FINAL REPORT TO THE


# The Place-Based Structural Determinants and Effects of Self-Employment

by

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## Extended Abstract

This study expands on previous research by including a wider set of local economic and community factors affecting non-farm entrepreneurship or self-employment than have previously been considered. These factors affect both the rates of and returns to self-employment in US counties. In the county-level regression analyses, individual-level socio-demographic variables capture the characteristics of the population pool from which the self-employed are drawn. These individual-level factors are distinguished from local county characteristics that affect self-employment or proprietorship formations. Some of the latter variables are subject to policy influence while others serve as controls that are not easily changed. While the literature on self-employment or proprietorship formations is sizeable, empirical research on the returns to self-employment is virtually non-existent. A major contribution of the present study is to reveal why the returns to self-employment vary over space.

Counties with older, more highly-educated and wealthier populations also had higher self-employment rates, as predicted. Likewise, counties with more foreign-born populations and greater ethnic diversity have higher rates of self-employment, but higher foreign-born shares are associated with lower earnings from self-employment. These results likely reflect a combination of cultural factors as well as labor market discrimination on the one hand, and greater tolerance for newcomers, on the other.

College completion conveys no earnings advantage to the self-employed and having a high school but no college degree entails an earnings penalty relative to not having completed high school. Greater wealth and access to capital raise the returns to self-employment while the effect of experience on earnings follows an inverted-U, reaching a maximum at age 37. Greater reliance on federal welfare payments in the population is associated with higher self-employment rates but lower returns to self-employment.

Counties in which more residents voted for the Republican presidential candidate in 2000 had higher rates of self-employment and returns to self-employment in these counties also were higher. This result is attributed to a stronger “entrepreneurial spirit” in these counties and fewer rules and regulations to thwart self-employment efforts.

Results for the effects of creative class-type variables are mixed. Patent activity leads to more self-employment but not to higher earnings. The presence of art dealerships is associated with higher self-employment rates (weakly) and earnings while musical instrument supply stores are associated with lower self-employment rates and have no effect on earnings.

Big-box retailers, especially Wal-Mart™, have been maligned recently for their effects on local communities. This study finds that while the presence of Wal-Mart stores depresses self-employment rates it may also raise the returns to self-employment. This supports the Schumpeterian prediction of creative destruction whereby the surviving self-employed are more productive as a result of competitive pressures.

Local business service providers allow the self-employed to out-source non-core functions, raising their profitability. Among the six types of providers studied here, temporary help and child daycare services stand out for being associated with both higher rates of self-employment and greater returns. Childcare services are not typically viewed as a constraint to expanded entrepreneurship but they warrant greater attention. Couriers and messengers, and office supply and stationary stores are associated with significantly higher earnings, but their presence does not affect self-employment rates. Surprisingly, greater availability of business support services is associated with significantly lower returns to self-employment.

Other previously omitted establishment types that may affect entrepreneurship and self-employment are local post-secondary educational institutions. The presence of junior colleges; business schools and computer and management training establishments; and technical and trade schools is associated with higher returns to self-employment. However, only technical and trade schools are associated with higher self-employment rates. An opportunity clearly exists for expanding the roles of colleges, universities and professional schools in stimulating local rates of and returns to entrepreneurship.

The self-employed respond rationally to financial incentives reflected in returns to wage-and-salary employment and self-employment risks. However, higher past returns to self-employment in a county unexpectedly are associated with lower subsequent self-employment rates, perhaps indicating that artificial barriers to entry exist in counties with high returns to self-employment. Higher levels of social capital, state right-to-work laws and greater self-employment risks are each associated with higher returns to self-employment.

Counties with natural amenities have proportionately more self-employed workers, as do metropolitan counties. Among US regions, the Northeast has higher shares of self-employed workers relative to the South, all else equal. In the West and the Midwest region, returns to self-employment are higher than in the South.

Standardized (beta) coefficients reveal that the following local factors have the greatest positive effect on non-farm self-employment rates, starting with the most important: 1. the presence of “jack of all trades” farmers; 2. lower returns to wage-and-salary employment, as the opportunity cost of self-employment; 3. greater access to credit; 4. greater availability of child daycare services; and 5. fewer retail firms. The statistically largest effects in terms of raising returns to self-employment are exerted by 1. higher historical returns to self-employment (in 2000); 2. an older or more experienced population (up to 37 years of age); 3. lower availability of business support services but 4. greater availability of temporary help services; and 5. fewer high-tech establishments.

Another innovation in this study is the use of spatial statistical methods to identify self-employment hot and cold spots. These are county clusters with especially high rates of or returns to self-employment. Analysis of regression residuals reinforces the results of the cluster map analysis in suggesting that the State of Tennessee is unusually successful in stimulating self-employment, both in terms of rates and returns.

## Introduction and Purpose

Substantial progress has recently been made in understanding the origins of entrepreneurial or self-employment behavior and in designing educational programs needed to nurture and expand this behavior as a backbone of national economic growth. Interest in entrepreneurship or self-employment as an economic development strategy has exploded as policymakers and community leaders realize that most natural resource-based and manufacturing jobs lost in recent decades will not return. Instead, these leaders are looking inside their communities for new sources of economic growth. At the same time awareness is growing that the propensity towards self-employment and the returns to such endeavors vary significantly over space. Yet the reasons for this spatial variation remain poorly understood. The void in research is even more significant for our understanding of local factors that affect the returns to self-employment efforts.

This exploratory study examines entrepreneurship or self-employment as an engine of local economic growth, links local structural conditions to entrepreneurship, identifies local policy levers available to stimulate entrepreneurial activity, and isolates factors that influence returns to entrepreneurial endeavors. Unlike most previous work, this research focuses on county-wide relationships rather than only on individual firms or entrepreneurs. The approach is highly complementary to efforts pursued by The Ewing Marion Kauffman Foundation, and the results provide new insights into what communities can and cannot do to stimulate local entrepreneurial activity in the form of self-employment.

It is important to note that, despite the growing interest in entrepreneurship, most states collect data only on workers covered by unemployment insurance, i.e., wage-and-salary workers in the ES 202 data series (e.g., Goss 2006). If proprietors or the self-employed do not appear in state-level statistics, then it is impossible for states to know how public policies affect this increasingly important set of actors, both in terms of their rates of formation and their productivity or earnings.

Given the strong interest in entrepreneurship and self-employment, the relative dearth of empirical studies in the US on the local economic impact of these workers on total job growth is surprising (e.g., Short and Dunn, 2002). Important exceptions are the work of McConnon et al. (2002), who examine the multiplier effect of proprietors on the local economy, Audretsch and Keilbach (2004*a*,*b*) who examine the effect of entrepreneurial "capital" on economic growth and labor productivity in German regions (see also Acs and Storey 2004), and Robbins et al. (2000), who find that Small Business employment at the state-level is associated with higher productivity and GSP growth (also see, however, the caveats in Boettke and Coyne, n.d.). Recently, Rupasingha and Goetz (2007) find that self-employment is a powerful means of helping individuals escape from poverty in the US, an argument also made in Gilder (1993). The present study is similar in its objectives but differs by the scope and analytical method used from this prior work.

Questions about the effect of proprietors or the self-employed on other job creation are not trivial. For example, such firms could out-compete and displace existing firms, especially if they are initially subsidized, thereby producing no net new jobs (Van Stel and Storey 2004). Or, they could create competitive pressures that increase the economic viability of a region, leading to future job growth. Whether one factor outweighs the other must be answered empirically. To the author's knowledge, this is the first study to test systematically and comprehensively for the effect of proprietorship formation on overall job creation in the US economy at the county-level.

