The Determinants of Rural Self-Employment: Insights from County-Level Data[1]

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Abstract: The sustained surge in rural self-employment since 2000 has largely gone unnoticed by policy makers and rural economic developers. Here we document this increase and identify variables associated with expanding self-employment using county-level data. Our regression analysis draws largely on two previous studies, which we update and refine by using more nuanced measures of *rural*. Results provide mixed evidence about the importance of capital access to self-employment growth, but reveal that different polices are needed in rural counties depending on their proximity to metro areas and overall population size, if the goal is to increase future rural self-employment rates.

Introduction

Over the period 2000-2009, the ratio of rural[3] self-employed to wage-and-salaried workers surged from just under 24% to over 30%. The additional one million rural workers who were self-employed in 2009 represent almost a one-quarter increase over the year 2000. In contrast, there were over half a million (568,000) *fewer* rural wage-and-salary jobs in 2009 than in 2000.[4] In the "jobless recovery" from the recession of 2000, self-employment has clearly been key to the economic survival of many rural workers, households and the communities in which they reside. Many of these workers likely were forced into self-employment out of *necessity*, rather than in pursuit of an *opportunity*, as a result of labor-saving technological changes and global competition, in addition to the lackluster national employment recovery (Goetz et al. 2010). Despite the common perception that self-employment is low-paying and only a last resort for many workers, however, a growing body of peer-reviewed literature suggests unequivocally that self-employment has tangible positive impacts on local income and employment growth, and that it is also associated with reduced poverty rates at the county-level (Rupasingha and Goetz, 2011; Goetz et al. 2012 provide a review).

The increase in rural self-employment (or entrepreneurship) has not occurred evenly over space. In 137 counties the ratio of self- to wage-and-salary employment increased by over 10 percentage points while in others (n=150 or 7.5%) the ratio declined between 2000 and 2009. A common perception in the public media is that lack of access to credit at the community level prevents more individuals from working for themselves: even though banks are reportedly "flush with cash," credit barriers such as lack of collateral prevent the funds from being available to po-

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[3] We use the BEA's definition of rural for aggregate numbers such as these and the USDA's definitions of rural (elaborated below) to identify individual rural counties; the terms *rural* and *non-metro* are used interchangeably.
[4]There were 19,171,144 total rural wage-and-salary jobs in 2000, compared with 18,603,440 in 2009 according to BEA/Regional Economic Information System data (accessed Sept 22, 2011).

tential entrepreneurs. Even so, using individual-level data from the 1996 and 2001 Survey of Income and Program participation waves, Bates et al. (2010) find no evidence to suggest that capital access barriers prevent small business starts.

In addition, other locally-varying predetermined variables have likely influenced changes in self-employment rates over time. Here we focus on these variables as potential policy levers. Other policy constraints, operating at the national level, also have been cited in the literature as restricting self-employment or entrepreneurship. These include the lack of a national health care program and disincentives that render workers who want to start their own business ineligible to receive unemployment compensation.

The plan of this paper is as follows. In the next section we motivate a regression model to explain rural self-employment growth, drawing on the existing literature, which is briefly reviewed. Then we discuss and define our data and present summary statistics. This is followed by the regression results, along with a discussion. One of the contributions of the paper is that we study the impact of regressors on self-employment or proprietorship formations across different types of rural areas, as measured by the USDA's 2003 Rural Urban Continuum Code (RUCC-03), and we also examine the dynamics across rural areas for different years corresponding to the peaks and valleys of the most recent business cycles (i.e., annually, starting in 2003).

Literature Synopsis and Regression Model

While there is a sizable literature on the individual-level and geographic area-level determinants of entrepreneurship (e.g., Bates 1990, Acs and Armington 2006, Michelacci and Silver 2007, Goetz and Rupasingha 2009, Doms et al. 2010), few systematic and rigorous studies explore the causes of self-employment or entrepreneurship at the level of rural U.S. counties or labor market areas, and none considers the rural-urban continuum (defined below). Because rural areas are not homogeneous but differ in terms of key characteristics such as population density and access or proximity to cities, we maintain that such an analysis is important to fully understand the process of self-employment growth in those areas. And, no prior study examines relationships in the current economic downturn at the rural county level.

To motivate our regression analysis, we draw primarily on two relatively recent studies, by Acs and Armington (2006) and Goetz and Rupasingha (2009). The book *Entrepreneurship, Geography, and American Economic Growth* by Acs and Armington (2006) [AA] marked one of the first applications of New Growth Theory concepts to understanding the determinants of new establishment formations, and sectors, across 394 spatial units (Labor Market Areas or LMAs) with varying economic characteristics; the dependent variable was measured over the years 1995 and 1996, with regressors generally measured in levels in 1994, or changes over the period 1992-1994. More specifically, Acs-Armington calculate new firm formation rates across LMAs as new establishments in 1995 and 1996 per 1994 worker. They are able to distinguish among six sectors and model growth as a function of firm size, sector specialization, proprietor shares, educational attainment, recent growth in income and population, and the unemployment rate within the LMA. In general their coefficient estimates have expected signs (discussed next) and the adjusted *R*-square values are high for these types of studies -- generally above 63%.

More specifically, in the Acs-Armington model (p.65 *ff*), a locality in which large firms (more employees per establishment) dominate have *fewer* new firm formations, because knowledge is developed and applied within the firm, rather than being allowed to spill over into the community. Further, larger firms tend to crowd out smaller, more competitive firms that may be more entrepreneurial. Counties with more specialized industries, as measured by the number of establishments per 1,000 population, on the other hand, provide greater exposure for potential entrepreneurs to different management and technical production practices, which could in turn translate into new business ideas.

Along these lines, Acs-Armington also suggest that a higher share of existing self-employed workers in the community, and fewer high school dropouts and more college graduates are all associated with a higher rate of new establishment formation. This reflects both a more conducive existing entrepreneurial climate, and more potential for innovation that builds on human capital spillovers within a locality. In addition, the (lagged, compound) population and income growth rates from 1992 to 1994 are included to control for the desirability of a community for migrants and opportunities for selling products, respectively. The unemployment rate, finally, measures the degree to which individuals are driven into self-employment by a lack of alternative work opportunities.

These authors caution that even though their independent variables are measured one or two years before the period over which establishment growth occurs, the regressors may not be strictly exogenous, and that the results therefore need to be interpreted with caution. They also note (footnote 11, p.68) the exclusion of financial variables, which are important factors in new firm formation, and "which [they] hope to take into account in subsequent research." In this paper, we introduce a number of candidate variables to capture the potential effect of access to adequate financing, as explained below.

In addition, we draw on Goetz and Rupasingha (2009) [GR] for additional variables to include in the regression analysis. Chief among these are the relative financial returns to potential entrepreneurship, the riskiness of those returns, homeownership characteristics and basic banking variables as proxies for access to capital, income within the community as a measure of demand (beyond recent income growth), an ethnic fractionalization index, basic socioeconomic and demographic variables, natural amenities and economic policy variables measured at the state-level (see Appendix). In the present study, we expand this vector by including measures of liquidity available and competition among, or availability of, bank branch offices. Goetz and Rupasingha's paper is based on a utility-maximizing choice between wage-and-salary and self-employment, based on relative earnings, and it uses 1990 as the base year and models the change in the self-employment rate between 1990 and 2000. They estimate a general spatial model (SAC) after finding evidence of spatial dependence bias in the national data.

Briefly, we expect higher self-employment earnings within the county to be associated with higher increases in self-employment shares (as in AA and GR), and greater variation in returns to self-employment (risk) to depress the growth in such shares. The percent of homes that are owner-occupied, along with the median home value in 2000, are included to serve as basic measures of collateral availability (considering that homes are Americans' largest source of wealth) -- these were both statistically significant (and positive) in GR. Two other variables

available at the county-level are the value of bank deposits in the county, and the number of bank branch offices. We include measures for these from the year 2000, normalized by population. As an alternative measure to bank deposits per capita (which had a sign counter to expectations in GR) we consider here dividend, rent and interest payments (DRIPs) into the county, also per capita. Conceptually, this is a pool of funds potentially available to local businesses.

The ethnic fractionalization index is based on Alesina et al. (1999) and captures the ethnic diversity of a county. A higher index means greater diversity in terms of ethnic groups, and our calculation takes into account all of the major races reported in the Census classification; the index has a correlation of about 90% with African-American (Black) presence in counties, and thus in part captures potential opportunities--or the lack thereof--for minority and otherwise underserved populations. We hypothesize this variable to have a positive effect, reflecting greater entrepreneurship among immigrants.

