employees per firm has a powerful negative effect in current period, but has a powerful positive effect with a one-year lag. We speculate that the negative effect has to do with the benefits of employment in larger firms—better pay and benefits and stability—relative to the benefits of self-employment. However, large firms make good customers, so new ventures will be launched to service that markets demands. With a two-year lag, C&I lending has a positive effect on the number-of-firms growth rate. It seems reasonable to expect that C&I loan volume would "lead" growth in the number of firms, but we have no strong explanation for why the lead time would be as long as two years.

Table 2
ARELLANO-BOND DYNAMIC PANEL-DATA ESTIMATION
Robust one-step result

D.V.: gFirms

		Coef.	t-stat				Coef.	t-stat	
gFirms					Educatn		-0.02	-1.29	
	t-1	0.29	3.93	***		t-1	0.02	1.16	
	t-2	0.11	1.93	*		t-2	0.02	1.05	
	t-3	-0.08	-1.7	*		t-3	0.01	0.86	
Income		3.06	1.69	*	Emp/Firm		-16.87	-3.66	***
	t-1	-3.83	-1.92	*		t-1	20.74	4.66	***
	t-2	-1.69	-0.98			t-2	-1.94	-0.66	
	t-3	0.52	0.5			t-3	-1.80	-0.63	
Ag MfgPct		-0.07	-2.41	**	C & I		-0.11	-1.54	
	t-1	0.05	1.8	*		t-1	0.06	0.78	
	t-2	-0.03	-0.83			t-2	0.18	3.08	***
	t-3	0.00	-0.14			t-3	-0.12	-1.26	
Unemply		-0.14	-2.1	**	EFNA		4.87	2.42	**
	t-1	-0.07	-0.83			t-1	-2.28	-0.91	
	t-2	0.14	1.81	*		t-2	2.01	1.5	
	t-3	0.17	2.18	**		t-3	-1.81	-1.14	
Pop Den		12.26	2.13	**	Constant		0.12	2.51	**
	t-1	-12.15	-1.83	*	*	Significant at 90%			
	t-2	11.17	1.18		**	Significant at 95%			
	t-3	-13.96	-3.19	***	***	Significant at 99%			

H0: no autocorrelation of order 1 in residuals
z = -4.66 Pr > z = 0
H0: no autocorrelation of order 2 in residuals
z = 0.45 Pr > z = 0.6517
F-stat= 613.57

Turning to the EFNA, current "economic freedom" has a positive and relatively large effect on the current number-of-firms growth rate. That is, states whose governments currently spend less on current consumption and transfers, tax incomes and sales less, and employee less of the work force, etc., experience more current firm launches and/or fewer current firm failures. Although the direction of economic freedom's effect was ambiguous, *a priori*, we expected the policies summarized by the EFNA to have some significant impact. In this model, economic freedom significantly influences entrepreneurship and the number-of-firms growth rate.

In Table 3 we re-estimated the model using the income residuals described previously in place of real GDP per capita. Although the results in Table 3 are similar to those of Table 2, there are several differences. The F-statistic is rather smaller, and the hypothesis of no AR(2) in the residuals is rejected by a much narrower margin. However, the constant term is no longer significant. The somewhat unexpected negative coefficient on the third lag of the dependent variable is no longer significant. None of the coefficients for agriculture-manufacturing are

significant. The coefficients on current and single-lagged population density are no longer significant. The second lag of unemployment is no longer significant and the first lag of unemployment switches sign to negative.

Table 3
ARELLANO-BOND DYNAMIC PANEL-DATA ESTIMATION
Robust one-step result

D.V.: gFirms

	Coef.	t-stat			Coef.	t-stat	
gFirms	…	…		Educatn	-0.03	-1.24	
t-1	0.16	1.72	*	t-1	0.00	0.13	
t-2	0.15	1.77	*	t-2	0.01	0.34	
t-3	0.00	-0.06		t-3	0.01	0.53	
Inc Resid	-0.61	-0.29		Emp/Firm	-19.37	-3.64	***
t-1	-2.19	-1.39		t-1	23.39	4.86	***
t-2	-0.65	-0.33		t-2	-3.00	-0.84	
t-3	-0.70	-0.32		t-3	4.36	1.55	
Ag MfgPct	-0.01	-0.25		C & I	-0.12	-1.03	
t-1	-0.02	-0.57		t-1	0.10	1.34	
t-2	-0.02	-0.53		t-2	0.16	2.79	***
t-3	0.01	0.26		t-3	-0.04	-0.41	
Unemply	-0.20	-3.09	***	EFNA	4.08	1.86	*
t-1	-0.23	-2.33	**	t-1	1.43	0.7	
t-2	0.13	1.41		t-2	1.10	0.57	
t-3	0.22	3.02	***	t-3	-5.61	-2.64	***
Pop Den	0.93	0.15		Constant	0.01	0.16	
t-1	-2.59	-0.47		*	Significant at 90%		
t-2	13.45	1.31		**	Significant at 95%		
t-3	-15.37	-2.75	***	***	Significant at 99%		
H0: no autocorrelation of order 1 in residuals							
z =	-4.2		Pr > z =	0			
H0: no autocorrelation of order 2 in residuals							
z =	-1.53		Pr > z =	0.1252			
F-stat=	170.81						