**Economic and Community Context of Entrepreneurship**

Economists have in the past tended to treat the entrepreneurial process as a black box (Barretto 1989; also see, however, Parker n.d.). In part this is due to the fact that entrepreneurship is difficult to quantify and model. Baumol (2006) explains that the heterogeneity of entrepreneurship pushes it out of the reach of quantitative analysis: "… an invention yesterday is mere repetition today" (p. 2). Further, entrepreneurship is about disequilibrium, and thus cannot be treated within "… a stationary Walrasian model, even

in a more sophisticated variant" (*ibid.*). Phelps (2006, p.8) presents a contrasting perspective, sketching an equilibrium model of entrepreneurial actions and "the entrepreneurial economy as an interactive system." Another attempt toward formal modeling can be found in Lowrey (n.d.).

Researchers studying entrepreneurial endeavors have focused on individual rent-seeking behavior and generally not considered community-wide factors. Or, they have examined entrepreneurship as collective action in the sense of Olson (1971), whereby benefits are received through group action (e.g., Cook and Plunkett 2006). The growing interest in clusters, spawned largely by the work of Porter (1985, 1998, Ch. 7), suggests a new avenue for inquiry that considers broader community-wide factors as impacting the self-employed in particular industries.

Seminal works on entrepreneurship include Schumpeter (1911) and Kirzner (1979). In Schumpeter's model of creative destruction, agents seek out and exploit new market opportunities with an unrelenting drive to "do things better" and to launch entire new industries. In the process they create economic wealth, well-being and progress. Kirzner's contribution is that entrepreneurs restore the equilibrium that was perturbed by Schumpeterian action because they are alert to the opportunities that exist within disequilibrium (Baumol 2006). Table 1 summarizes the development of the literature on entrepreneurial rents starting in the 18$^{th}$ Century.

Previous research on entrepreneurs and the self-employed yields at least three key insights. First, personal characteristics such as experience or age, educational attainment, ethnicity, access to collateral and labor market characteristics (discrimination, industry, unemployment rates, etc.) vary systematically among those who are self-employed and those who are not (e.g., Lazear 2005; Simon 2004; Rissman 2003; Bates 1990; Borjas 1986; see also Mar 2005). Second, returns to self-employment tend to be lower than returns to wage-and-salary employment, suggesting that psychic income plays an important role in the self-employment decision (Hamilton 2000), and self-employment rates are sensitive to differences in the relative returns to self- as opposed

to wage-and-salary employment (Cowling and Mitchell 1997). Third, the opportunity to work in a business owned by a family member is key to becoming self-employed (Fairlie and Robb 2005).

**Table 1. Historical Explanations of Rents Earned by Entrepreneurs**

| *Author, year* | *Capability* | *Activity* | *Rents Received* |
|---|---|---|---|
| Cantillon, 1755 | Bearing of uncertainty | Management | Uncertain selling price minus certain buying price or vice versa |
| Von Thünen, 1824 | Judgment | Management | Profit minus interest on invested capital, insurance premiums, salaries and wages paid |
| Knight, 1921 | Judgment, bearing of uncertainty | Innovation | Monopoly revenue minus contractible production cost |
| Schumpeter, 1934 | Intuition | Innovation | Management salary or Ricardian rent |
| Kirzner, 1979 | Alertness, optimization | Arbitrage | Price in market A minus price in market B |
| Casson, 1995 | Judgment, leadership | Management, innovation | Risk-adjusted Ricardian gain minus costs of supervision & capital |

*Source*: Ross and Westgren (2006)

Perhaps less well-known is the fact that the relative returns to self-employment have been declining over time, according to data compiled by the Bureau of Economic Analysis. At the same time, a survey of consumer finances by the Federal Reserve Bank reveals that families headed by self-employed individuals had nearly twice the average income of other households: $141,500 vs. $70,100 (Aversa 2006). Even so, this raises the question of whether workers are pushed involuntarily or pulled voluntarily into self-employment and whether, in an economic sense, there is "too much" self-employment (see also Parker n.d.).

The fact that entrepreneurship does not occur in a vacuum is often overlooked. Whether measured as new business formations or changes in self-employment and proprietorship rates, entrepreneurial activity varies significantly across the United States (Acs and Armington 2005; Advanced Research Technologies 2005). Some places clearly are more conducive than others to the formation of new businesses or provide superior preconditions for entrepreneurship. Recent research is starting to reveal the

systematic factors that account for differences in proprietorship formation rates over time across counties (Lee et al. 2004; Goetz and Rupasingha 2006*b*).

The present exploratory study endeavors to explain not only variation in the growth of entrepreneurship or self-employment from place to place, but also variation in the returns or rents that accrue to the self-employed. The goal is to identify strategic policy and educational levers that may influence the creation of new firms and the productivity of the self-employed.

The basic analytical procedure is to relate county-wide (average) characteristics to new firm formations and the returns to entrepreneurial activity. A key advantage of this approach is that selection and other biases inherent in individual-level data are avoided. On the other hand, the possibility of ecological fallacies cannot be ruled out and must be addressed to the extent possible. For example, in communities with more art dealerships the returns to self-employment may be higher because per capita incomes are also higher. In this case, controlling for per capita income is one way of reducing a potential ecological fallacy.

Measuring entrepreneurial activity or energy in a region at any geographic or governmental level is difficult because public data collection efforts have generally not kept pace with rapid changes in labor markets and the nature of work. These include multiple job-holding or out-sourcing of contract work (Pink 2001, pp. 29-31; see also Kauffman Foundation 2005, pp.34-35) and proprietorship formations or self-employment (e.g., Goss 2006). The author's own research includes efforts to estimate entrepreneurial climate as well as entrepreneurial capacity at the state-level (Goetz and Freshwater 1997, 2001). This earlier work provides a foundation for the research undertaken here, which includes understanding the place-based structural foundations of entrepreneurship.

Human beings do not live by their economic relationships alone. Indeed, there is growing recognition of the profound value of trust and social networks and relations to indi-

viduals' success in the economic sphere (Skinner and Staiger 2005; Barrett 2005; Durlauf and Young 2001; Parker 2004). The 2007 Kauffman Prize Medal for Distinguished Research in Entrepreneurship was awarded to Professor Toby Stuart for his work on the effects of social networks on entrepreneurship.[1]

Furthermore, individual entrepreneurs and the self-employed must rely on auxiliary local supporting businesses in order to operate efficiently and profitably. These businesses may range from business support services such as photocopying and legal advice to daycare providers or temporary help service agencies.

The emergence of such supporting firms, or a lack thereof, can pose a fundamental chicken-and-egg problem in some communities: there is a dearth of such businesses because there are no entrepreneurs or self-employed workers who demand these kinds of services, and there are no self-employed workers because no supporting businesses are available locally to allow them to operate at a profit. Helping communities to break out of this vicious circle may be a challenge. Many of the individuals who operate these kinds of supporting services may also be self-employed (e.g., daycare providers) but it is difficult to separate this effect from that of the business support provided. Nevertheless, as a minimum, the effect of these activities on county-wide *returns* to self-employment is likely to be unbiased.