Our socioeconomic variables (from GR) include median population age, female labor force participation rates, per capita personal income net of DRIPs, the unemployment rate and a vector of employment shares by major industry. These include construction, manufacturing, retail trade and finance insurance and real estate (FIRE). Briefly, construction workers are more likely to be self-employed while for communities with manufacturing dominance the opposite is often found to be the case; likewise, with the rise of big-boxes retail workers are less likely to be self-employed, whereas FIRE workers (e.g., realtors, financial advisors) are again more likely to be self-employed. We use these variables as proxies for the types of populations from which the self-employed are likely (or not) to emerge.

In recent years there has been an explosion of interest in the role of natural amenities in driving rural economic development (the seminal paper is Deller, Tsai and Marcouiller 2001; see also Rupasingha and Goetz 2004). Although this variable from the USDA's Economic Research Service (McGranahan 1999) is not amenable to policy change, it is an important control variable. In brief, higher amenities have been associated with both faster income and population growth, and also faster increases in the rate of self-employment over time, beyond the income and population growth controls already included (e.g., this captures higher-end tourism of second homes development, which would not necessarily be reflected in the two growth variables).

Recent research suggests that rural areas have lower firm entry rates relative to urban areas, *cet. par.*, because lower salvage values of rural capital require higher expected profits (Yu et al. 2011; also Johnson and Quance 1972). Unlike GR, who include all US counties, we cannot use a Rural indicator variable given that we are working with only non-metro (rural) counties. Instead we add population density to capture the presence of agglomeration economies, or the lack thereof. Note that these agglomeration benefits can be offset by higher factor costs associated with density or congestion, including for land and labor (Moretti 2004). Last, we include state-level economic freedom measures that are explicit policy variables. As described in APPENDIX 1, they capture the relative size of government in the state's economy; takings and discriminatory taxation; and relative freedom in the labor market; higher values of these variables indicate more freedom.

Perhaps most significantly, Goetz and Rupasingha (2009) find that the self-employed respond rationally to economic incentives, at least over the period 1990-2000. In their study, high-

er returns to self-employment and lower wage-and-salary earnings and lower financial risks associated with self-employment all lead to subsequently higher rates of self-employment or proprietorship formations over time. In addition, the self-employed also respond rationally to state-level economic policy, as elaborated below, and greater access to collateral -- measured by home ownership rates and median home values -- is also associated with higher increases in self-employment rates. Together, these results give us some degree of confidence to explore these data further at a more exclusive level of geography (rural or non-metro only) and using the most recent data available to understand the effects of the 2008 recession.

Data Definitions, Preliminary Analysis and Summary Statistics

Our dependent variable in the regression model is defined as the simple change in the ratio of self-employed to wage-and-salary jobs over time, as discussed above: $[(se_{t+\delta} - se_t)/ws_t]_i$ where *se* is the number of self-employed workers, *ws* the number of wage-and-salary workers, *i* indexes the county (with a total of N=1,991 rural counties), *t* is the base year (2000) and δ is the increment or lag in time over which the change is calculated (e.g., when $\delta = 9$, the rate of change is between the years 2000 and 2009. Of the different calculations available for expressing self-employment change, this one most closely follows that used by Acs and Armington (2006).[5]

This self-employment change measure differs from that used in Goetz and Rupsingha (2009), who use change in the ratio se_t/ws_t for each year and county, and which we also used in our earlier discussion as well as our graphical analysis below. Obviously, the ratio used by GR increases when *se* rises more rapidly than *ws*, or when *ws* declines more rapidly than *se*. Likewise, the AA ratio is positive as long as $se_{t+\delta} > se_t$, and it is increasing so long as $(se_{t+\delta} - se_t) > ws_t$.

Figure 1 shows the self-employment rate used by GR, for the years 1969-2009, as the green line ("ratio"); this is the self-employment number divided by contemporaneous wage-and-salary employment. The structural break in the rate of change in the ratio in 2001 is noteworthy. Before this year, the rural self-employment rate on average increased by 0.20 percentage points annually; since 2001, it has grown at a robust pace of 0.72 percentage points annually. This pace was surpassed or matched only twice historically (over the period shown), in early 1980 and late 1980/early 1990, but then only for shorter durations of two or three consecutive years. For comparative purposes, Figure 1a shows that the two different ways of calculating the self-employment rate, and its changes, produce similar results, albeit on different scales.

The relatively sharp increase in the self-employment rate, or the change in self-employment relative to 2000 wage-and-salary employment over the years 2000-09, did not occur evenly across rural America. In this context a variable useful for stratifying non-metro counties is the Rural-Urban Continuum Code, measured in 2003 (RUCC-03), which is mapped in Figure 2. The definitions of these different counties are provided in the map (and Table 1), and basically capture two dimensions: population size and concentration (urban population of over 20,000; urban population of between 2,500 and 20,000; and no urbanized populations) and adjacency or non-adjacency to metro areas. Other studies have shown that adjacency to metro areas can con-

[5] Acs and Armington (AA) fix the labor force in the denominator in the base year (1994) and consider establishment growth as occurring over the years 1995 and 1996. They have actual firm formation data whereas we are limited to using *net* change in self-employment, or the difference between new formations (entrants) and quits.

vey important benefits to a rural county (Partridge and Rickman 2008.), including access to labor markets and services, etc. Table 1 also shows that there are about 48 mn. rural residents, a number that is close to the population of senior citizens in this country. The other three county types (1 - 3) are metro counties with successively smaller population concentrations. Figure 3 shows boundaries of the Federal Reserve Districts and, for example, that the Minneapolis district contains only one urban core whereas the Kansas City district contains a total of three.

Figure 4 shows that 2000 self-employment shares decline smoothly across the first 5 county types (from 1 to 5) and then increase for the smaller rural counties, with the respective adjacent county showing a higher share (e.g., 4 vs. 5). At the same time, Figures 5 and 6 show that larger increases in self-employment rates occurred in the metro-adjacent rural counties, across the three different size classifications, using both the AA and GR measures of self-employment. This likely reflects greater access to suppliers -- and market outlets -- for self-employed workers as they responded to the economic challenges of the 2000-09 period by switching to self-employment.

The basic variables used in our regressions are defined in Table 2, which also provides summary statistics. Our sample is limited to the 1,992 non-metro counties for which valid data are available across these variables. The data are compiled from two primary sources, USA Counties (http://censtats.census.gov/usa/usa.shtml) for basic Census Data and the Bureau of Economic Analysis' (BEA) Regional Economic Information System (REIS) for data on self-employment numbers, total full- and part-time employment, and dividends, rents and interest payments, as well as inter-censal year population estimates. Further, both the RUCC-03 code and the Amenities Index are from the USDA's Economic Research Service, and the state-level policy measures are from the www.freetheworld.com website (accessed Sept. 15, 2011).

The self-employment numbers are developed by the BEA from Federal Tax Schedule C, Form 1040 filings, and they include unincorporated workers who work for themselves. They are also referred to as non-farm proprietor(ship)s. The numbers include full- and part-time employees and it is possible that the same worker files multiple schedules, and a worker may be both self-employed and also work for someone else on a wage payroll (and therefore be counted in the ES 202 Unemployment Insurance series). In addition, underreporting of such activity is likely to be widespread. Thus, these numbers are not without problems and they need to be viewed with caution.

Estimation Strategy and Results

We start with two regressions that approximate the Acs-Armington (AA) and Goetz-Rupasingha (GR) papers; our results are different from those obtained in these earlier works, but considering differences in time periods, geographic units and measures of the dependent variables (compared to AA), this is not unexpected. These results are reported in Appendix II. Our primary regressions draw on both of these earlier papers. In the case of Acs-Armington, we decided to drop the Industry Specialization variable because it consistently produced the unexpected sign. Instead we substituted a vector of employment shares by industry, thus following the Goetz-Rupasingha paper more closely. From the AA paper we retained the compound growth rates in population and income leading up to the growth period, as well as the educational

attainment measures and the initial self-employment share as well as the unemployment rate. The remaining regressors are based on GR except that we add additional financial access proxies.