Most interesting are the results for the income residuals and EFNA. The income residuals are not significant in any time period; however, the third lag of EFNA is now negative and significant. The EFNA effects are quantitatively large, although this result should be taken with a grain of salt. EFNA values have been rather stable across time, especially within states. Accordingly, this result is of more consequence to spatial variations in the number-of-firms growth rates than to variations in the rate through time. Nonetheless, Table 3 implies that the income effects estimated in Table 2are actually due to economic freedom; particularly, EFNA with a three-year lag. With a three-year lag, economic freedom exerts a large and strongly

significant *negative* effect on the number-of-firms growth rate, while current economic freedom exerts a slightly smaller *positive* effect on the growth rate.

Given that the EFNA tends to be stable through time within a state, it makes sense to interpret this result by comparing states. Consider two states that are similar in every way, except that one state has been and remains more "economically free" than the other state. Table 3 implies the economically freer state should experience *slower* growth in the number of firms in the state. This result is not unexpected, though. The freedom to launch new businesses is also the freedom for businesses to fail.

CONCLUSIONS

Similar to the world freedom indices, the EFNA is positively and significantly related to a variety of economic attainment variables. As measured by the EFNA, economic freedom in the states leads to economic attainment in the states. Researchers have also related the EFNA to measures of entrepreneurship. This step in the research seems natural, if "economic freedoms generate growth primarily *because* they promote underlying entrepreneurial activity, which is then the source of economic growth," as Kreft & Sobel (2005, 9) state. Most commonly, these studies have related the EFNA to some measure of one particular aspect of entrepreneurship, firm creation. We extend this literature by relating the EFNA to the annual growth rate in the number of firms, within a dynamic panel data model that incorporates lagged values of the independent and dependent variables as explanatory factors.

Although the effect of economic freedom on income levels or growth is not in question, (Doucouliagos and Ulubasoglu, 2006) its specific impact on launches and failures of businesses is ambiguous, *a priori*. Governments that maintain a limited "footprint" upon, and intervention in, their economies leave potential entrepreneurs with the freedom to launch businesses to pursue a wide variety and great number of perceived profit opportunities. Over time many of these perceived opportunities will be revealed as mirages, and many of the new firms will be revealed as undercapitalized, poorly managed, or possessing some other defect. In the ordinary course of the economic process, these firms will fail. A limited, small government that allows entrepreneurs to launch new firms is unlikely to intervene in markets to prevent those firms from failing. Accordingly, economic freedom's effect on the *net* number of firms or the number-of-firms growth rate is unclear.

Our results offer some evidence that economically freer states may experience growth rates in the number of firms that are little different or *slower* than other, less free states, *ceteris paribus*. This result is reminiscent of Gohmann, Hobbs & McCrickard (2008) who found that increases in economic freedom lead to growth in the number of firms in some service industries, but that the reverse is true in other service industries.

The idea that pursuing more economic freedom yields more firm deaths may be alarming to some. In fact, some researchers suggest government's role might include intervention to

reduce the failure rate (Strotmann, 2007). However, firm births and firm deaths are inevitably intertwined in an economy that is largely free from government intervention, and this process of firms being born and other firms dying is integral to markets' ability to create wealth. Recall that the strongest result in this literature is that policies increasing economic freedom increase the level and growth rate of income, independent of their effects on firm births or firm deaths. As Lane and Schary (1991) state: "…business failures are one method by which the economy retools or redistributes resources … (Lane and Schary, 1991, p. 104)." Strotmann (2007) also argues that failures are a sign of a healthy economy. Struggling businesses that are artificially propped up by government may tie up resources, such as financial capital (credit), physical capital (e.g., retail space), for instance, that might otherwise be available to entrepreneurs seeking to start a new business. Thus, their failure or death is actually a positive outcome in general—though it may be very stressful at a personal level—because it frees up resources in the competitive environment for others to utilize. Simply put, "not all types of corporate failures are undesirable (Liu, p. 2004, 944)."

END NOTE

1. Parker and Robson (2004) study self-employment using a panel of OECD nations, however, their empirical work focuses on panel data tests for cointegration, not on the Arellano-Bond (1991) estimator as this paper does. Wang's (2005) working paper employs the Arellano-Bond estimator, among others. However, a literature review failed to uncover publication of Wang's working paper.

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