Richard Florida's (2002) work on the "creative class" has added another dimension to our understanding of innovation, the openness of different communities to new ideas and human differences, and potential entrepreneurial activity or self-employment. Proxies for this creative class include, for example, patent-generating activity and the presence of art dealerships or musical instrument suppliers in a community. McGranahan and Wojan (2005) present more-refined measures of the creative class at the county-level.

[1] Press release at www.kauffman.org/items.cfm?itemID=728, August 14, 2006.

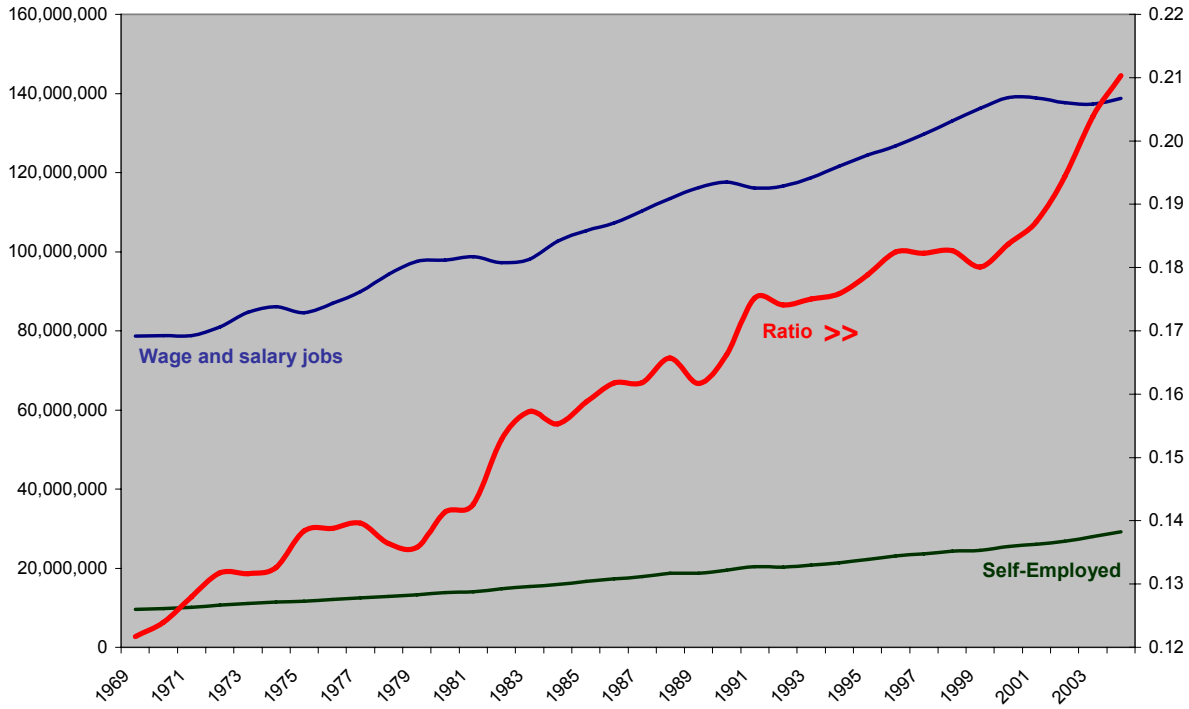
Communities and regions to a large extent control their own destinies. For example, businesses in some counties aggressively provide broadband services to their local firms and residents. During the 2005 holiday season, an estimated 45 percent of all online retails sales were completed by small retailers rather than big chains (Tedeschi 2005, citing Forrester Research data; however, Fairlie 2005 finds no independent impact of Internet access on self-employment or entrepreneurship). Many of these small firms are owned by self-employed owners, as sole proprietorships.

Institutional factors such as regulations and income tax levels also matter, as do state Right-to-Work laws. Some communities contain business schools and community colleges that offer basic entrepreneurship or business training. The presence of these institutions may increase local self-employment rates as trained individuals remain in the local area in which they received their training, or as they become self-employed applying the concepts even while they maintain their regular employment. However, whether such educational institutions matter empirically, and how, is not known. Yet other variables, such as natural amenities (mountains, lakes, moderate climate) or the metro/non-metro status of a county may also matter but these variables are not amenable to policy influence.

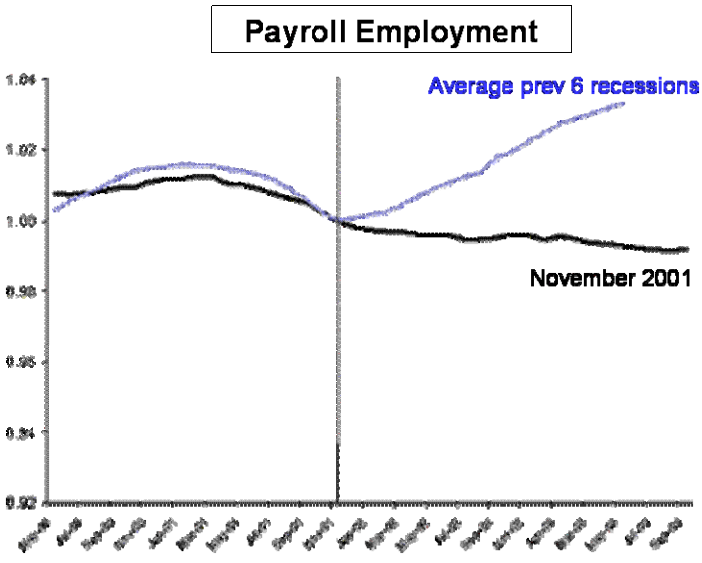
***National Self-Employment Trends: Shares and Returns***

Dramatic growth in self-employment shares nationally over the last three decades is evident from Figure 1. Between 1969 and 2004 – the most recent year for which data are available – the number of full- and part-time non-farm self-employed workers or proprietorships tripled, from 9.6 to 29.2 million (the source of these data is described in more detail below). In comparison, the number of full- and part-time wage-and-salary workers grew by only 77 percent, or 60.1 million, from a total of 78.8 million in 1969 to 138.8 million workers in 2004. By 2004 the total number of wage-and-salary jobs had not yet recovered to pre-recession levels (139.0 million in 2000), although their number had increased from the trough of 137.3 million in 2003. This reflects the so-called "jobless

**Figure 1: Trends in Wage-and-Salary vs. Self-Employment Jobs, and Ratio of Self-Employed to Wage-and-Salary Workers**




recovery" at the beginning of this Century (see the adjacent graphic insert, from the NBER Business Cycle Dating Committee).[2]




While the wage-and-salary job numbers (by definition) closely track the national business cycle, declining or stagnating during recessions, the number of self-employed workers has shrunk in only two out of the 35 years shown in Figure 1: in 1989 and in 1992. On average, just over half a million (560,000) new self-employment

[2] Source: http://www.nber.org/cycles/recessions.html

jobs were created each year over this period, with a higher number in more recent history. Wage-and-salary jobs increased by 1.6% annually over this period, or by 1.72 million net new jobs each year.

As a result of these trends, the ratio of self-employed to wage-and-salary workers increased sharply from 12 to 21 percent between 1969 and 2004, or to one-in-five. The relative rise in self-employment is especially pronounced in the years since 2000, but similar surges occurred in the early 1980s and 1990s. These powerful trends explain the popularity of books such as *Secrets of Self-Employment – Working from Home* (1996); *Free Agent Nation* (Pink 2001); *Multiple Streams of Income* (Allen 2005) and, more recently, *The Disposable American* (Uchitelle 2006). And, if the trends continue, one worker will be self-employed for every four wage-and-salary workers by 2010.