Results for the 2000-2009 Time Period

Table 3 shows, in the last two columns, the core regression results for changes in self-employment between 2000 and 2009, relative to 2000 wage-and-salary employment, as a function of 2000 baseline regressors. We report standardized estimates to avoid scaling issues in reporting the parameter estimates. The other columns are for intervening periods (2000-03 through 2000-08). In this manner, we are able to assess the effects of the baseline year regressors as the first decade of the new Century progressed. Of course, the baseline conditions also changed as the years went by, and we do not capture these changes in our analysis. Even so it is interesting to note the gradual increase in the adjusted *R*-square value as more time lapses since 2000.

Focusing on the last column, the establishment size variable is negative but not statistically different from zero when we use only the linear term. However, when we conduct a sensitivity test, we find that including a squared term yields a U-shaped effect on relative self-employment changes, and both terms are statistically significant.[6] Both compound income and population growth had the expected positive signs (from AA), as did the educational attainment variables. Note that the positive effect on high school dropouts is counter to expectations. Also, a greater pool of existing self-employed workers in a county is clearly associated with higher growth in self-employment over time, which is again consistent with AA. Thus, with the exception of the sector specialization variable (see footnote) and the nuance of a non-linear relationship with establishment size, our results support those obtained by AA even though our dependent variable is different, as is our time period of analysis.

Turning next to the primary economic incentives variables used by GR, we find that higher returns to self-employment, and lower risks, are associated with greater increases in that activity. However, unlike GR we have the inconsistent result that greater wage-and-salary earnings are also associated with greater increases in self-employment activity. It is possible that wage-and-salary levels in this case are picking up another effect, such as effective local consumer demand warranting a greater supply of goods and services from the self-employed (note also that, as in GR, the effect of per capita income net of DRIPs is negative and statistically significant). The direct (un-interacted) effects of our two housing-related variables, in contrast to the GR findings, are also negative, although only one of these is statistically significant. However, when we allow for an interaction term (reported in Table 3), it is positive and statistically different from zero. Thus having both a higher share of owner-occupied homes and higher median home values appears to increase access to capital in support of self-employment. Effects of the two bank variables are not distinguishable from zero, while the DRIPs per capita clearly are and, as expected, positive.

[6] We report only the results with linear and quadratic terms here; other results are available on request. Note also that the sector specialization variable used by AA consistently produced the incorrect (negative) sign in our regressions and conflicted with the vector of employment by sector shares; consequently we excluded this variable.

Our median age measure is statistically different from zero only when we allow for a quadratic effect (reported in Table 3), and it suggests an increasing and then declining effect of age. Greater ethnic diversity is associated with more self-employment, while the opposite is true of female shares in the labor force. Women are less likely to be self-employed if they are working, according to these results. As in GR, and as already noted, higher per capita incomes are associated with smaller increases in self-employment over time. For the unemployment rate we also follow GR and include a quadratic term, which yields the same initial decrease in self-employment growth followed by an increase as workers are pushed into self-employment.

For the employment by sector shares, only retailing is significant in a two-tailed test, whereas manufacturing passes a one-tailed test. Amenities have no effect in this model, while population density does: greater agglomeration benefits self-employment or proprietorship formations. Greater labor market freedom is associated with more self-employment activity, conceivably because it is easier to hire workers. The negative (although not significant) sign on takings and discriminatory taxation is not unexpected: less freedom on this variable can drive individuals into self-employment because such activity is easier to shield from tax authorities than wage-and-salary earnings (GR obtain the same negative effect for this variable, and it has been documented elsewhere).

Results for the Interim Time Periods

Recognizing the limitations of such an analysis, we propose that the other results in Table 3 potentially reveal changes in the effects of the regressors over the business cycle and, more specifically, in the period leading up to and including the housing collapse that started in late 2007. First of all, effects of most of the variables are robust over this period, regardless of the period chosen (i.e., δ). The effect of non-farm proprietor incomes (returns to self-employment) was statistically insignificant in 2007, while the effect of wage-and-salary earnings was not distinguishable from zero for most of the decade. Deposits per capita had a negative effect, which was statistically significant, in 2005 and 2006.

The number of bank branches per capita, as our measure of competition (although we do not know if these are from the same bank), was statistically significant in 2000-05, 06 and 07, in two-tailed tests. It is not clear how much should be read into this result, but it may be worthy of further investigation. For example, did bank branch offices "push" out loans to questionable self-employed borrowers in the years leading to the peak of the housing bubble? With this in mind, it is also noteworthy that the effect of construction employment was positive and statistically significant in each of the years 05-08, with the size and t-value of the standardized beta coefficient peaking in 2008. The years 05-07 are the only period among those shown in which the effect of female labor force participation was indistinguishable from zero.

Finally, the effect of the FIRE sector employment is somewhat puzzling, as it is negative throughout (although perhaps declining), and not different from zero in the 2000-09 period regression. Although we are controlling for population growth in the years 1995-2000, we would have expected more self-employment increases in the FIRE sector as the housing sector expanded across the nation, even in rural areas.

Results by Rural-Urban Continuum Code

As noted, a key variable of interest to us, although it does not appear among the regressors, is the RUCC03. As part of the analysis, we run separate regressions for each of the RUCC codes to assess whether or not different policies may be needed for different types of rural counties across the nation. Results are reported in Table 4, and they provide insights into the independent effects of proximity and population size. As stated earlier, the RUCC code captures both population size (declining with higher codes) and metro-adjacency, with the odd number codes (5, 7 and 9) designating non-adjacent and possibly more remote, less accessible counties.

A first result that stands out is that compound population growth clearly matters at least statistically in each of the metro-adjacent county types, with levels of significance well below the 0.01 threshold. This very likely reflects spillover effects of population movement from metro counties on self-employment, with continued sub-urbanization. Population growth also mattered in a positive manner in the two larger metro non-adjacent county types, but the *t*-statistics are one-half the size, or less, of those for adjacent counties.

It is similarly noteworthy that having a college-educated population is important for self-employment growth in code 5 and 7 (and to a lesser degree code 9) counties, but not in code 4 and 6 counties. Thus the status of being located next to a metro area may reduce the need to have college graduates to stimulate self-employment growth (note that this is not true for code 8 counties among the adjacent set). Perhaps this is so because college grads can more readily be hired from metro areas in the non-metro adjacent counties. Interestingly, even though they do not rise to statistical significance, the only instance in which wage-and-salary earnings have a negative sign, is for the larger counties (4 and 5). The riskiness of self-employment has the biggest effect in the smaller, non adjacent counties (7 and 9), and the sign is actually in the wrong direction for code 8 counties (non-urban but adjacent): here greater risk attracts more self-employed. This may be related to commodity-driven boom-bust cycles, rather than irrational decision-making.

Another, perhaps remarkable result is obtained for the number of bank branches per capita. In particular, the expected positive sign is found only for both of the smallest county types: those that are non-urbanized and likely have thinner capital markets, and this is true regardless of whether or not the county is adjacent to a metro area. In sharp contrast, for the counties that are the next size up (some urbanized populations), the effect is negative and statistically significant, regardless of adjacency status.

For median age, and median age squared, the flipping of signs for code 4 and 5 counties is noteworthy: we obtain a U-shape for adjacent counties, and an inverse U for those not adjacent, in the case of the larger urbanized non-metro counties. Youth entrepreneurship educational programs may be especially effective in code 4 counties, where the tendency is for self-employment to pick up only among older residents while younger ones shy away from such activity. Similarly, the shape of the unemployment rate effect also flips between code 4 and code 7 and 8 counties. The share of workers in construction has opposite effects in the two largest non-metro county types, depending on adjacency status, possibly reflecting relative demands for new housing and other construction in these two county types. And finally, amenities matter in a posi-

tive manner in the smallest counties regardless of adjacency status, they do not matter in code 5-7 counties, and they actually depress self-employment growth in code 4 counties.

Conclusion

Our results suggest that all rural counties are not the same and that different types of policy interventions may be required in different rural county types, if the goal is to more uniformly increase self-employment activity across the nation. For example, attracting more highly-educated populations to induce self-employment may work as a strategy in metro non-adjacent counties, but not in those located next to urban labor markets. On the other hand, increasing the number of bank branches per capita, or finding other ways of increasing capital availability, would appear to be an effective strategy in the smallest non-metros, regardless of their adjacency status. Otherwise, the lack of access to capital appears to constrain expanded self-employment. More generally, our results underscore the importance of the effect of metro adjacency on information search and related transactions costs in accessing markets.

