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Determinants of Entrepreneurial Activity in Rural Illinois: Insights from the American Community Survey

1.0 Introduction

A common prescription for community economic development is to stimulate entrepreneurship (Audretsch 2007; Herman, 2018). This prescription is largely derived from global data that shows positive correlations between entrepreneurial activity of nations and their GDPs (see Sidebar).

Our interest in this paper is on assessing entrepreneurial activity at the county level in rural Illinois. We identify factors that stimulate entrepreneurship (for example, level of education) so that policymakers can influence these factors to promote entrepreneurship activities in the region.

The paper is organized as follows. Section 2 profiles the socioeconomic characteristics of the study region. The profile analysis is used to deduce hypothesis related to entrepreneurial activity in different industries. Section 3 explores the determinants of entrepreneurial activity using self-employment data from the American Community Survey, five-year estimates (US Census 2017), and Section 4 outlines an input-output model (Athiyaman, 2018) to assess the economic impacts of community initiatives that could help foster entrepreneurial activities.

Correlation between Entrepreneurial Activity and GDP

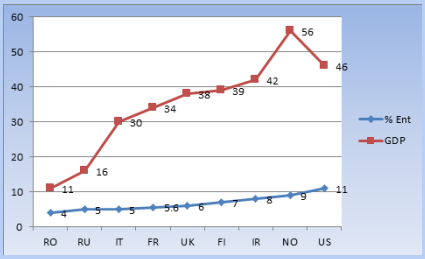
The study of entrepreneurship has attracted scholars from a variety of disciplines to research the correlates of entrepreneurship. Recently, the focus has been on the economic consequences of entrepreneurship.

Table A1 presents data on entrepreneurship and per capita GDP of nine nations. The zero-order correlation between these two variables is a high 0.83 (Figure A1). This correlation is the reason for the normative prescription to use entrepreneurship as a tool for regional economic development.

Table A1: Association between Entrepreneurship and Wealth

Country	% of Entrepreneurs	GDP Per Capita ($1000)
Romania (RO)	4	11
Russia (RU)	5	16
Italy (IT)	5	30
France (FR)	5.6	34
United Kingdom (UK)	6	38
Finland (FI)	7	39
Ireland (IR)	8	42
Norway (NO)	9	56
Unites States (US)	11	46

