AN EMPIRICAL ANALYSIS OF THE LINK BETWEEN ENTREPRENEURSHIP AND ECONOMIC GROWTH IN WEST VIRGINIA

RESEARCH PAPER 2009-2

Maribel N. Mojica[1]
Tesfa G. Gebremedhin
Peter V. Schaeffer

Abstract
Entrepreneurship variables constructed from county-level proprietorship and firm birth data were included in an endogenous growth model to determine the relationship between entrepreneurship and economic growth in West Virginia. The empirical estimates using weighted least squares (WLS) and 2-stage least squares (2SLS) regressions generally show empirical evidence regarding the positive contribution of entrepreneurial activity to economic growth. Counties with more proprietors and business start ups exhibited higher growths in population and employment growth compared to less entrepreneurial counties. However, none of the entrepreneurship variables used in the study is statistically significant in determining per capita income growth.

[1] Graduate Research Assistant, professor and professor, Division of Resource Management, Davis College of Agriculture, Forestry and Consumer Sciences, West Virginia University.

Paper presented at the Southern Agricultural Economics Association Annual Meeting, Atlanta, Georgia, January 31-February 3, 2009.

This research was supported by Hatch funds appropriated to the Agricultural and Forestry Experiment Station, Davis College, West Virginia University.

AN EMPIRICAL ANALYSIS OF THE LINK BETWEEN ENTREPRENEURSHIP AND ECONOMIC GROWTH IN WEST VIRGINIA

Introduction

West Virginia is one of the most rural states in the country, characterized by high levels of unemployment and poverty. Despite the expansion of the United States economy in the past decades, rural communities in West Virginia lagged behind in terms of social and economic well-being of its population. Searching for new ways to alleviate poverty in rural areas, new approaches are emerging that support smaller companies instead of the traditional pursuit of large industries in the past. A consequence of this change is the increased importance of entrepreneurship by creating economic value through the establishment of new or the growth of existing firms. New businesses and self-employment contribute jobs at the start of the business operation, resulting in higher income levels and increased wealth, and enhanced market (Fritsch and Mueller, 2004; Henderson, 2006). One of the most obvious contributions of entrepreneurship to the increased welfare of society is the creation of new jobs and additional income through multiplier effects (Robinson, Dassie, and Christy, 2004). Entrepreneurs create new wealth for themselves and the communities by taking innovations to the market and commercializing new ideas. Many scholars and professionals believe that entrepreneurship is critical to maintaining an economy's health and that business creation in low income areas is essential for economic development (Goetz and Freshwater, 2001; Acs, 2006; Lichtenstein and Lyons, 2001; Smilor, 1997). Minniti (1999) argues that entrepreneurs are catalysts for economic growth because they generate a networking externality that promotes the creation of new ideas and new market formations.

Learning about entrepreneurship is important to understanding how it contributes to economic growth and development, and how entrepreneurial capacity can further the

dimensions of economic development. Exploring entrepreneurship and its contribution to the local economy can help develop a map in designing specific development policies. These policies will include expanding and improving the status of community-based characteristics that will support rural areas in creating new firms, retaining and expanding local businesses, and expanding entrepreneurial development, and eventually help in alleviating poverty.

The main objective of the study is to determine the impact of entrepreneurship in economic growth and development in West Virginia, a rural and one of the poorest states in the United States. Specifically, the objectives are (1) to develop a database of entrepreneurship variables, measures of economic growth and socio-demographic variables; and (2) to determine the impact of entrepreneurship on economic growth in West Virginia. This is done by taking into account the role of entrepreneurial activity while controlling for other factors affecting economic growth.

Literature Review

Considerable attention has been paid in literature to the link between entrepreneurship and economic growth. Acs et al. (2005) used start-ups of new firms as a measure of entrepreneurship that facilitates knowledge spillover. Their study used two models, one with fixed effects and a simultaneous equations model to empirically examine the impact of entrepreneurship on economic growth, using country-level data for the years 1981-1998. They used lagged values of gross domestic product (GDP) to measure economic growth, and variables such as investments in knowledge, and level of entrepreneurship to explain it. The level of entrepreneurship was represented by the self-employment rate. In both models, countries with higher degrees of entrepreneurial activity were found to have higher rates of economic growth.