Much has been made recently within the economics literature of the importance of density and agglomeration benefits. In this context it is also noteworthy that the detailed regressions by RUCC reveal that population density plays a statistically significant role only in code 5 and 9 counties, both of which are disadvantaged by lack of access to a nearby metropolitan county. In these types of counties it may be necessary to encourage greater population concentration (i.e., consolidation of communities) if the goal is to support higher self-employment rates. Although they cannot change their stocks of natural amenities, the smaller counties (8 and 9) could expand the marketing and promotion of their natural amenities, if they wish to attract new self-employed workers from elsewhere.

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Table 1: Selected 2000 Rural Population Statistics by RUCC*

rucc03	Total Population	Mean Population	Population per mile^2	Counties (Number)	Definition
4	14,259,827	66,947.5	101.1	213	Urban pop. 20,000+ adj.
5	5,207,328	51,557.7	64.5	101	Urban pop. 20,000+ not adj.
6	14,997,680	25,121.7	41.9	597	Urban pop. 2,500-19,999 adj.
7	8,248,109	18,874.4	30.8	437	Urban pop. 2,500-19,999 not adj.
8	2,405,935	10,415.3	21.7	231	Completely rural - adjacent
9	2,741,321	6,637.6	12.6	413	Completely rural - not adjacent
Total	47,860,200	24,026.2		1,992	

Source: Authors' calculations using Census data.

*In comparison, for metro counties only (*N*=1.046), total population was 228,522,280 with an average of 218,472.5 per county and population density of 591.9.

Table 2: Variables Definitions and Summary Statistics

Variable	Definition	Min.	Max.	Mean	Std. Dev.
AcsShGr09	Change in self-employment, 2000-2009, see text	-.27	.98	.0652	.09256
EstabSize2000	Number of workers per establishment, 2000	1.4	59.8	11.1	4.2
EstabSizeSQ	Squared term	2.0	3573.1	140.3	131.6
CmpdIncome	Compound per capita income growth, 1995-2000	1.0	1.2	1.0	0.0
CmpdPopuln	Compound population growth, 1995-2000	1.0	1.1	1.0	0.0
NEWdropout	Share of adults without high school degree, 2000	3.7	65.3	24.1	8.9
EDU685200D	Share of adults with college degree or more, 2000	5.4	60.5	14.3	5.7
share00	Self/wage-and-salary employed, 2000	0.0	0.6	0.2	0.1
nfpinc00	Self-employment earnings per self employed, 2000	3928.6	60056.4	17564.1	5436.9
wsE2000	Wage-and-salary earnings per worker, 2000	14780	52973	23181.7	3789.2
CV96_05	CV of self-employment earnings, 1995-2005	0.0	0.7	0.2	0.1
PCOWNOCC	Percent owner-occupied homes, 2000	42.8	89.9	75.1	5.8
MEDHVALU	Median home value, 2000	20100	750000	70703.1	36270.1
OwnOccMedVal	Interaction term x 10^6	1.126	44.4	5.27	2.44
BRANCHpc00	Number of bank branches per capita 1,000, 2000	0.0	2.7	0.5	0.3
DRIPpc00	Dividends, rent and interest payments per cap., 2000	1.0	32.4	4.5	1.9
medage00	Median age of the population, 2000	20.6	53.0	38.2	4.0
medagesq	Median age square	424.4	2809.0	1474.9	301.2
ethnic00	Ethnic diversity index (see text), 2000	0.0	0.7	0.2	0.2
flf00	Female labor force participation rate, 2000	34.2	54.1	45.8	2.3
NETIncPCwoDRIP	Per capita personal income without DRIPS, 2000	9905.0	69206.2	21862.4	4186.6
urate00	Unemployment rate, 2000	0.2	33.0	6.0	2.9
uratesquare	Unemployment rate squared	0.0	1089.0	44.7	52.5
cons00	Employment share in construction, 2000	2.2	22.5	7.6	2.4
manu00	Employment share in manufacturing, 2000	0.0	48.6	16.0	9.9
rtrade00	Employment share in retail trade, 2000	1.7	26.9	11.3	2.1
fire00	Employment share in finance, ins. + real estate, 2000	0.0	11.1	3.9	1.2
amnscale	Amenity scale (see text)	-6.4	11.2	-0.1	2.2
PopDen	Population density, 2000	0.3	343.3	38.5	39.7
DEPOSITpc00	Bank deposits per capita, 2000	0.0	201.9	12.4	7.1
area1	Size of government (larger value means less), 2002	5.3	9.1	8.0	0.8
area2	Takings and discriminatory taxation, 2002	5.5	8.3	7.0	0.5
area3	Labor market freedom, 2002	5.8	8.6	7.1	0.7
Valid N (listwise)	1992				

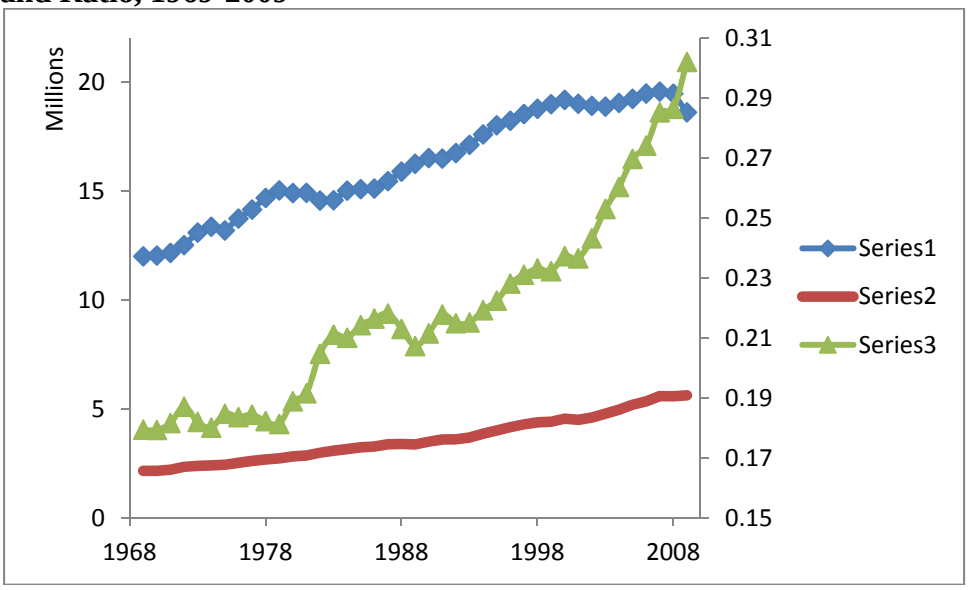
Table 3: Regresssion Results for Alternative Time Periods