It is important to note that the patterns shown in Figure 1 are at odds with Current Population Series (CPS) data, based on household-level surveys. Kauffman Foundation (2005, p.33) refers to a statistical gap of 8 million "between the number of employed persons reported in recent surveys of U.S. households versus the number reported in surveys of U.S. employers." Paradoxically, CPS data show that self-employment rates have declined, to only seven percent in recent years from levels around 19 percent in 1950 (Hipple 2004; Manser and Picot 1999; also see Blau 1987). Pink (2001, pp. 29*ff*) discusses shortcomings of the CPS given the new employment realities facing many workers.

At the same time, Bureau of Economic Analysis data show that the returns to self-employment, or earnings per proprietor, lag far behind the returns to wage-and-salary employment (Figure 2). In 1969, the average self-employed worker earned $6,758, whereas the average wage-and-salary job paid only $6,507 (a ratio of 103.9%). By 2004, the average self-employed worker earned almost $10,000 less than the average wage-and salary worker: $29,250 vs $38,798, or 75.4%.

**Figure 2: Trends in Nominal Earnings per Job: Wage-and-Salary vs. Self-Employment**

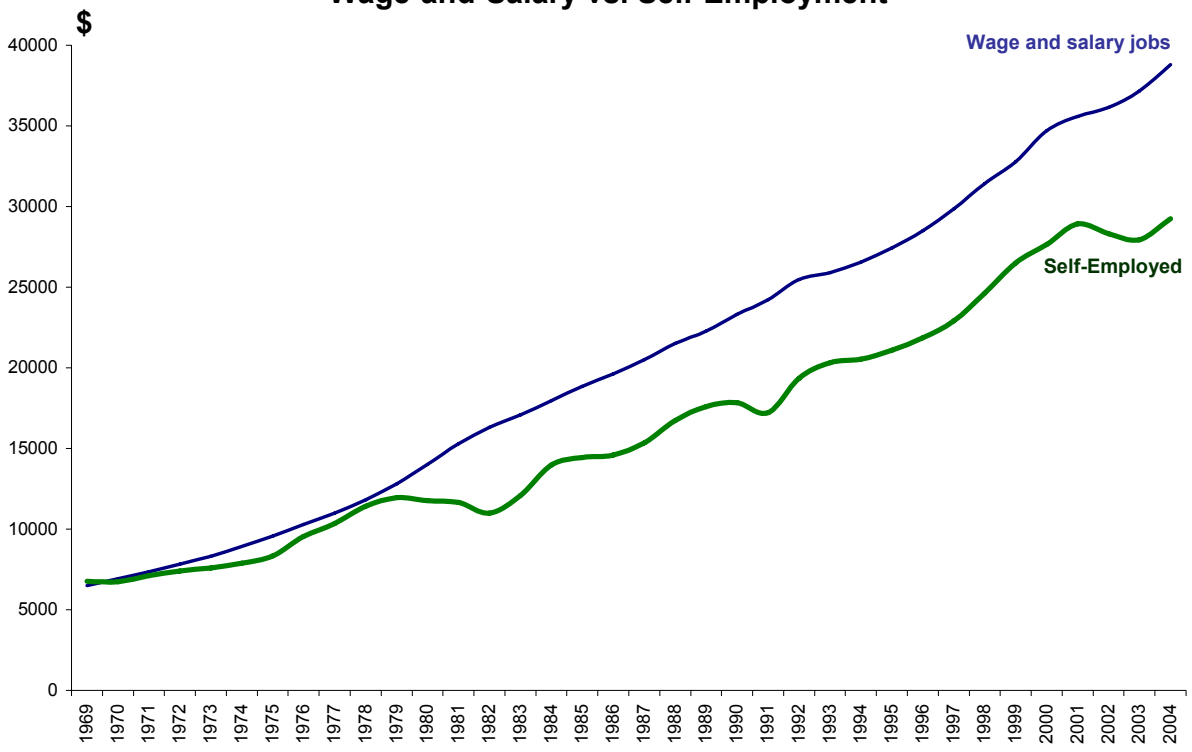



Figure 3: Self-Employment Earnings Relative to Wage-and-Salary Earnings, 1969-2004

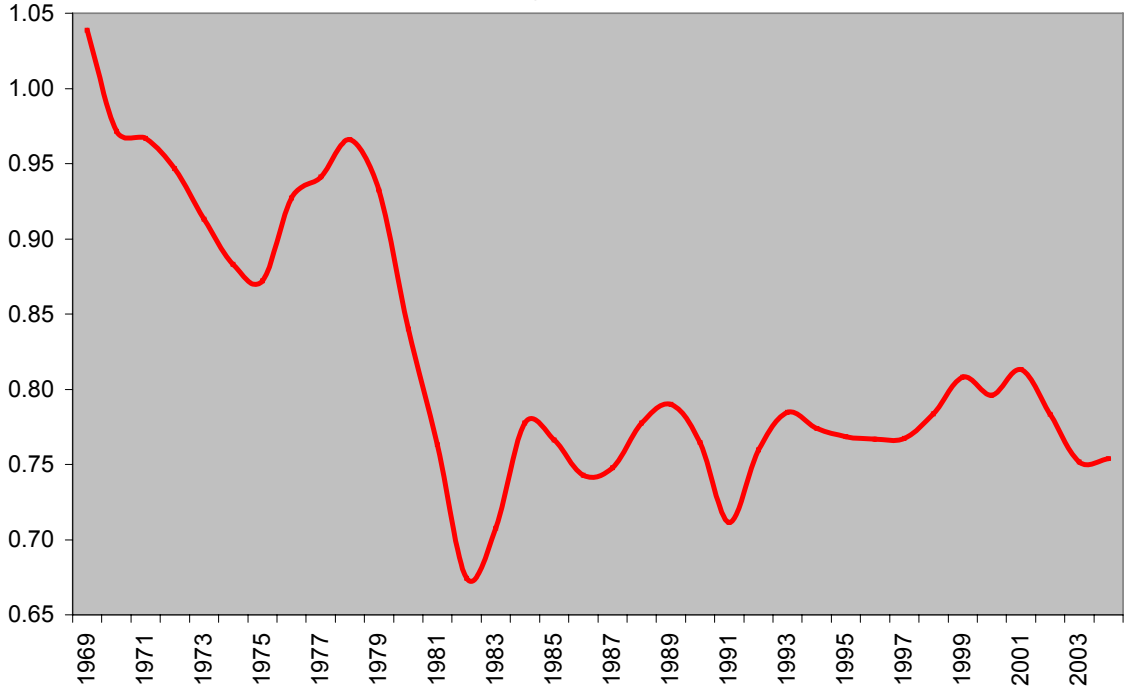


Figure 2 shows that returns to self-employment first started to lag behind wage-and-salary earnings in 1978, at about the time of the first surge in the ratio of self-employed relative to wage-and-salary workers. By 1982, the average self-employed worker earned only about two-thirds (67.4%) of the average wage-and-salary employee. This represents the greatest differential (or lowest relative pay) of the period studied, and it occurred at the end of the natural resource or commodities crisis sparked by the OPEC cartel in 1973. From 1988 to 1992 another lag period was observed, even as the ratio of self-employed to wage-and-salary workers again surged, but the pay discrepancy closed to 71.2%. Since 2000, the discrepancy has increased again, to three-quarters (75.4%), after being as small as 81.3% in 2001.