In another cross-country analysis, Beck, Demirguc-Kunt, and Levine (2005) found a positive and statistically significant relationship between small and medium enterprises (SMEs) and economic growth. SMEs were found to have high levels of innovation in skill intensive industries (e.g., Acs and Audretsch, 1987) and the study used the share of SME labor in the manufacturing sector of each country to explain economic growth, which was measured by real GDP per capita. Several policy variables were included in the growth model such as government expenditures as a share of GDP, share of exports and imports in GDP, inflation rate, share of credit to the private sector by financial institutions in GDP, and variables measuring business environment. Using ordinary least squares (OLS) regression, the results revealed that the share of SME employment in total manufacturing employment is associated with greater levels of growth in GDP per capita.

Audretsch and Keilbach (2005) introduced the concept of entrepreneurship capital, referring to society's capacity to create entrepreneurial activity specifically to generate new firms. Their study measured the impact of entrepreneurship on regional labor productivity and on the regional growth of labor productivity in Germany. Entrepreneurship capital was measured using the number of startup enterprises relative to the region's population. In addition, entrepreneurship capital was classified into three types: startups in all industries, high-technology startups, and startups in information communication and technology (ICT) industries. This was done to capture the effects of the two latter measures on economic performance since they involve R&D as well as greater financial risks. The results of the regression revealed that all three measures of entrepreneurship capital significantly affect a region's labor productivity. However, the results for the second model on the effect of entrepreneurship capital on the growth of labor productivity showed statistically significant effects only for R&D intensive industries.

Acs and Armington (2005) examined the relationship between entrepreneurship and economic growth, using the Census Business Information Tracking Series (BITS) data. These data cover US private sector businesses and track their employment and firm ownership. They were used to estimate a regression model of regional variation in rates of employment growth as determined by entrepreneurship. Economic growth was represented by average annual employment growth while entrepreneurial activity was measured using the formation rate of firms with fewer than 500 employees and the business-owner share of the labor force. In addition, measures of agglomeration effects and human capital were included in the model. As hypothesized, the results revealed a positive and statistically significant coefficient on the firm birth rate. The study reported that an increase in the new firm formation rate of one standard deviation from its mean causes the employment growth rate to increase by one-half a standard deviation from its mean.

Using regional data, Van Stel and Suddle (2005) examined the relationship between new firm formation and change in regional employment in the Netherlands. In their study they considered the difference in time period, sector, and degree of urbanization. They found that the maximum effect of new firms on regional development is reached after about six years. Fixed effects estimation was employed using employment growth as the dependent variable regressed against the startup rate, wage growth, and population density. To control for differences in time periods, the sample was divided into two time periods and the results showed that the impact of new firm formation to employment growth has been stable and was the same in both periods.

How does the relationship between entrepreneurial activity and economic growth differ between rural and urban areas? Henderson (2006) studied this question using county-level data. Entrepreneurship activity in the first model was represented by using the number of

business startups, the number of new businesses that survived five years, and the number of new business startups that survived and achieved high growth. In the second model, business ownership factors such as the average share of non-farm employment and the average annual growth rate in entrepreneurs were used as indicators of entrepreneurial activity. In addition to entrepreneurship measures, employment growth was regressed against other factors such as transportation infrastructure, labor characteristics, agglomeration forces, natural amenities, property taxes, and regional dummy variables. The empirical results of the model using business ownership variables support the hypothesis that entrepreneurial activity is positively affecting employment growth. This is also true for the models using business startup indicators. However, when all three measures of business startups were tested in one model, only the coefficient for the number of new firms with high growth was found to be positive and significant. Considering the analysis between metropolitan and non-metropolitan areas, the study found that employment growth was stronger in metro counties in relation to the number of business startups and the number of new businesses that survived. However, there is no significant difference on the relationship between high growth business startups and employment growth between metro and non-metro counties.