	2000-03			2000-04			2000-05			2000-06			2000-07			2000-08			2000-09		
Variable	Std. β		*t* -stat	Std. β		*t* -stat	Std. β		*t* -stat	Std. β		*t* -stat	Std. β		*t* -stat	Std. β		*t* -stat	Std. β		*t* -stat
(Constant)		***	-4.57		***	-6.08		***	-6.62		***	-6.71		***	-6.87		***	-6.60		***	-6.08
EstabSize2000	-0.2993	***	-3.96	-0.2143	***	-2.92	-0.1886	***	-2.64	-0.1771	**	-2.53	-0.1707	**	-2.51	-0.1655	**	-2.42	-0.1454	**	-2.13
EstabSizeSQ	0.2028	***	3.43	0.1574	***	2.73	0.1434	**	2.57	0.1386	**	2.53	0.1344	**	2.52	0.1296	**	2.42	0.1170	**	2.19
CmpdIncome	0.1076	***	4.14	0.1206	***	4.77	0.1240	***	5.05	0.1194	***	4.95	0.1167	***	4.97	0.1061	***	4.51	0.0919	***	3.91
CmpdPopuln	0.1503	***	4.65	0.1796	***	5.72	0.1924	***	6.31	0.1969	***	6.57	0.1972	***	6.77	0.1879	***	6.44	0.1685	***	5.78
NEWdropout	0.0596		1.54	0.0921	**	2.44	0.0912	**	2.49	0.0866	**	2.40	0.0917	***	2.62	0.0931	***	2.65	0.0888	**	2.53
EDU685200D	0.1448	***	3.60	0.1445	***	3.69	0.1294	***	3.40	0.1322	***	3.54	0.1374	***	3.78	0.1636	***	4.49	0.1820	***	5.00
share00	0.0932	***	3.06	0.1623	***	5.47	0.2465	***	8.56	0.2922	***	10.3	0.3466	***	12.6	0.3629	***	13.2	0.4015	***	14.6
nfpinc00	0.0588	**	2.41	0.0492	**	2.07	0.0365	†	1.58	0.0316	†	1.39	0.0231		1.05	0.0364	*	1.65	0.0564	*	2.55
wsE2000	0.0422		1.35	0.0423		1.39	0.0338		1.14	0.0223		0.77	0.0193		0.68	0.0350		1.24	0.0562	*	1.99
CV96_05	-0.0991	***	-4.56	-0.1228	***	-5.81	-0.1092	***	-5.32	-0.0990	***	-4.91	-0.0853	***	-4.35	-0.0754	***	-3.84	-0.0597	***	-3.04
PCOWNOCC	-0.1596	***	-3.40	-0.1637	***	-3.58	-0.1612	***	-3.63	-0.1470	***	-3.37	-0.1404	***	-3.31	-0.0989	**	-2.33	-0.0468		-1.10
MEDHVALU	-0.6380	***	-3.33	-0.7934	***	-4.26	-0.8117	***	-4.49	-0.8423	***	-4.74	-0.8191	***	-4.74	-0.7256	***	-4.19	-0.5685	***	-3.28
OwnOccMedVal	0.6324	***	3.23	0.7895	***	4.15	0.8137	***	4.40	0.8396	***	4.62	0.8159	***	4.62	0.6593	***	3.72	0.4374	**	2.47
DEPOSITpc00	-0.0405		-1.52	-0.0421		-1.62	-0.0475	*	-1.88	-0.0412	*	-1.66	-0.0322		-1.34	-0.0279		-1.16	-0.0197		-0.82
BRANCHpc00	0.0521	†	1.62	0.0464		1.48	0.0516	*	1.70	0.0501	*	1.68	0.0507	*	1.75	0.0375	†	1.29	0.0257		0.88
DRIPpc00	0.0810	†	1.56	0.0905	*	1.79	0.0832	*	1.70	0.0923	*	1.92	0.0793	*	1.69	0.1059	**	2.25	0.1246	***	2.66
medage00	0.5266	**	1.97	0.5400	**	2.08	0.4584	*	1.82	0.4075	*	1.65	0.3715		1.54	0.4154	*	1.72	0.4805	**	1.99
medagesq	-0.5049	*	-1.91	-0.5450	**	-2.12	-0.4630	*	-1.85	-0.4450	*	-1.81	-0.4158	*	-1.74	-0.4722	**	-1.97	-0.5490	**	-2.29
ethnic00	0.1003	***	3.28	0.1100	***	3.69	0.1222	***	4.22	0.1397	***	4.92	0.1526	***	5.52	0.1743	***	6.29	0.1860	***	6.72
flf00	-0.0890	***	-3.25	-0.0471	*	-1.77	-0.0397		-1.54	-0.0407		-1.61	-0.0397		-1.61	-0.0579	**	-2.34	-0.0796	***	-3.22
NETIncPCwoDRIP	-0.1921	***	-3.67	-0.1578	***	-3.09	-0.1433	***	-2.89	-0.1363	***	-2.80	-0.1193	**	-2.52	-0.1138	**	-2.40	-0.1124	**	-2.37
urate00	-0.1761	**	-2.45	-0.1448	**	-2.07	-0.1570	**	-2.31	-0.1572	**	-2.35	-0.1716	***	-2.64	-0.1955	***	-3.00	-0.2148	***	-3.30
uratesquare	0.1488	**	2.28	0.1224	*	1.92	0.1283	**	2.08	0.1277	**	2.10	0.1352	**	2.29	0.1573	***	2.66	0.1779	***	3.01
cons00	0.0236		0.79	0.0463		1.60	0.0464	*	1.65	0.0531	*	1.92	0.0570	**	2.12	0.0470	*	1.74	0.0334		1.24
manu00	-0.0192		-0.53	-0.0227		-0.64	-0.0249		-0.72	-0.0204		-0.60	-0.0062		-0.19	-0.0307		-0.93	-0.0528	†	-1.61
rtrade00	-0.1026	***	-4.12	-0.0873	***	-3.60	-0.0848	***	-3.60	-0.0746	***	-3.23	-0.0722	***	-3.21	-0.0764	***	-3.39	-0.0770	***	-3.42
fire00	-0.0916	***	-3.46	-0.0723	***	-2.81	-0.0736	***	-2.95	-0.0683	***	-2.78	-0.0610	**	-2.55	-0.0510	**	-2.13	-0.0343		-1.43
amnscale	-0.0339		-1.06	-0.0001		0.00	0.0043		0.14	-0.0009		-0.03	0.0098		0.34	0.0128		0.44	0.0161		0.56
PopDen	0.0914	***	3.14	0.0831	***	2.93	0.0834	***	3.03	0.0832	***	3.08	0.0807	***	3.07	0.0823	***	3.12	0.0833	***	3.17
area1	0.0339		1.02	0.0459		1.42	0.0489		1.56	0.0217		0.70	-0.0030		-0.10	-0.0186		-0.62	-0.0258		-0.86
area2	-0.0439		-1.33	-0.0451		-1.40	-0.0487		-1.56	-0.0423		-1.38	-0.0408		-1.37	-0.0228		-0.76	-0.0134		-0.45
area3	0.0610	**	2.36	0.0738	***	2.93	0.0821	***	3.36	0.0852	***	3.54	0.1010	***	4.32	0.1041	***	4.45	0.0966	***	4.13
Adj. *R*- square	0.120			0.167			0.215			0.242			0.283			0.280			0.282		

Table 4: Regression Results by Rural-Urban Continuum Code, 2000-09 (AA)