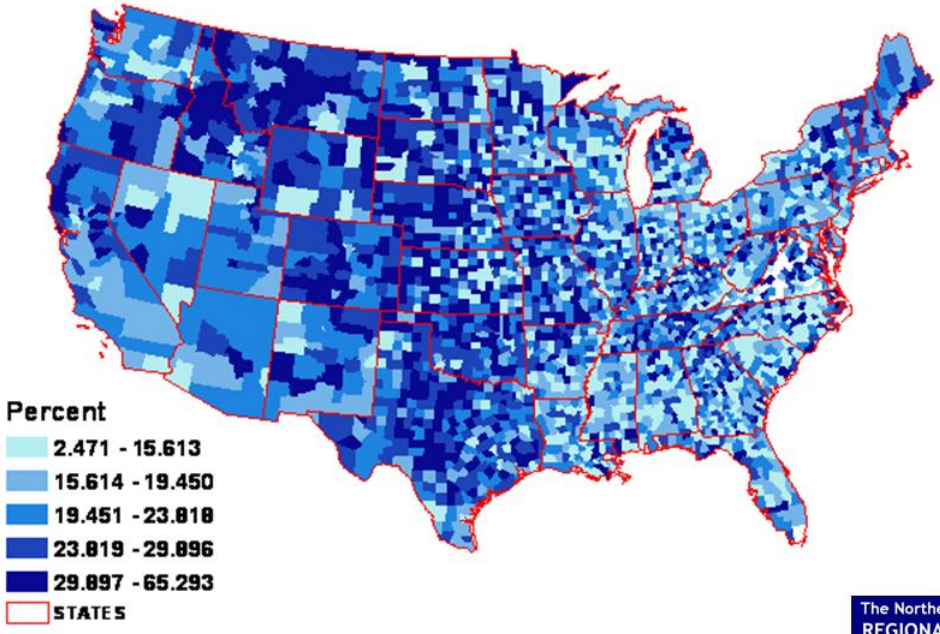
Figure 3 shows a sharp structural break occurring in the relative returns series in the late 1970s and early 1980s, from which the relative returns to or productivity of self-employment never recovered. As noted, this is also a period in which the ratio of self-employed to wage-and-salary employed increased steadily and it may suggest a relative oversupply of self-employed workers.

***County-Level Variation in Self-Employment: Shares and Returns***

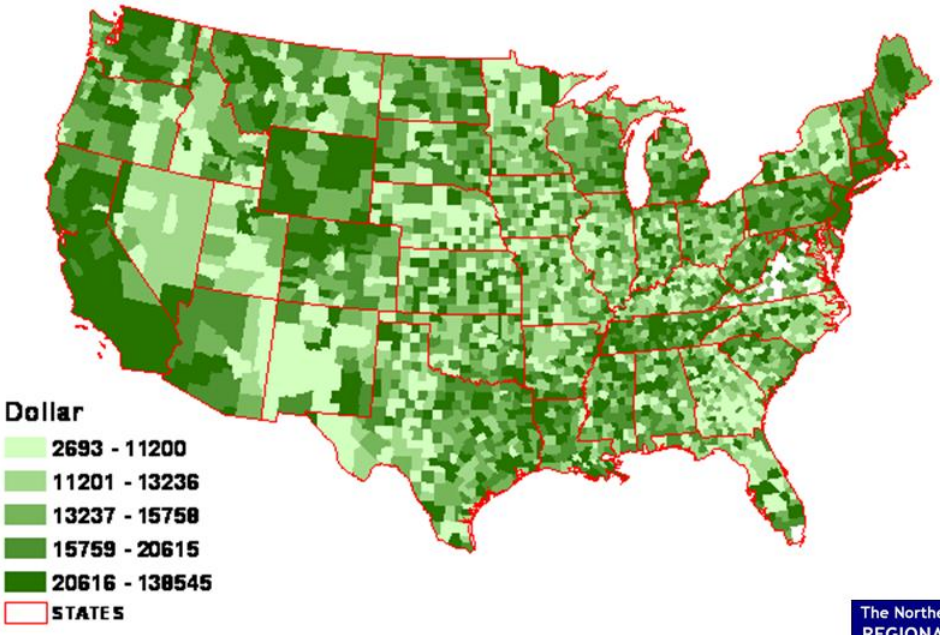
Notable patterns emerge when self-employment shares and returns are examined spatially, at the county-level geographic unit of analysis. Here the enormous diversity that exists within the nation becomes clear. In particular, neither the ratio of self-employment to wage-and-salary employment nor the returns to self-employment are distributed evenly over space, as is illustrated in the following maps.

Figures 4 and 5 show the shares of self-employed workers in 2004 and the average returns to self-employment in 2004 using quintiles. The relatively dark shading through the nation's midsection stands out in Figure 4, implying relatively greater reliance on self-employment in that part of the country. While there is some overlap in terms of the darker shading in Figure 5 with that of Figure 4 (especially in natural resource-rich Wyoming), higher returns to self-employment are observed in the US Northeast, Michigan, throughout the US South and, especially, along the West Coast.

## Figure 4: Self-Employment Shares, Non-Farm Workers, 2004 [Quintiles]




## Figure 5: Self-Employment Returns, Non-Farm Workers, 2004 [Quintiles]



Figures 6a and 6b show the top ten percent of counties in terms of the ratio of self-employment to wage-and-salary employment in 1969 and 2004, respectively. In 1969, counties with the highest ratios of non-farm self-employed were clustered in the center of the country (Heartland), parts of Appalachia, and the inter-Mountain West (especially Idaho and Montana). By 2004, the high concentrations had spread to selected counties east of the Mississippi River as well as California and Nevada. While the counties with high shares tended to be somewhat contiguous or more concentrated spatially in 1969, they generally appear to be less so by 2004. The high concentrations in the nation's center may be a residual effect of farming activity (although these are non-farm self-employed) and other natural resource-related activity.

Meigs County, TN led all other US counties in 2004 with a ratio of 1.850, or 185 self-employed workers for every 100 wage-and-salary workers. The lowest-ranked county is Tunica County, Mississippi, with a ratio of 0.0249, or 2.5 self-employed workers for every 100 wage-and-salary employees. This latter county is remarkable because it also experienced the largest reduction in the poverty rate of all non-metro US counties in the 1990s, most likely because of a boom in gaming activity (Jensen, Goetz and Swaminathan 2006). The fact that a low ratio of self-employed to wage-and-salary workers coincided with a large reduction in poverty in this county is consistent with the relatively smaller returns to self-employment activity shown in Figure 3.

Thirty-eight of Texas' 254 counties appear among the top 300 US counties ranked by the self-employment ratio in 2004, followed by 20 counties each in Tennessee and Nebraska, 19 in Missouri, 17 in Colorado and 16 in Kansas (Figure 4a). Arizona and Utah, on the hand, do not have a single county in this category. Explaining this diverse pattern of relative concentrations in self-employment is the task of the subsequent regression analysis.