Camp (2005) reported that the most entrepreneurial regions in the U.S. had 125 percent higher employment growth, 58 percent higher wage growth, and 109 percent higher productivity compared to the least entrepreneurial regions. The study supports the view that entrepreneurship is the link between innovation and regional economic growth and development. Regression results revealed a four-year lag between measures of entrepreneurship and economic growth, positive and significant coefficients for entrepreneurship activity, and high levels of expected variation. These results suggest that entrepreneurship is a driver of regional economic growth. Moreover, Kreft and Sobel (2005)

support entrepreneurship as the "missing link" between economic freedom and economic growth. Economic freedom generates growth as it promotes entrepreneurial activity. This relationship was studied using sole proprietorship and patent activity as measures of entrepreneurship and the freedom index. The freedom index is composed of a number of public policies affecting economic freedom. The results show that the conduit between economic freedom and economic growth is entrepreneurship.

These studies have supported the hypothesis that entrepreneurship contributes positively to economic growth. However, empirical analyses examining the role of entrepreneurship in fostering economic growth at the county-level are lacking, particularly in the various US states. Using West Virginia county-level data, this study will examine more closely the relationship between entrepreneurship and economic growth.

Method of Analysis

The Knowledge Spillover Theory of Entrepreneurship transformed the traditional approach to entrepreneurship by holding the characteristics of individuals constant and treating entrepreneurship as an endogenous response to the incomplete commercialization of knowledge, giving rise to the missing link in recent economic growth models (Audretsch, Keilbach, and Lehmann, 2006). Previous studies have supported the contribution of entrepreneurial activity to economic growth. To investigate the link between entrepreneurship and growth, this study adopts regional economic growth models while incorporating measures of entrepreneurship in the analysis. The model captures the influence of the level of entrepreneurship on economic growth while measuring the effects of other factors that are traditionally linked with growth and development.

A simultaneous equations (SEM) model is used with measures of growth utilized as dependent variables. It is based on the Carlino and Mills' (1987) two-equation model, which

represents the association between changes in population and employment. Their model employs population and employment dynamics in determining how regional factors affect patterns of growth. The assumption is that households and firms aim to maximize utility by consuming goods and services, residential location relative to the place of work, and non-market amenities. Deller et al. (2001) expanded the model to a three-equation framework by incorporating the role of income in regional economic growth. This is based on the assumption that households and firms also consider labor quality to maximize utility. In sum, the model represents that firms choose an optimal location based on location cost and revenue advantages, agglomeration benefits, and labor quality.

Following Deller et al. (2001), Nzaku and Bukenya (2005), and Deller (2007), this study employs the model representing the relationship between population (P), employment (E), and income (I). The general form of the three-equation model is:

$$P^* = f\left(E^*, I^* / \Omega^P\right) \tag{1}$$

$$E^* = g\left(P^*, I^* / \Omega^E\right) \tag{2}$$

$$I^* = h\left(P^*, E^* / \Omega^I\right) \tag{3}$$

where P^{**}, E^*, and I^* represent the equilibrium levels of population, employment, and per capita income, respectively, and Ω^P, Ω^E, and Ω^I are sets of variables describing initial conditions, measures of entrepreneurship, and other variables that are traditionally linked to economic growth. From the equilibrium framework of the model, a linear relationship between the variables to be estimated can be presented as:

$$\Delta P = \alpha_{0P} + \beta_{1P}P_{t-1} + \beta_{2P}E_{t-1} + \beta_{3P}I_{t-1} + \gamma_{1P}\Delta E + \gamma_{2P}\Delta I + \sum \delta_{IP}\Omega^P \tag{4}$$

$$\Delta E = \alpha_{0E} + \beta_{1E}P_{t-1} + \beta_{2E}E_{t-1} + \beta_{3E}I_{t-1} + \gamma_{1E}\Delta P + \gamma_{2E}\Delta I + \sum \delta_{IE}\Omega^E \tag{5}$$

$$\Delta I = \alpha_{0P} + \beta_{1I} P_{t-1} + \beta_{2I} E_{t-1} + \beta_{3I} I_{t-1} + \gamma_{1I} \Delta E + \gamma_{2I} \Delta P + \sum \delta_{II} \Omega^{I} \qquad (6)$$

ΔP, ΔE, and ΔI are changes in population, employment and per capita income, respectively. The speed of adjustment becomes embedded in the coefficient parameters α, β, and δ. For the purpose of this study, measures of entrepreneurship are incorporated in the model, in addition to the variables that are linked to economic growth including measures of human capital, infrastructure, agglomeration, natural amenities, and a vector of additional socio-economic variables.