Figure A1: Correlations among Entrepreneurship and GDP



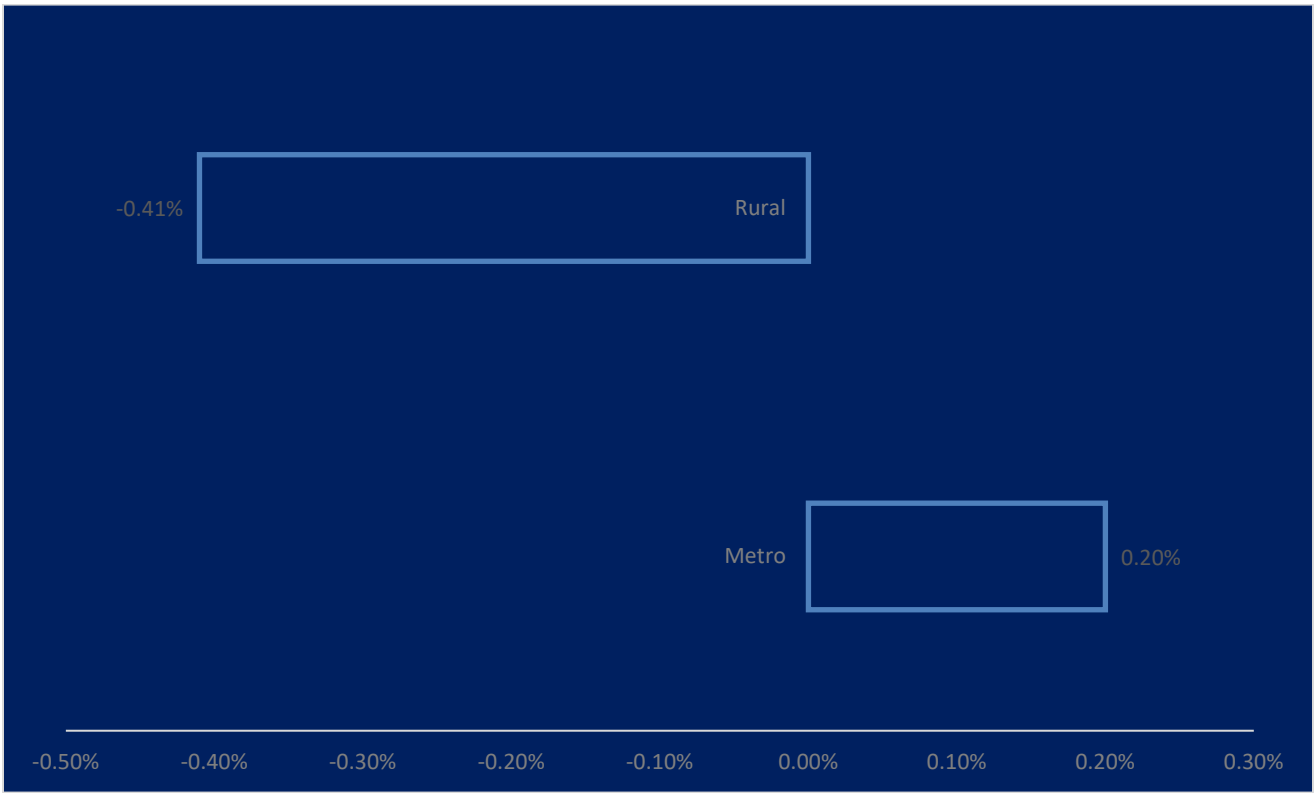
2.0 Profile of Rural Illinois

Illinois had a total population of 12.85mil people in 2017, an increase of 109,167 people since 2010. Population increases are confined to the metro areas, rural Illinois lost 0.41% of its population every year since 2010 (Figure 1). Furthermore, one in ten in rural Illinois lives in poverty and the median household income is 26% less than the state's median household income of $61,229.

2.1 Gross Regional Product (GRP)

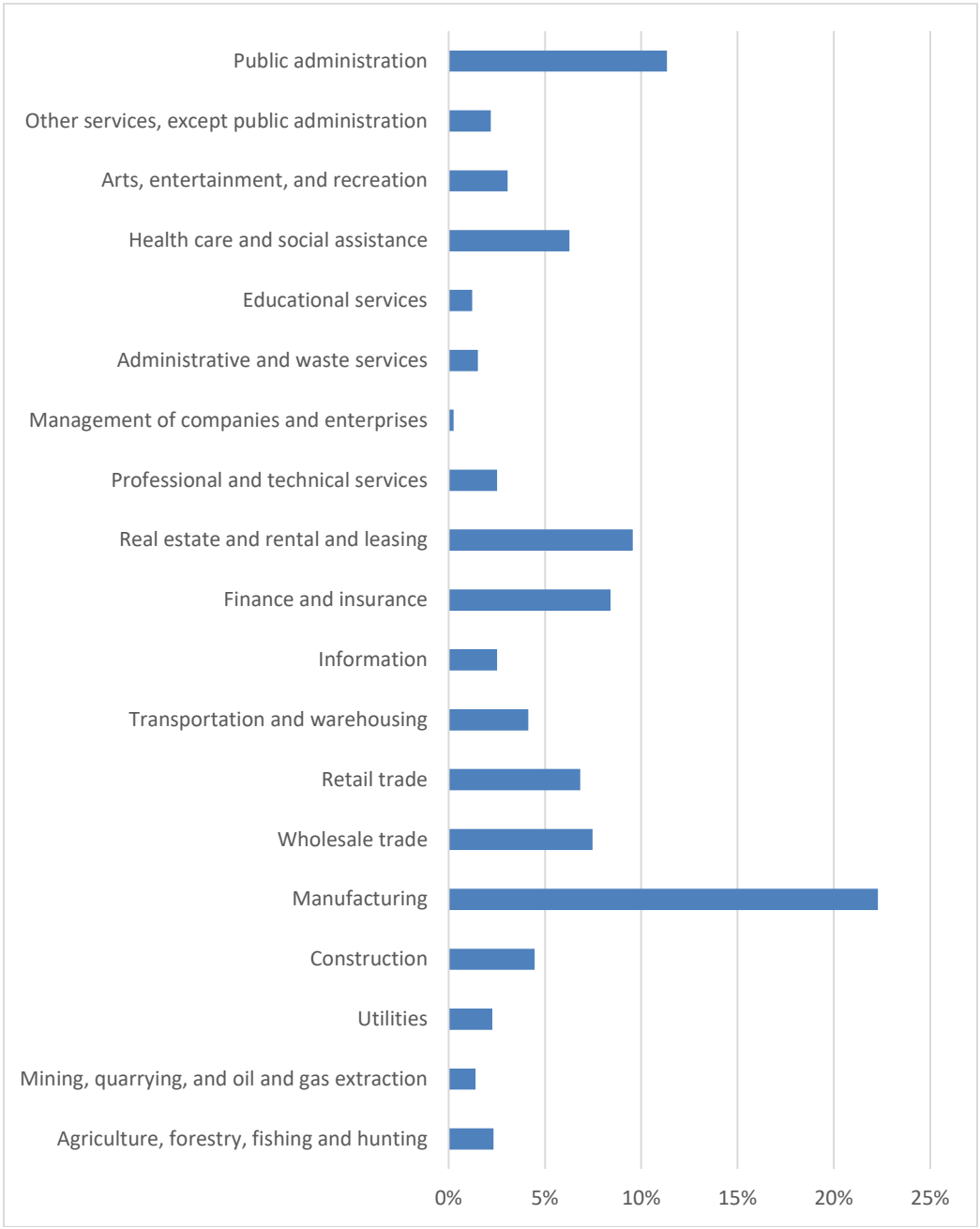
Figure 2 shows industry contribution to the rural region's $67bil economy; rural Illinois contributed 8% to the state's $865bil GDP in 2017. The manufacturing sector accounts for 22% of the rural region's outputs. Public administration and real estate sectors account for another 21% of the rural economy. Other major sectors include wholesale and retail trade (14%), finance and insurance services (8%), and real estate (6%).