Figures 7a and 7b show the top 300 counties ranked by returns to self-employment per worker, in 1969 and 2004. In 1969, the concentration of counties with high returns in western Pennsylvania (likely related to natural resources) and the Rocky Mountains

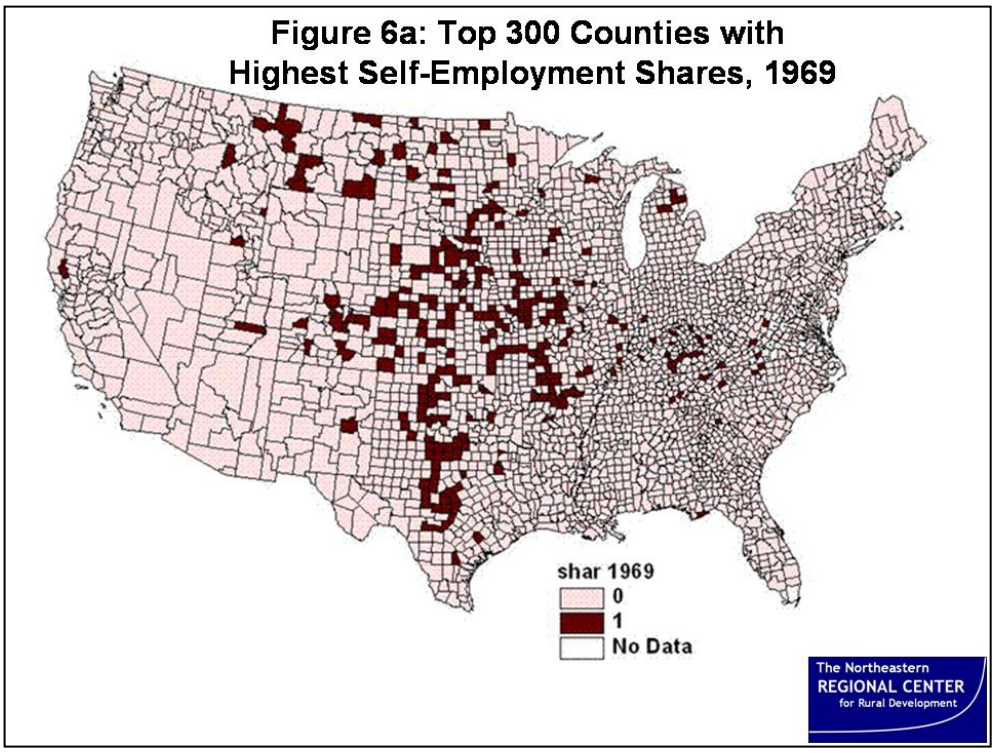


Figure 6a: Top 300 Counties with
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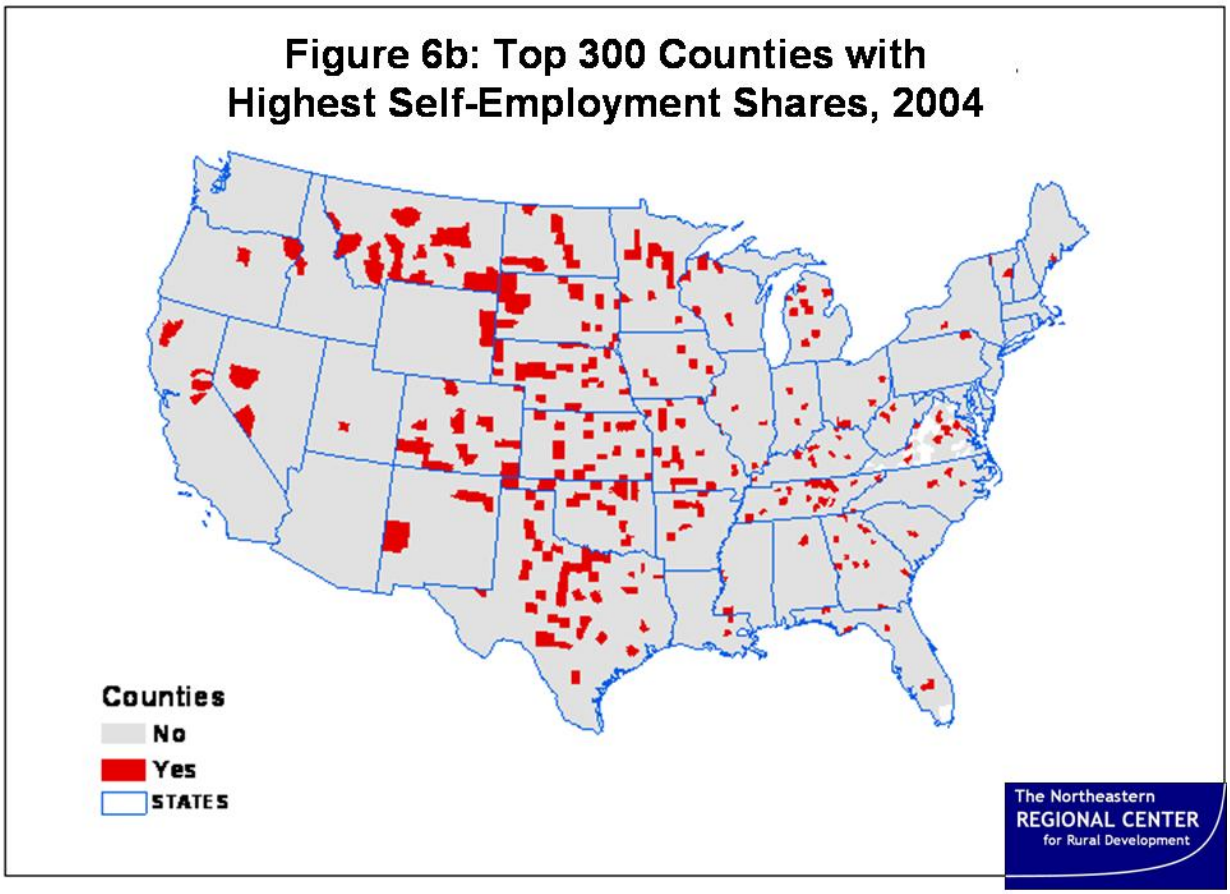
Figure 6b: Top 300 Counties with
Highest Self-Employment Shares, 2004
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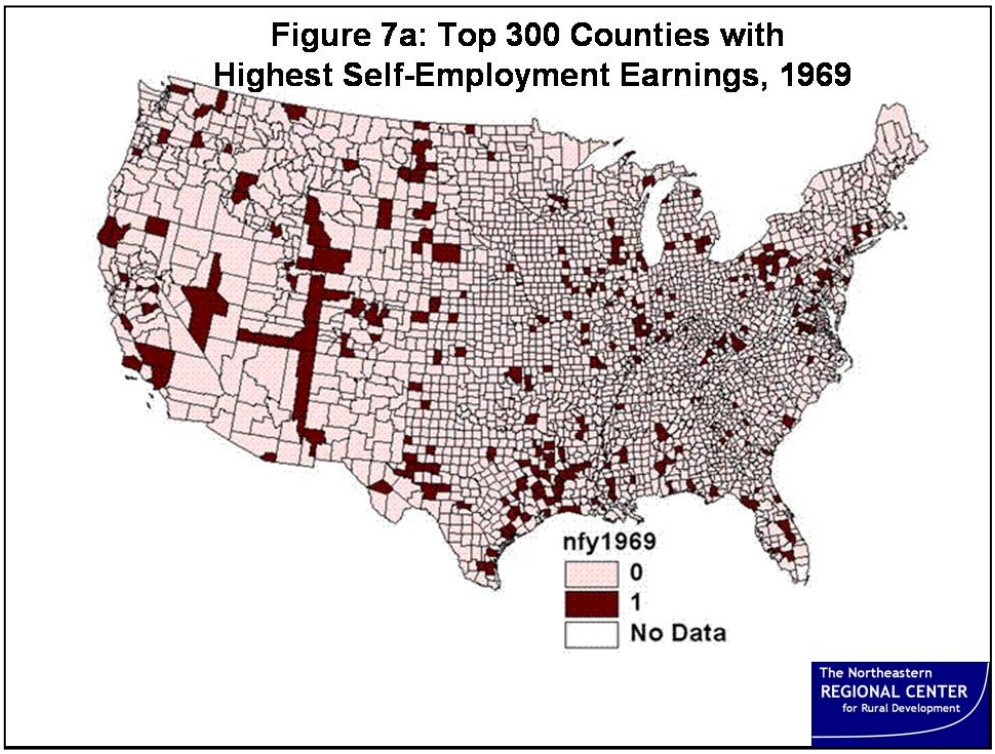
Figure 7a: Top 300 Counties with
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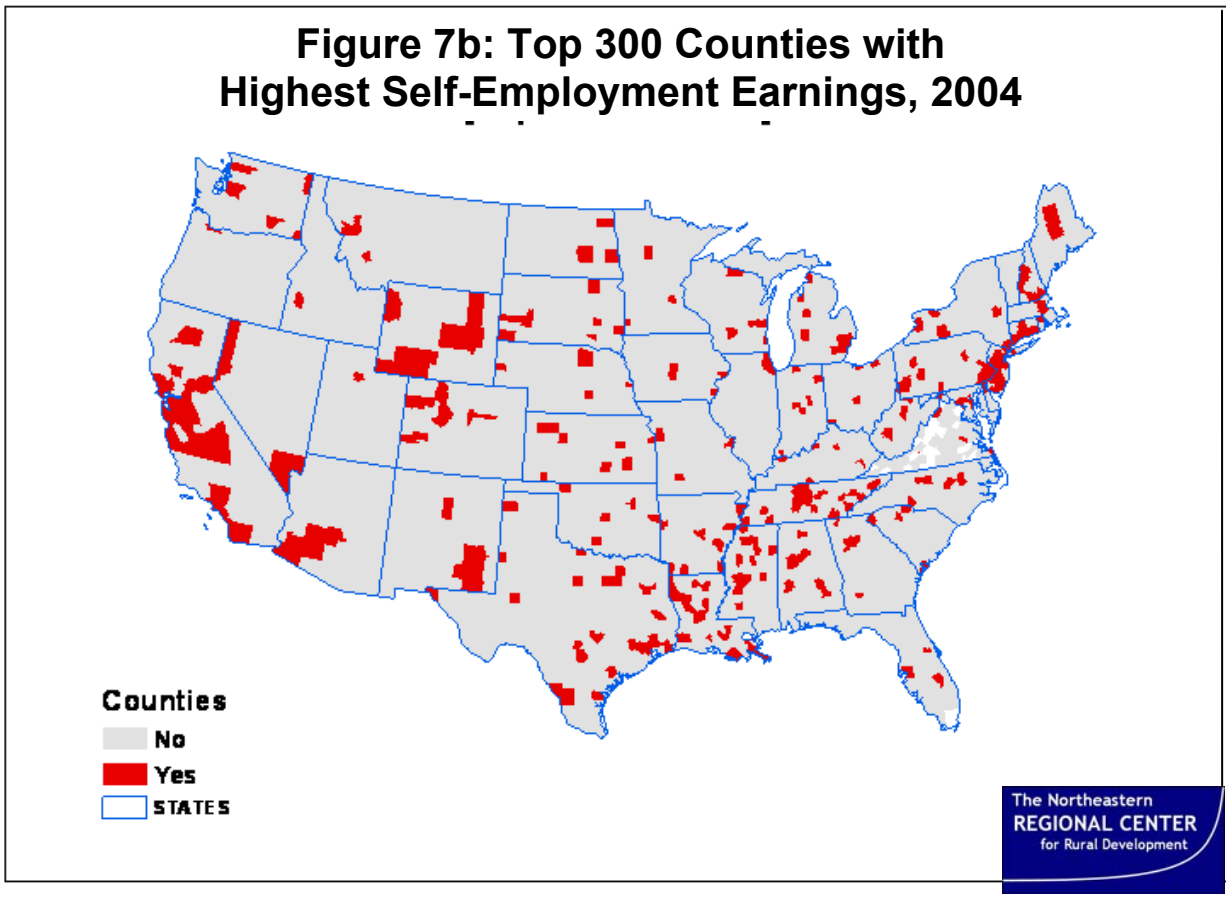
Figure 7b: Top 300 Counties with
Highest Self-Employment Earnings, 2004