To further the investigation of the relationship between entrepreneurship and economic growth, the set of equations is also treated as individual linear equations where changes in population, employment, and per capita income are regressed individually against entrepreneurship variables and other factors influencing economic growth. These linear equations are as follows:

$$\Delta P = \alpha_{0P} + \delta_{IP} \Omega^{P} + \varepsilon_{P} \qquad (7)$$

$$\Delta E = \alpha_{0E} + \delta_{IE} \Omega^{E} + \varepsilon_{E} \qquad (8)$$

$$\Delta I = \alpha_{0I} + \delta_{II} \Omega^{I} + \varepsilon_{I} \qquad (9)$$

ΔP, ΔE, and ΔI are changes in population, employment and per capita income, respectively, as used in the simultaneous equation model, while Ω is the vector of variables that are traditionally related to economic growth. These equations assume no bidirectional relationship between the measures of economic growth and the explanatory variables.

Assuming no endogeneity, the linear models in equation 7, 8, and 9 are estimated individually using weighted least square regression (WLS) while the simultaneous equation model is tested using two stage least squares (2SLS) regression.

Data

Panel data on the 55 counties of West Virginia drawn from several sources are used in the empirical analysis. Endogenous variables include county level growth in population, employment and per capita income for the years 1995 to 2005 as indicators of economic growth. These data were drawn from publications of the Bureau of Economic Analysis (BEA). Levels of entrepreneurship are represented using variables constructed using the number of nonfarm proprietors from publications of the Regional Economic Information System, Bureau of Economic Analysis (REIS, BEA) and the number of firm births from the US Census Bureau. Data on human capital, infrastructure, agglomeration, natural amenities, and a vector of additional socio-economic variables are from BEA-REIS, the Census Bureau, and the Economic Research Services (ERS, USDA) and the Natural Resource Analysis Center at West Virginia University (NRAC, WVU). A summary of the variables is presented in Table 1.

Entrepreneurship variables derived from data on self employment include the number of proprietors in a county (PROP) and the change in the number of proprietors between 1995 and 2005 (CHPROP). Measures of entrepreneurship derived from new firm start ups include average firm births per county (BIRTH) and change in the number of firm births (CHBIRTH). Data on firm expansion are used to represent high-growth entrepreneurs in the region. This will determine the contribution of firm growth to economic development. This is represented by the average number of firm expansion per county (EXPAND). A positive relationship between the measures of entrepreneurial activity and economic growth is hypothesized based on theory and the results of previous studies.

Table 1. Descriptive statistics of variables

Variable Code	Definition	Min	Max	Mean	Std. Dev
CHPCI	Change in per capita income, 1995-2005	1587	7686	4030.09	1088.98
CHEMP	Change in employment, 1995-2005	-4653	8525	589.75	1638.89
CHPOP	Change in population, 1995-2005	-7085	16703	-164.31	2471.52
LPCI	Lagged value of per capita income	9028	22871	14491.64	2880.77
LEMP	Lagged value of employment	1391	130324	14792.75	19654.37
LPOP	Lagged value of population	5171	207396	32874.98	32709.31
EDUHI	Percent of population with high education, 25 years and older	42	84	67.75	8.8
CRIME	Crimes reported per 100,000 of population	0	963	84.42	150.33
GOVEX	Government expenditure per capita	20503	1628942	191765.43	236174.3
PCTAX	Per capita tax	0.0013	1.0407	0.2211	0.2443
PCPRTAX	Property tax per capita	84	1003	328.38	139.9
POV	Percent of families with incomes below poverty level	189	7229	1372.12	1157.91
POPDEN	Population per square mile	9.6	479	94.64636	101.14657
ROADDEN	Miles of road per square mile	0.1256	0.6187	0.2832	0.1013
NATAMER	Natural amenities ranking (ERS, USDA)	2	4	3.11	0.53
PROP	Number of non-farm proprietors	385	15431	2259.1	2405.58
BIRTH	Number of firm births	2	494	63.08	77.66
EXPAND	Change in the number of firm employment	12	1613	184.95	245.98
CHPROP	Change in the number of nonfarm proprietors	-2068	3219	236.26	569.28
CHBIRTH	Change in the number of firm births	-60	85	-2.08	20.49

In addition to entrepreneurship, other explanatory variables are included in the endogenous growth model to better understand the factors affecting economic growth in West Virginia. Human capital is measured by using share of population with high-school education (EDUHI). A higher population share with high school education indicates a higher quality of the labor force in the county. Furthermore, a higher quality of the labor force is expected to be more efficient and therefore reduces the average cost of business, leading to higher

employment and income growth. Hence, a positive relationship between the human capital variables and the measures of economic growth is hypothesized.