Figure 1: Changes in Number of People, ACGR 2010-2017



Note: ACGR = Annual Compound Growth Rate.

Figure 2: GRP Estimates for Rural Illinois, 2017 Figures



Source: Author's calculations based on data from BEA, Table SAGDP2N. Employment numbers were used to allocate economic activity to industries.

3.0 Self-Employment in the Region

According to the 2017 US Census, rural Illinois has 1,314,192 people in the 16+ age group. About 7% or 88,051 people are unemployed. Of the remaining, 724, 828 (55%) are in the workforce and around 16% (207,319 persons) are self-employed. Slightly more than two-in-five of the self employed are affiliated with health, or the education sector. Although the manufacturing sector employs 22% of the rural workforce only 15% of the self-employed work in manufacturing (Table 2).

Table 2: Entrepreneurial Activity in Rural Illinois, Number of Self-Employed

Industry Sector	Frequency Count	Percent
Agriculture	15, 647	8%
Construction	20, 969	10%
Manufacturing	31, 857	15%
Retail	19, 476	9%
Transportation	10,979	5%
Information	3,317	2%
Finance	10,096	5%
Real Estate	1,821	1%
Admin. Services	5,059	2%
Education	30,390	15%
Health	59,364	29%

Table 2 highlights that self-employment, a proxy for entrepreneurial activity, is not highly correlated with employment numbers in the county. For example, the manufacturing sector employs the most people in rural Illinois, but it doesn't produce the most entrepreneurs. Entrepreneurs are largely found in the health and the education sectors.

In order to understand the determinants of entrepreneurial activity, an empirical analysis involving self-employed persons (n=355) and persons who work for wages or salary (n=4102) was performed[1]. Specifically, we explored the personal characteristics and work behavior of the two groups using a logistic regression. The statistical procedure models the log odds of a positive response (being self employed) as a linear combination of the predictors:

$$\log\left(\frac{p}{1-p}\right) = b_0 + b_1\, gender + b_2\, age + b_3\, education + b_4\, race + b_5\, work\ hours + b_6\, marital\ status + b_7\, travel\ time\ to\ work$$

Appendix 1 contains technical details of the statistical model. The salient findings include:

1. The difference in odds is lower (-.9817) for females compared to males. Put simply, females have a lower probability of being self-employed;
2. Age increases the likelihood of being an entrepreneur: the difference in odds is expected to increase by 0.0391 units for a unit change in age;
3. If a salaried, "working-for-others" resident were to increase her working hours by one unit, the difference in the log-odds of becoming an entrepreneur is expected to increase by 0.0162 units;
4. An unmarried status lowers the log odds of being an entrepreneur by 0.4072 points, and
5. As travel time to work increases, the log-odds of being an entrepreneur are reduced by 0.0240 units.

Further industry-wise analysis reveals that education is essential for being an entrepreneur in the services sector, and older residents are likely to be self-employed in the agricultural sector.

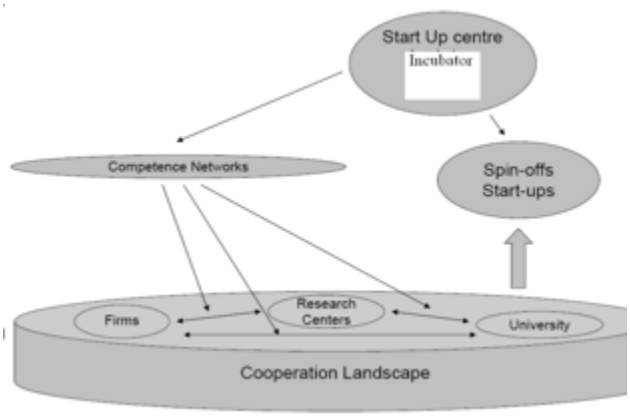
[1] The analysis was limited to the Public Use Microdata Area 1400 counties (see US Census Geography definitions). Cases with missing values on the variables were deleted from the statistical analysis.