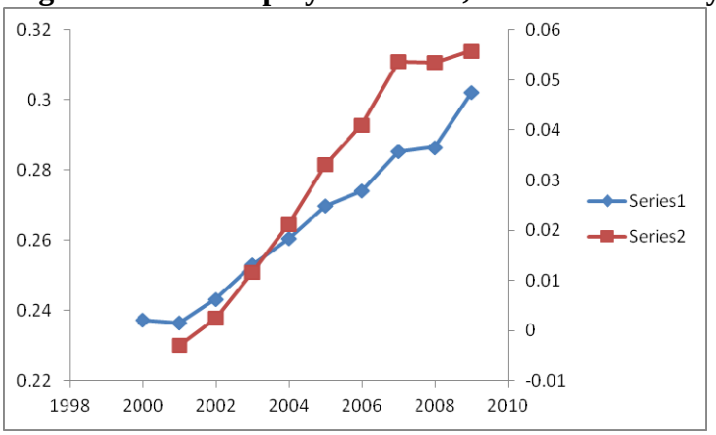
	Code 4		5		6		7		8		9	
Variable	Std. β	*t*-stat	Std. β	*t*-stat	Std. β	*t*-stat	Std. β	*t*-stat	Std. β	*t*-stat	Std. β	*t*-stat
(Constant)	***	-2.92	**	-2.20	***	-4.98	***	-3.05	***	-2.86		-0.06
EstabSize2000	0.3665	0.87	-0.1635	-0.25	-0.1420	-0.80	-0.3366	-1.54	0.1086	0.46	-0.2265 *	-1.75
EstabSizeSQ	-0.2892	-0.74	-0.1773	-0.30	0.2144	1.37	0.2773	1.39	-0.1409	-0.64	0.1319	1.19
CmpdIncome	0.1355 **	2.14	0.0769	0.73	0.1314 ***	3.16	0.0272	0.60	-0.0699	-0.97	0.1155 *	2.11
CmpdPopuln	0.2588 ***	3.26	0.2540 †	1.62	0.1907 ***	3.89	0.0901 †	1.64	0.2098 ***	2.87	0.0649	0.83
NEWdropout	0.2114 *	1.79	0.1666	0.86	0.0755	1.18	0.1786 **	2.36	0.2404 **	2.48	-0.0253	-0.30
EDU685200D	0.0432	0.45	0.2736 *	1.70	0.0499	0.82	0.2268 ***	2.61	0.1821 *	1.72	0.2283 †	2.59
share00	0.4087 ***	5.36	0.6677 ***	4.70	0.5241 ***	r	0.2890 ***	5.14	0.6215 ***	8.55	0.1486 †	2.55
nfpinc00	0.0641	1.13	0.0617	0.58	0.1302 ***	3.57	0.0711 †	1.59	0.1006 †	1.61	0.0431	0.89
wsE2000	-0.0626	-0.91	-0.1307	-0.93	0.1135 **	2.48	0.0214	0.37	0.0830	1.27	0.0792	1.24
CV96_05	-0.0639	-1.18	-0.0354	-0.48	0.0014	0.04	-0.3265 ***	-8.57	0.1963 ***	3.31	-0.1448 ***	-3.16
PCOWNOCC	-0.0688	-0.36	0.2620	0.91	0.1329	1.19	0.0350	0.43	-0.0693	-0.44	-0.1469 *	-1.67
MEDHVALU	-0.6476	-1.07	-0.8320	-0.70	0.4139	0.80	-1.6153 ***	-3.38	-1.6450 **	-2.01	-0.7278 **	-2.30
OwnOccMedVal	0.7184	1.15	0.5154	0.41	-0.4907	-0.95	1.4224 ***	2.98	1.2720	1.55	0.6725 **	1.97
DEPOSITpc00	0.0331	0.64	-0.1352	-0.92	0.1879 ***	3.49	0.0907 †	1.34	-0.2472 ***	-2.78	-0.0750	-1.07
BRANCHpc00	-0.1220 *	-1.95	0.1111	0.95	-0.1426 ***	-2.81	-0.1064 *	-1.93	0.1808 **	2.01	0.1338 **	1.99
DRIPpc00	0.1522	1.14	0.0255	0.10	0.0690	0.85	0.4724 ***	4.01	-0.1274	-1.01	-0.0903	-0.88
medage00	-1.9000 ***	-2.95	2.9134 **	2.58	0.1419	0.32	2.1459 ***	4.28	2.0316 **	2.17	-0.4283	-0.73
medagesq	1.7039 ***	2.74	-3.1676 ***	-2.87	-0.3408	-0.77	-2.3373 ***	-4.75	-2.0124 **	-2.20	0.4508	0.79
ethnic00	0.2418 ***	2.80	0.2617 *	1.87	0.2454 ***	4.56	0.1889 ***	3.53	0.1563 **	2.20	0.0917	1.53
flf00	0.0513	0.74	0.0470	0.39	0.0344	0.77	-0.0066	-0.12	0.0771	1.18	-0.2140 ***	-3.92
NETIncPCwoDRIP	0.1020	0.66	0.5508	1.61	-0.0266	-0.31	-0.2722 **	-2.01	0.3627 ***	2.80	-0.0866	-1.07
urate00	0.4013 **	1.90	-0.5026	-1.09	-0.0010	-0.01	-0.2656 **	-2.23	-0.9185 ***	-4.33	-0.1172	-0.62
uratesquare	-0.5612 ***	-2.69	0.5882	1.43	-0.0229	-0.18	0.2898 **	2.56	0.9436 ***	4.06	0.1180	0.66
cons00	0.1362 *	1.80	-0.2946 *	-1.93	0.0064	0.14	0.0682	1.19	0.0046	0.07	0.0402	0.61
manu00	0.0318	0.31	0.0500	0.42	-0.1072 *	-1.78	-0.0693	-1.04	0.0555	0.65	-0.0320	-0.42
rtrade00	0.0290	0.47	0.0418	0.48	-0.0278	-0.75	-0.0351	-0.81	0.0284	0.46	-0.1337 **	-2.48
fire00	0.0909	1.37	-0.0572	-0.56	-0.0127	-0.33	-0.0401	-0.79	0.0503	0.76	-0.0052	-0.09
amnscale	-0.2163 **	-2.39	0.0166	0.13	0.0503	0.93	0.0251	0.42	0.2172 ***	2.68	0.1385 **	1.97
PopDen	-0.0512	-0.77	0.1944 *	1.74	0.0021	0.04	0.0113	0.21	-0.0472	-0.58	0.1330 *	1.70
area1	-0.0635	-0.74	-0.2330	-1.47	0.0102	0.18	-0.1369 **	-2.33	-0.0008	-0.01	0.0020	0.03
area2	-0.1045	-1.26	0.0021	0.02	-0.0904	-1.60	0.1537 ***	2.73	-0.0579	-0.65	-0.1076	-1.51
area3	0.1612 ***	2.74	0.2279 ***	2.24	0.1796 ***	4.27	0.1052 **	2.30	0.0567	0.83	0.0872	1.34
Adj. *R*-square	0.537		0.571		0.362		0.435		0.451		0.242	

Figure 1: Rural Wage-and-Salary Employment, Self-Employment, and Ratio, 1969-2009



Series 1: Wage-and-salary employment (ws_t), left axis
Series 2: Self-employment (se_t), left axis
Series 3: Ratio of self to wage-and-salary employment (se_t/ws_t), right axis

Figure 1a: Self-employment Rate, Last Decade Only



Series 1: se_t/ws_t; annual self-employment rate ($[se_{t+\delta}/ws_{t+\delta} - se_t/ws_t]$ used by GR) -- left axis.
Series 2: Change in self-employment relative to 2000 wage-and-salary employment (AA definition: $(se_{t+\delta} - se_t)/ws_t$); δ=[1,…,9]: the dependent variable used here; right axis.