Road density (ROADDEN) is used to represent the quality of infrastructure which affects the firm's average cost and is expected to affect economic growth. A positive relationship between the growth measures and the quality levels of a county's infrastructure is expected as infrastructure defines the ease of distribution of goods and services between firms and the market.

Agglomeration is found to have a positive effect on growth through reduced costs of information transfer and knowledge spillovers arising from diversity (Henderson, 2006). To measure agglomeration, the empirical models include population density (POPDEN). Agglomeration is expected to have a positive effect to both employment and income growths when agglomerations increase network externalities (Ciccone and Hall, 1996). Other socio-economic variables such as per capita income taxes (PCTAX), per capita property taxes (PCPRTAX), government expenditure (GOVEX), and percent of families below poverty (POVERTY) are also included in the empirical analyses. Taxes are expected to be negatively related to measures of economic growth as taxes reduce demand for goods and services as well as reducing firm profits. Government expenditure is hypothesized to be positively related to employment and income growth as it reflects investments in public welfare. On the other hand, a negative relationship between percent of families in poverty and the measures of economic growth is expected. A higher percentage of families in poverty indicate slower increases in employment and income levels. The number of crimes (CRIME) is included and hypothesized to have a negative influence on growth, while natural amenities ranking is expected to show a positive coefficient. Finally, positive coefficients on the measures of economic growth and their lagged values are hypothesized to have positive coefficients.

Results and Analysis

The empirical results from estimating the equation on population growth are presented in Table 2. They were obtained using weighted least squares (WLS) and two-stage least squares (2 SLS) regressions, respectively. WLS results generally show positive and statistically significant relationships between entrepreneurial activity and population growth. Although the variable measuring firm expansion (EXPAND) shows a negative coefficient, the coefficients on the number of proprietors per county (PROP), number of firm births (BIRTH) and the change in the number of firm births (CHBIRTH) are positive and statistically significant, indicating that economic growth, as measured by population growth, is positively influenced by entrepreneurship.

The WLS results also show a positive relationship between employment growth and population growth indicating that increases in employment drives population increase. The negative coefficient in the lagged value of change in population may be explained by the general decrease in population in the state for the years covered in the analysis. Government expenditure, as hypothesized, indicates a positive relationship with population growth as it reflects investments for public welfare. The control variable for agglomeration (POPDEN) also indicates a positive coefficient, as expected. Contrary to expectations however, natural amenities rank showed a negative coefficient.

To control for endogeneity among variables used to measure economic growth and their lagged values, the model is estimated using two- stage least squares regression as shown in Table 2. In terms of entrepreneurial activity, the number of proprietors (PROP) coefficient supports the theory that entrepreneurship and population growth are positively related. Increase in the number of employees (EXPAND) shows a negative coefficient as the result of WLS regression indicates. Employment growth is again positive in influencing population

growth. However, change in per capita income indicates a negative relationship with population growth. The lagged value of population growth shows a positive coefficient as well as the variable for government expenditure which further supports the hypotheses. Poverty (POV) has a negative coefficient indicating that the level of poverty decreases growth. On the other hand, the variable for education shows a negative coefficient as well as the lagged value of employment.