4.0 Impact Analysis

Given the region's objective of economic development, resource dependence theory (Barney and Clark 2007) suggests that rural Illinois should create business incubators regression that provide the technological and organizational resources and managerial expertise for the transformation of a business idea into an efficient economic organization. How does this work?

Consider Figure 3, it shows the business incubator as the manager of competence networks that include one or more universities and their associated research centers. This is expected to enhance the innovation potential of the region. In addition, the incubator will provide affordable work space for start-ups / spin-offs and this "sheltered nurturing" of new businesses is expected to produce successful firms which would then generate new jobs.

Figure 3: Business Incubator and Regional Development



As regards the monetary value of these benefits, an investment to a tune of $250, 000 on a business incubator in each of the 63 rural counties would generate *immediate* (one-year planning horizon) benefits for the region as follows:

1. The $250,000 investment would generate $594,335 total (industry) output for each of the rural county's economy;
2. Approximately 7 new jobs will be added to the county's economy;
3. Construction and manufacturing sectors would benefit the most from the investment, and
4. The investment would add $292,160 to a rural county's gross regional product.

5.0 Summary and Conclusion

Rural Illinois contributes eight percent to the state's GDP. Its $65bil economy relies heavily on manufacturing and services such as finance and insurance. Statistical models relating entrepreneurial activity and entrepreneurs' personal and behavioral attributes suggest that locating business incubators in the region would facilitate entrepreneurial activity.

An input-output model of the region's economy suggests that $250, 000 physical-development investments on a business incubator in each of the rural county would generate $594,335 industry output for a county's economy. It is now up to the county managers to decide on strategies for the incubator (for example, type of incubator, location, criteria for admission into the incubator, etc.).

Appendix 1: Technical Details of the Logit Analysis

The analysis was performed using self employed versus wage / salary earners as the dependent variable. The dependent variable (ENT) was distributed as follows (see Table 1):

1 = self employed, and
0 = Wage earners

Table 1: Response Profile

Ordered Value	ENT	Total Frequency
1	1	355
2	0	4102

As mentioned earlier, the fitted model is:

$$\log\left(\frac{p}{1-p}\right) = b_0 + b_1\, gender + b_2\, age + b_3\, education + b_4\, race + b_5\, work\ hours + b_6\, marital\ status + b_7\, travel\ time\ to\ work$$

Table 2 presents the model "fit" statistics; the null hypothesis $\beta_i = 0$, was rejected. Put simply, the model fits the observed data well.

Table 2: Model Fit Statistics

Criterion	Intercept Only	Intercept and Covariate
AIC	2479.323	2260.989
SC	2485.725	2312.206
-2 Log L	2477.323	2244.989

Testing Global Null Hypothesis: BETA=0

Test	Chi-Square	DF	Pr >
Likelihood Ratio	232.3341	7	<.0
Score	211.7712	7	<.0
Wald	197.8487	7	<.0

Table 3 presents the parameter estimates. They should be interpreted as follows: for a one unit change in the predictor variable, the difference in log-odds for a positive outcome is expected to change by the respected coefficient, given the other variables in the model are held constant.

Table 3: Analysis of Maximum Likelihood Estimates[2]

Parameter	DF	Estimate	Standard Error	Wald Chi-Square	Pr > ChiSq
Intercept	1	-2.7317	0.6395	18.2437	<.0001
gender	1	-0.9847	0.1296	57.7075	<.0001
AGEP	1	0.0391	0.00469	69.5674	<.0001
edu	1	-0.0471	0.0358	1.7357	0.1877
race	1	0.4041	0.3875	1.0876	0.297
wrkhrs	1	0.0162	0.00494	10.8029	0.001
marst	1	-0.4072	0.1447	7.9143	0.0049
trtime	1	-0.024	0.00453	28.1014	<.0001

Finally, Table 4 presents statistics similar to the common, regression R^2. Briefly, *pairs* lists the total number of distinct pairs with one having a positive response (ENT = 1) and the other having a negative response (ENT = 0). Our data file has 1,456,210 pairs (4102 x 355). *Percent concordant* highlights the number of "expected" matches. *Percent discordant* shows the number of "mismatches". Other statistics such as the *Somers D* express the above in a familiar correlational form: for example, -1 (all pairs disagree) and 1 (all pairs agree).

Table 4: Association of Predicted Probabilities and Observed Responses

Percent Concordant	72.7	Somers' D	0.462
Percent Discordant	26.5	Gamma	0.466
Percent Tied	0.8	Tau-a	0.068
Pairs	1456210	c	0.731

[2] The PUMS dataset label these variables as follows: AGEP, SCHL, SEMP, SEX, WKHP, RAC2, JWMNP, and MAR.

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