Figure 1b: Histogram for Self-Employment Rate Change (GR), 2000-2009

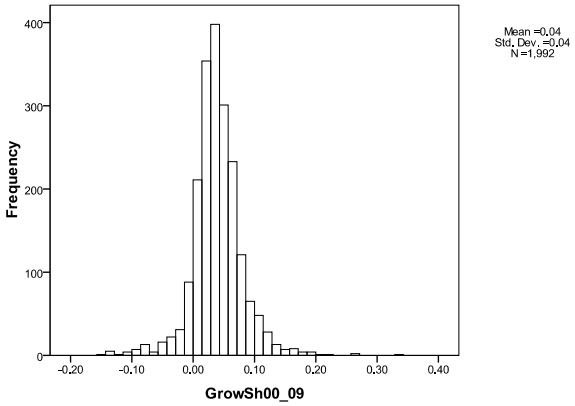


Figure 2

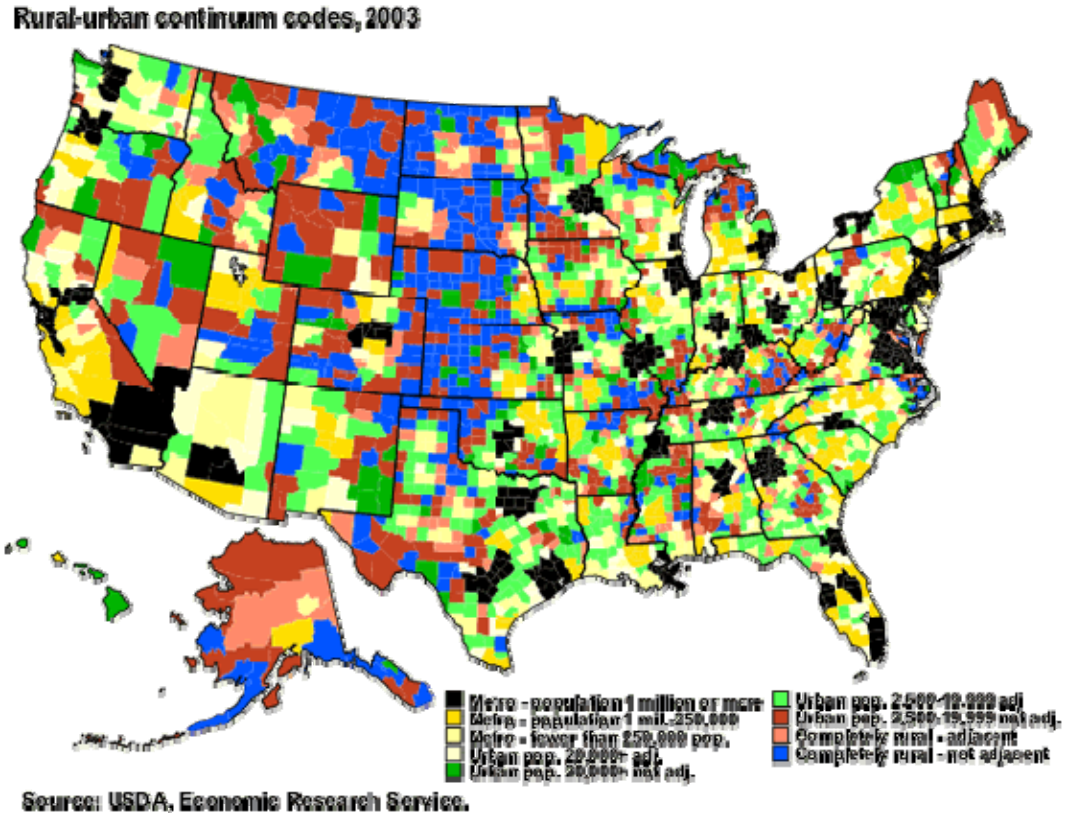


Figure 3

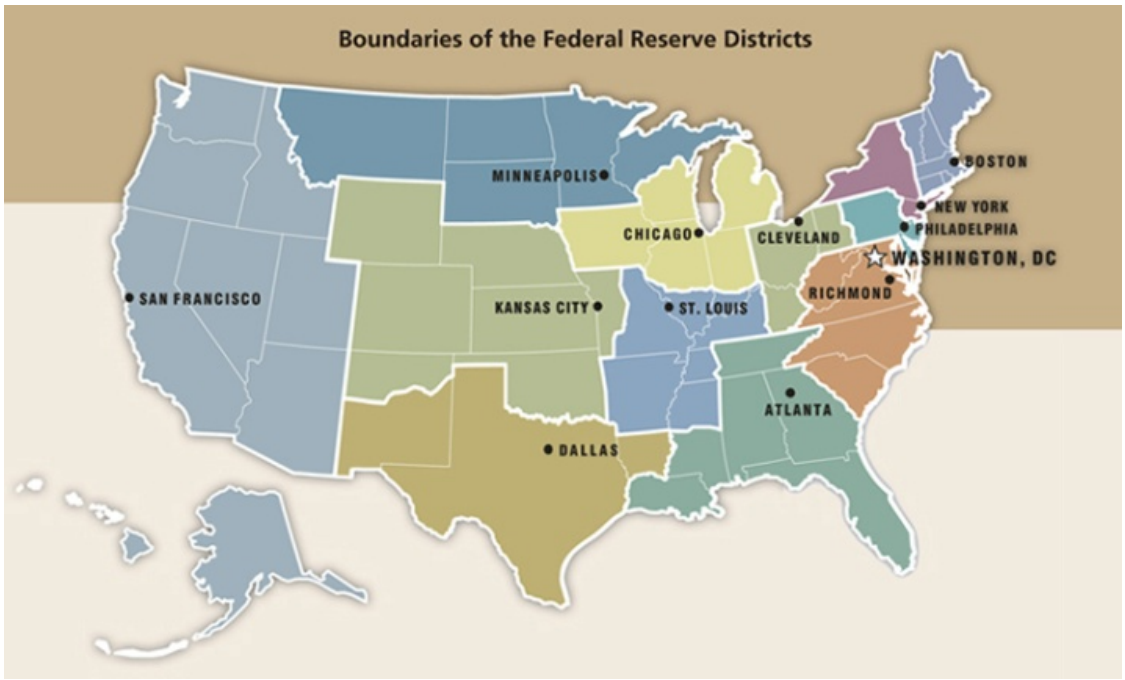


Figure 4: Self-Employment Ratio in 2000 by RUCC-03

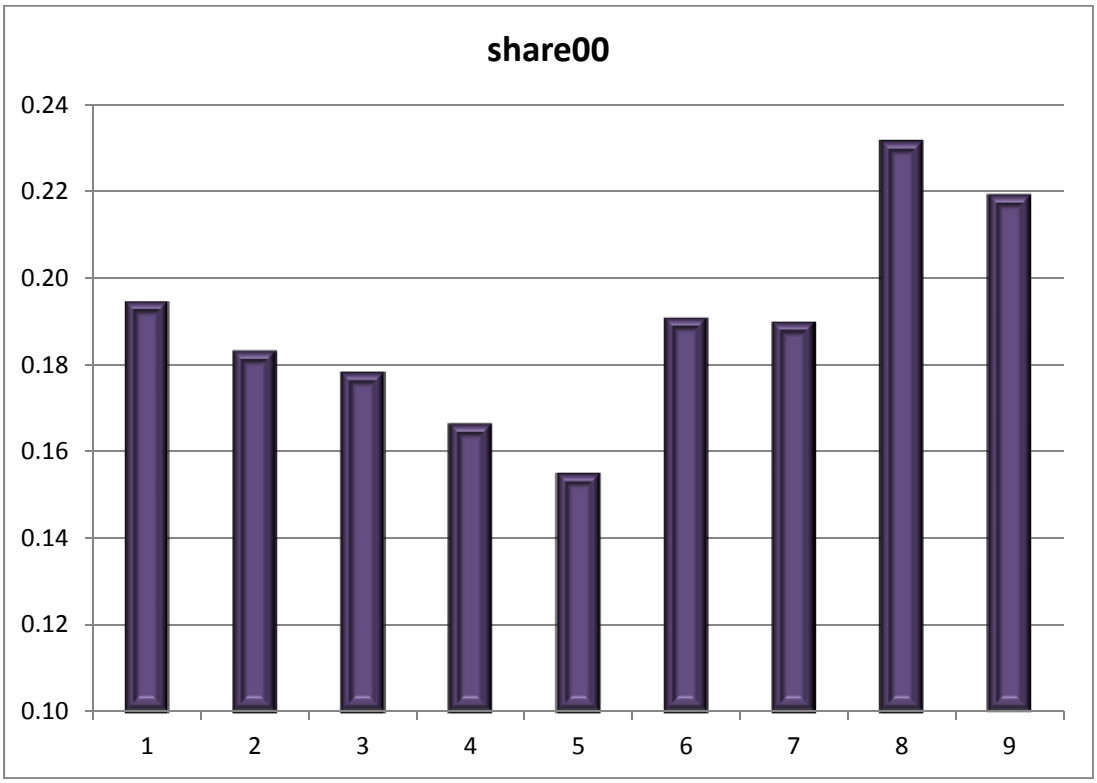


Figure 5: Change in Self-Employment Ratio (GR) 2000-09 by RUCC-03

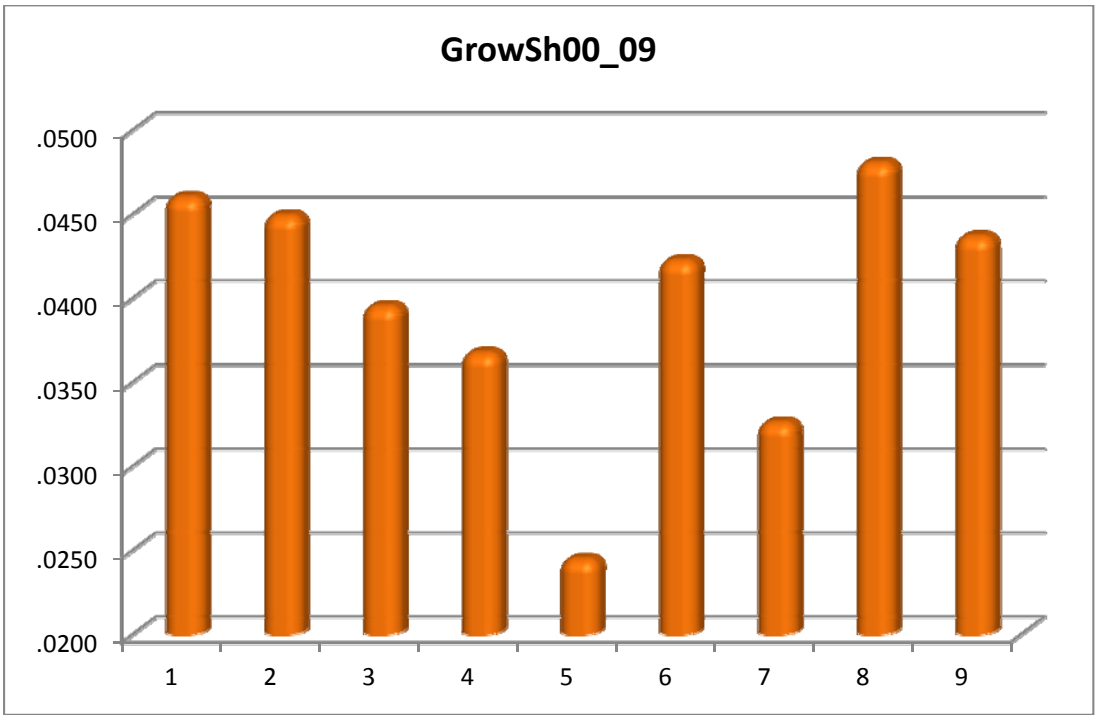


Figure 6: Change in Self-Employment Ratio (AA) 2000-09 by RUCC-03

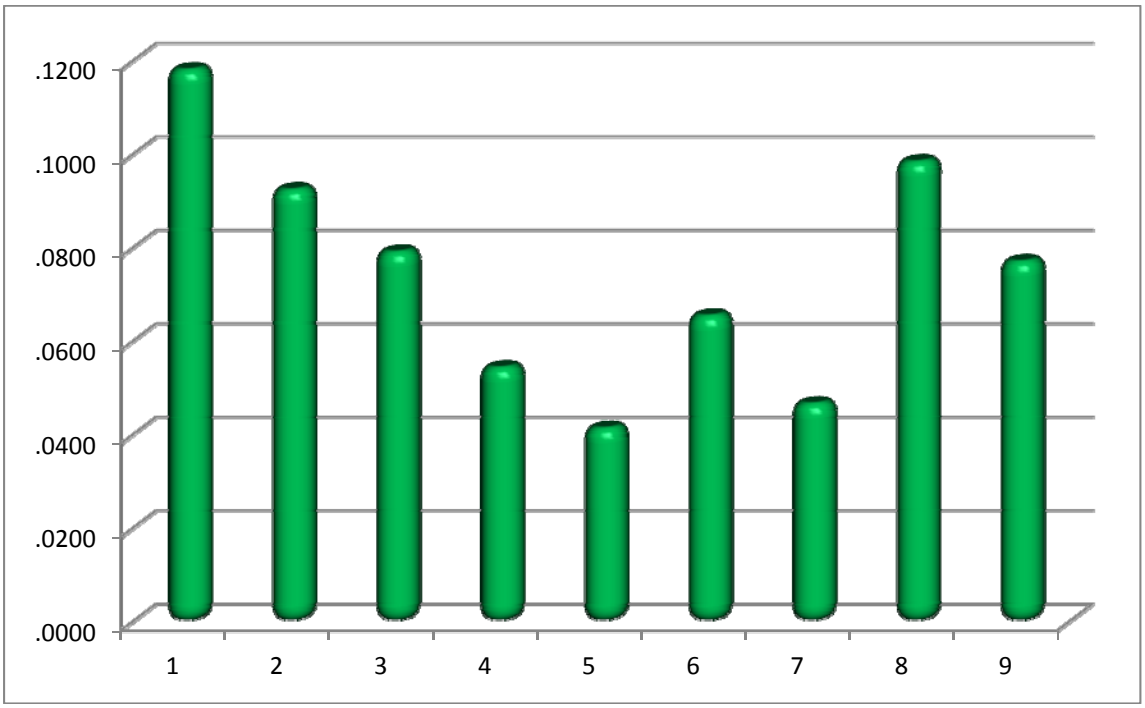
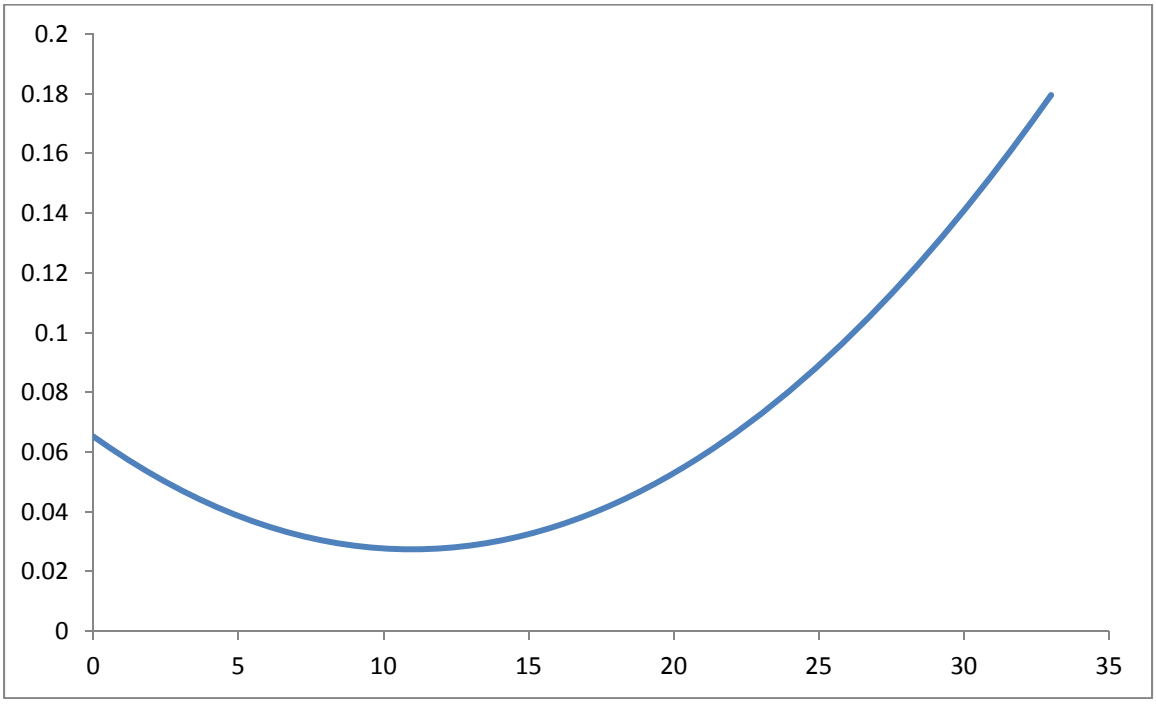


Figure 7: Effect of Unemployment Rate on Self-Employment Change (AA), 2000-09



Note: 88.0% of non-metro counties had an unemployment rate of less than 9.1% (the current national average) in 2000. The minimum of the above function occurs at 11.0%; 94.2% of counties had an unemployment rate below this minimum.

APPENDIX 1:
Areas and Components of the Economic Freedom of North America Index

AREA 1. Size of Government
1A. General Consumption Expenditures by Government as a Percentage of GDP
1B. Transfers and Subsidies as a Percentage of GDP
1C: Social Security Payments as a Percentage of GDP
AREA 2. Takings and Discriminatory Taxation
2A. Total Government Revenue from Own Source as a Percentage of GDP
2B. Top Marginal Income Tax Rate and the Income Threshold at Which It Applies