Table 2. WLS and 2 SLS estimation results on population growth

Dependent Variable: CHPOP

	WLS		**2 SLS**	
Variable	**β Coefficient**	**t-statistic**	**β Coefficient**	**t-statistic**
Constant		-0.201		2.813
CHPCI	-0.134	-1.594	-0.123*	-1.764
CHEMP	0.464***	4.937	0.391***	4.694
LPCI	0.277	1.372	0.184	1.181
LEMP	-0.506	-0.598	-1.915***	-3.181
LPOP	-2.562***	-3.316	2.248***	2.474
EDUHI	0.128	0.799	-0.346**	-2.376
CRIME	0.286	1.301	0.215	1.308
GOVEX	1.534***	2.598	0.636*	1.727
PCTAX	-0.107	-0.792	0.004	0.032
PCPRTAX	-0.106	-1.056	-0.021	-0.247
POPDEN	0.304*	1.907	0.240	1.441
ROADDEN	-0.016	-0.154	-0.128	-1.062
STABPMI	0.032	0.427	-0.001	-0.017
NATAMER	-0.119*	-1.756	-0.095	-1.499
PROP	1.818***	3.084	1.019***	2.492
BIRTH	1.367***	3.070	0.573	1.554
EXPAND	-2.909***	-3.581	-1.552***	-2.669
CHPROP	0.255***	2.975	-0.042	-0.521
CHBIRTH	0.130	1.253	0.254***	3.109
POV	weight	weight	-1.713***	-5.105
R^2 0.747			R^2 0.742	
N 110			N 110	

***, **, * Significant at 1 %, 5 %, and 10%, respectively

Table 3 shows the result of estimating the equation using employment growth as the dependent variable by employing WLS and 2SLS estimations. One of the variables measuring entrepreneurship activity, EXPAND, has a positive and statistically significant

coefficient. The number of firm births (BIRTH) has a negative coefficient, indicating an inverse relationship with change in employment. The other two variables used to measure economic growth, population and per capita income growth, are also found to be positively influencing employment growth, as hypothesized. However, the lagged value of employment shows a negative coefficient. Government expenditure (GOVEX) also has a negative coefficient, contrary to the hypothesis. These unexpected results may be due to the nature and specification of the data. Although, per capita property tax (PCPRTAX) shows a positive coefficient, per capita tax (PCTAX) has a negative coefficient which supports the theory that taxes discourage people to work in places with higher tax rates.

In the 2SLS estimation, two variables on entrepreneurship are found to have positive and significant relationships with employment growth. These are the change in the number of proprietors (CHPROP) and the increase in the number of employees (EXPAND) which further support the theory on the link between entrepreneurial activity and growth. The other variables used to measure growth remains positive and statistically significant. However, the coefficients for the lagged value of employment and government expenditure also remain negative.

The results in estimating the per capita income equation are presented in Table 4. The estimates using weighted least squares regression show the expected signs of the coefficients. Employment growth (CHEMP) showed a positive influence with income growth. The lagged value of per capita is also found to be positive and statistically significant in determining income growth. The variable representing the quality of human of capital (EDUHI) has a positive coefficient indicating its contribution in determining per capita income. Government expenditure also shows a positive relationship with per capita income growth. However, none

of the variables measuring entrepreneurial activity is statistically significant in determining income growth.

Table 3. WLS and 2 SLS estimation results on employment growth

Dependent Variable: CHEMP

	WLS		2 SLS	
Variable	**β Coefficient**	**t-statistic**	**β Coefficient**	**t-statistic**
Constant		-1.417		-0.998
CHPOP	0.460***	4.937	0.507***	4.494
CHPCI	0.242***	2.988	0.190**	2.412
LPCI	-0.298	-1.488	-0.211	-1.186
LEMP	-2.807***	-3.546	-1.424**	-2.012
LPOP	2.877***	3.805	0.591	0.553
EDUHI	0.212	1.337	0.231	1.363
CRIME	0.159	0.720	0.066	0.349
GOVEX	-2.022***	-3.543	-1.038***	-2.518
PCTAX	-0.249*	-1.884	-0.155	-1.181
PCPRTAX	0.201**	2.031	0.108	1.117
POPDEN	-0.016	-0.098	0.046	0.240
ROADDEN	-0.164	-1.598	-0.152	-1.102
STABPMI	-0.011	-0.144	-0.040	-0.487
NATAMER	0.017	0.255	-0.004	-0.055
PROP	-0.199	-0.323	-0.074	-0.154
BIRTH	-0.809*	-1.765	-0.482	-1.141
EXPAND	3.345***	4.238	2.372***	3.699
CHPROP	-0.067	-0.756	0.240***	2.717
CHBIRTH	-0.013	-0.121	-0.877	-0.899
POV	weight	weight	0.368	0.850
R^2 0.749			R^2 0.665	
N 110			N 110	

***, **, * Significant at 1 %, 5 %, and 10%, respectively

The results using two stage least squares (2SLS) in estimating the per capita income equation determined employment growth as positive and significant in determining per capita income. However, change in population shows a negative coefficient which may be attributed to the population decrease in the state for years 1995 to 2005. Lagged per capita income remains positive and significant as in the WLS results. The variable measuring the percent of

families below poverty (POV) has a negative sign, indicating a negative influence on per capita income.