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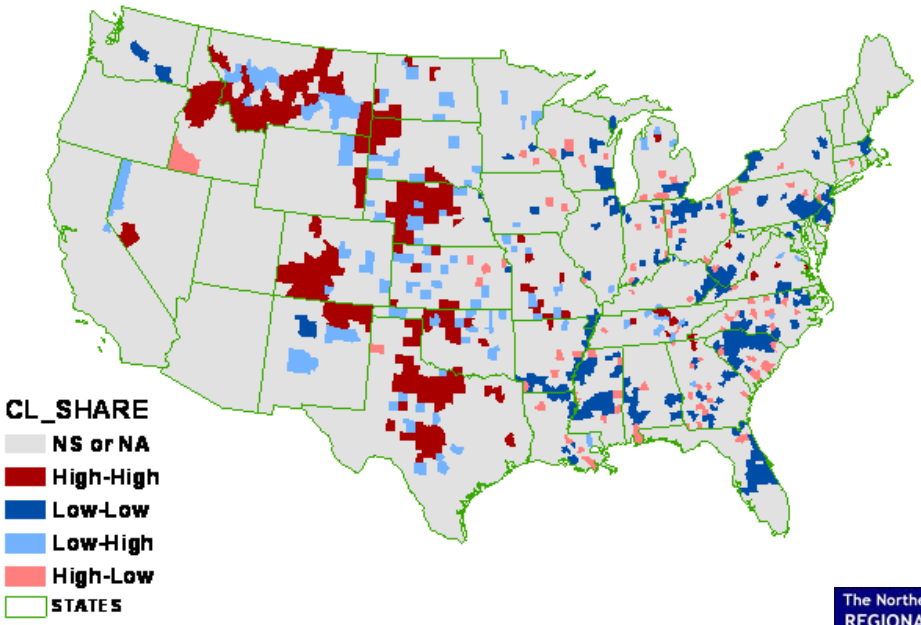
stands out. By 2004, counties with high returns to self-employment have shifted to metropolitan counties on both coasts: the northern reaches of the East Coast and the southern portions of the West Coast stand out as having higher returns to self-employment.

The highest average earnings per self-employed worker in 2004 were recorded in New York County, NY, at $138,545, followed by $87,491 in Harris County, TX and $85,119 in Denver County, CO. The lowest returns are found in Flagler County, FL with $2,693 (down from one of the highest returns in 1969, with $11,169), Twiggs County, GA with $2,918 and McPherson County, NE with $3,100. While not universally true, it is noteworthy that the higher returns in more recent years are observed in metro counties.