2C. Indirect Tax Revenue as a Percentage of GDP
2D. Sales Taxes Collected as a Percentage of GDP
AREA 3. Labor Market Freedom
3A. Minimum Wage Legislation
3B. Government Employment as a Percentage of Total State/Provincial Employment
3C: Union Density

Note: data are state-level; a higher value means *more* economic freedom, or less government intervention. The earliest year for which the data are available is 2002.

APPENDIX II: Auxiliary Regression Results

Acs-Armington model

	Std Coeff	t
(Constant)		-7.27
EstabSize2000	-0.072	-2.93
SectorSpec2000	-0.124	-4.28
NEWdropout	0.175	6.11
EDU685200D	0.244	8.17
CmpdIncome	0.051	2.35
CmpdPopuln	0.173	7.82
share00	0.342	13.9
urate00	-0.047	-2.04
Adj r-square: 0.222	N=1,991	

Note: Sectorspec, urate00: wrong signs.
Adj R sq lower than AA

Goetz-Rupasingha model

	Std Coeff	t
(Constant)		-2.37
NEWdropout	.074	2.01
EDU685200D	.175	4.39
CmpdIncome	-.010	-.419
share00	.127	4.47
urate00	-.025	-.37
uratesquare	.069	1.13
nfpinc00	.042	1.76
CV96_05	-.171	-8.04
PCOWNOCC	.033	1.09
MEDHVALU	.002	.06
medage00	.072	2.23
ethnic00	.179	6.03
flf00	.044	1.47
agr00	.304	6.56
cons00	.114	3.72
manu00	.330	8.34
rtrade00	-.050	-1.89
prserv00	.060	2.00
DEPOPC00	-.006	-.26
amnscale	.013	.42
area1	.030	.93
area2	-.034	-1.06
area3	.154	6.06
pcinc00	-.040	-1.00
ws_inc00	.040	1.40
adj. r sq. = 0.147	N=1,991	