Table 4. WLS and 2 SLS estimation results on per capita income growth

Dependent Variable: CHPCI				
	WLS		**2 SLS**	
Variable	**β Coefficient**	**t-statistic**	**β Coefficient**	**t-statistic**
Constant		-0.184		0.737
CHPOP	-0.205	-1.594	-0.273*	-1.764
CHEMP	0.373***	2.988	0.322***	2.412
LPCI	0.581***	2.380	0.541***	2.387
LEMP	-0.012	-0.012	-1.256	-1.345
LPOP	-1.201	-1.197	1.456	1.051
EDUHI	0.436**	2.257	0.064	0.289
CRIME	-0.456*	-1.687	-0.265	-1.078
GOVEX	1.795**	2.453	0.712	1.293
PCTAX	-0.028	-0.166	-0.011	-0.067
PCPRTAX	-0.176	-1.416	-0.042	-0.334
POPDEN	-0.078	-0.388	-0.109	-0.438
ROADDEN	-0.099	-0.770	-0.098	-0.545
STABPMI	0.030	0.323	0.057	0.057
NATAMER	-0.106	-1.251	-0.054	-0.566
PROP	-0.363	-0.475	-0.142	-0.227
BIRTH	0.431	0.748	-0.058	-0.104
EXPAND	-0.302	-0.282	0.402	0.449
CHPROP	0.045	0.401	-0.083	-0.699
CHBIRTH	0.040	0.309	0.065	0.507
POV	weight	weight	-0.976*	-1.753
R^2 0.749			R^2 0.431	
N 110			N 110	

***, **, * Significant at 1 %, 5 %, and 10%, respectively

Summary and Conclusions

The main objective of this paper was to determine the relationship between entrepreneurship and economic growth in the counties of West Virginia. This was accomplished by including entrepreneurship variables constructed from proprietorship and firm birth data into endogenous growth models. The model utilized measures of economic growth as endogenous variables including population growth, employment growth, and per

capita income growth estimated individually using weighted least squares (WLS) regression and simultaneously using two-stage least squares (2 SLS) estimation. Two stage least squares was used to control for possible endogeneity between the economic growth variables and their lagged values. In addition to entrepreneurship, the model included other factors that are traditionally linked to economic growth.

The results of the analyses using WLS and 2SLS generally show empirical evidence regarding the positive contribution of entrepreneurial activity to economic growth. Counties with higher numbers of proprietors and business start ups exhibited higher levels of population growth. Growth in proprietorship and the increase in the number of employees in businesses showed positive influences with employment growth. However, none of the entrepreneurship variables are statistically significant in determining per capita income growth. The general results suggest that higher levels of entrepreneurship are related with higher levels of economic growth in two measures of economic growth used in the study.

The study indicates the importance of understanding the role of entrepreneurship in analyzing the determinants of economic growth particularly in areas that are continuously seeking for new strategies towards economic development like in West Virginia. The empirical evidence shows the need for policy makers to design the necessary programs to assist entrepreneurs by creating a business environment where barriers for startup firms are controlled and where firm growth is encouraged. The results of the study highlight the contribution of entrepreneurship towards population growth and employment growth in the state. These provide evidence of the need for policies that will support entrepreneurial activity to retain people, to attract individuals to reside in Virginia communities, and to increase job creation. Furthermore, the result of no significant relationship between entrepreneurship and per capita income growth may imply that entrepreneurs are not earning

income high enough to significantly affect per capita income growth in the state. This suggests the need for programs that will help entrepreneurs increase their income which may include training of entrepreneurs and increasing access to capital loans. As communities search for new engines of economic development, encouraging firm start ups and building stronger businesses is necessary.

References

Acs, Zoltan J., 2006, "How is Entrepreneurship Good for Economic Growth?" *Innovations* 1(1), 97-107.

Acs, Zoltan J. and Catherine Armington, 2004, "The Impact of Geographic Differences in Human Capital on Service Firm Formation Rates," *Journal of Urban Economics* 56, 244-278.

Acs, Zoltan J. and Catherine Armington, 2005, "Using Census BITS to Explore Entrepreneurship, Geography, and Economic Growth," Small Business Research Summary No. 248, U.S. Small Business Administration's Office of Advocacy.

Acs, Zoltan J. et al., 2005, "Growth and Entrepreneurship: An Empirical Assessment;" Discussion Paper 3205, Max Planck Institute of Economics, Jena, Germany.

Acs Zoltan J. and David B. Audretsch, 1987, "Innovation, Market Structure and Firm Size," *Review of Economics and Statistics* 69, 567-574.

Audretsch David B. and Max C. Keilbach, 2005, Entrepreneurship Capital and Regional Growth," *The Annals of Regional Science* 39, 457-469.

Audretsch David B., Max C. Keilbach, and Eril E. Lehmann, 2006, *Entrepreneurship and Economic Growth*, Oxford University Press, Oxfrod, New York.

Beck, Thorsten, Asli Demirguc-Kunt, and Ross Levine, 2005, "SMEs, Growth, and Poverty," NBER Working Paper No. W11224 (http://www.nber.org/papers/w11224.pdf).

Camp, Michael, "The Innovation-Entrepreneurship NEXUS: A National Assessment of Entrepreneurship and Regional Economic Growth and Development," Small Business Research Summary No. 256, Advanced Research Technologies, Powell, OH.

Carlino, Gerald A. and Edwin S. Mills, 1987, "The Determinants of County Growth," *Journal of Regional Science* 27, 39-54.

Ciccone, Antonio and Robert E. Hall, 1996, "Productivity and Density of Economic Activity," *American Economic Review* 86, 54-70.

Deller, Steven C., Tsung-Hsui Tsai, David W. Marcouiller and Donald B.K. English, 2001, "The Role of Amenities and Quallity of Life in Rural Economic Growth," *American Journal of Agricultural Economics*, 83(2), 352-365.

Deller, Steven C.,2007, "The Role of Microenterprises in Economic Growth: A Panel Study of Wisconsin Counties 1977 to 1997," Paper presented at the 47th Southern Regional Science Association Meeting, March 27-30, 2008, Arlington VA- Washington, DC.

Fritsch, Michael and Pamela Mueller, 2004, "The Effects of New Business Transformation on Regional Development over Time," *Regional Studies* 38, 961-975.

Goetz, Stephan J. and David Freshwater, 2001, "State-level Determinants of Entrepreneurship and a Preliminary Measure of Entrepreneurial Climate", *Economic Development Quarterly* 15, 58-70.

Henderson, Jason, 2006, "Understanding Rural Entrepreneurship at the County Level: Data Challenges," Federal Reserve Bank of Kansas City, Omaha.

Kreft, Steven F. and Russell S. Sobel, 2005, "Public Policy, Entrepreneurship, and Economic Freedom," *Cato Journal*, 25 (Fall), 595-616.

Lichtenstein, Gregg A. and Thomas A. Lyons, 2001, "The Entrepreneurial Development System: Transforming Business Talent and Community Economies," *Economic Development Quarterly* 15(1), 3-20.

Minniti, Maria, 1999, "Entrepreneurial Activity and Economic Growth," *Global Business and Economic Review* 1(1), 31-42.

Nzaku, Kilungu and James O. Bukenya, 2005, "Examining the Relationship between Quality of Life Amenities and Economic Development in the Southeast USS," *Review of Urban and Regional Development Studies* 17(2), 89-105.

Robinson, Kenneth L., Wylin Dassie, and Ralph D. Christy, 2004, "Entrepreneurship and Small Business Development as a Rural Development Strategy," *Southern Rural Sociology* 20(2), 1-23.

Smilor Raymond W.,1997, "Entrepreneurship and Community Development," paper presented at the Kaufmann Center for Entrepreneurship, Leadership Conference on Entrepreneurship as a Community Development Strategy.

van Stel, Andre and Kashifa Suddle, 2005, "The Impact of New Firm Formation on Regional Development in the Netherlands," ERIM Report Series in Management, ERS-2005-075.