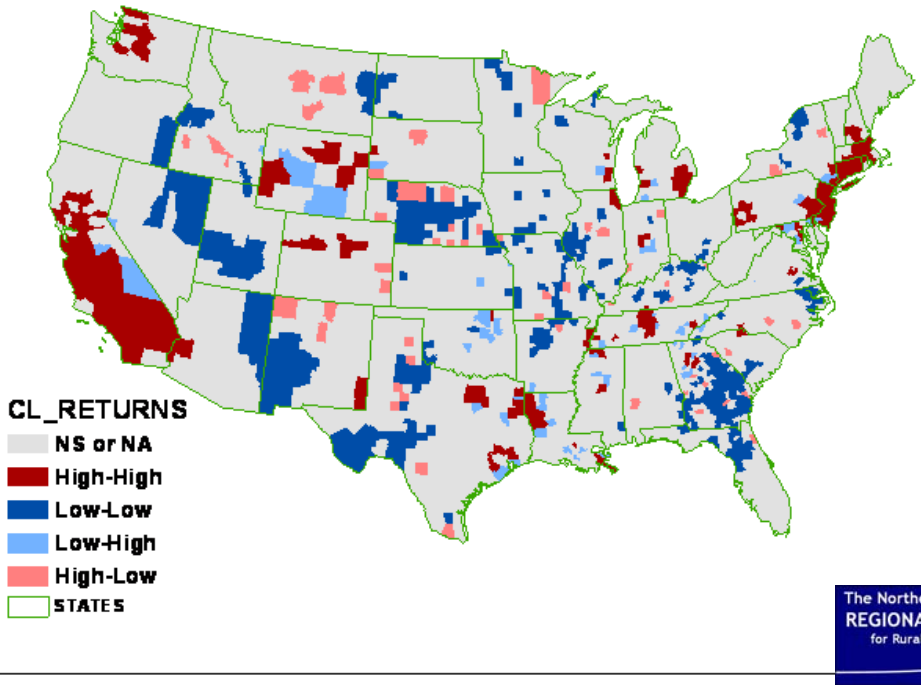
Another useful way of portraying the data is to identify geographic "hot" and "cold" spots of self-employment activity and earnings. This is done using spatial weights matrices to identify clusters of contiguous counties that are statistically high- or low-scoring on the different measures, or that alternate as high-low and low-high scoring. For example, Figure 8 shows that counties with high shares of self-employed workers in 2004 were clustered in the nation's center, while low shares were observed around Milwaukee/Chicago, Detroit, Philadelphia, Central Appalachia, South Carolina, Florida and the Mississippi Delta region.

In relatively sharp contrast, Figure 9 reveals that clusters of high returns to self-employment are observed on the coasts (northern East Coast, southern West Coast) and a number of metro areas, and low returns are clustered especially in Georgia and Nebraska as well as portions of the Intermountain West. The 2006 rankings of "Hot Cities" for launching and growing a business compiled by *Entrepreneur Magazine* show Pittsburgh at the very bottom (48 out of 50 cities), and Phoenix, AZ at the top, followed by Charlotte, NC, Austin and San Antonio, TX and Memphis and Nashville, TN (Shropshire 2006). It is interesting to examine the status of these cities in the two maps. For example, while it has a very low ranking as a Hot City, Pittsburgh is

## Figure 8: Hot and Cold Spots for Clusters of Self-Employment Shares, 2004




## Figure 9: Hot and Cold Spots for Clusters of Self-Employment Earnings, 2004



surrounded by a ring of counties with high returns to self-employment, but the city itself (Allegheny County), is not part of this group (the September 16, 2006 *The Economist*, pp. 42-44, describes the Pittsburgh region's efforts to reinvent itself).

The counties surrounding and including Nashville, TN similarly offer very high returns, and Nashville is also a Hot City according to the magazine's ranking. Austin and San Antonio, TX show up as county clusters with very high shares of self-employed workers, but Phoenix AZ, the top-ranked county, does not show up in either of the two maps. In part this may reflect the fact that counties west of the Mississippi are geographically larger. Charlotte, NC, in contrast, shows up as part of a cluster of counties with below-average shares of self-employment.

Thus, the cold- and hot-spot patterns in the maps are not related in a straightforward fashion to the Hot City rankings. In examining the above maps, it is worth noting that Arizona, California, Illinois, New York and Virginia aggressively examine the impact of state laws and regulations on small businesses (Kauffman Foundation 2005, p. 65). The next section develops conceptual models designed to account for the differences observed in the preceding maps.

**Conceptual Models**

Empirical evidence and the above maps suggest that the broader socioeconomic local conditions of a county influence entrepreneurial efforts, even in an era in which the Internet is widely believed to have reduced the importance of distance or location (see, however, Porter (2006) and Florida (2007 forthcoming)). More specifically, the "multi-facetted 'system' for nurturing high-impact entrepreneurship" described in Schramm (2004, 2006) may work more effectively in some US counties than in others. Additional county-level variables potentially important in this context include: *economic conditions* such as income levels or purchasing power, the presence of big-boxes, and industrial "churning"; *social conditions*, including civic capacity or social capital embedded in the local community; *ethnic diversity*, which may reflect labor market discrimination as well

as opportunities for satisfying unconventional demands by supplying niche products; the availability of *Internet Service Providers* to broaden the reach of local goods and services supplied; and natural amenities and environmental factors that attract footloose self-employed workers (freelancers).

A key innovation in the present study is the consideration of factors normally studied in isolation within separate disciplines, such as economics, sociology or political science (see also Acs and Storey 2004). Because of this isolation, earlier research may miss important interactions and relationships among the variables, and not control for all pertinent influences. A working hypothesis is that the variables used here exert a statistically significant and independent influence on the rate and level of self-employment in the US.

**a. Proprietorship formations and returns to proprietorships**

The dependent variables are the ratio of self-employed to all non-farm employed full- and part-time workers (*s*) in a county and the average annual returns to self-employment (*e*) as reported by the Bureau of Economic Analysis, Regional Economic Information System (REIS).[3] The emphasis is on the relative importance of the self-employed in the local workforce, rather than their absolute number or growth over time. This is intended to identify those regions and communities that are adapting more quickly to the pronounced trend away from wage-and-salary employment shown in Figure 1. Low, Hendersen and Weiler (2005) use the same dependent variables in their more limited analysis, but also consider the value of average proprietor income over average non-employer receipts as a "revenue capture" variable (p.83). This variable produces results that are qualitatively similar to those obtained for the average returns variable considered here and these results are not reported.

[3] Note that the definition of the self-employment ratio differs slightly from that used in the previous descriptive analysis, without materially affecting the results. The reason for this is that REIS does not report a single non-farm wage-and-salary employment number prior to 2001, when the switchover was made to the NAICS (North American Industrial Classification System).

The ratio of non-farm self-employed to all non-farm workers (wage-and-salary and self-employed) in county *i* in period *t* is hypothesized to be a function of individual-level characteristics (**Ω**), county-level characteristics that are and are not under the control of county decision-makers (**Θ**), lagged returns to self-employment (*e*) and historical variation in those returns (ξ). A similar model (process) is postulated to account for spatially-varying returns to self-employment per worker, except that a Mincer-style equation is used here, allowing for diminishing returns to experience.

(1) $s_{i,t+\Delta t} = f(\mathbf{\Omega}, \mathbf{\Theta}, e^*, \xi)_{i,t}$

(2) $\ln (e_{i,t+\Delta t}) = f(\mathbf{\Omega}, \mathbf{\Theta}, e, \xi)_{i,t}$

The linking of entrepreneurial behavior to the local economic, social and political conditions in a community, described in greater detail in the next section, distinguishes the present research from previous efforts in this area. The residuals from the regression equations (1) and (2) represent unmeasured effects, including the effectiveness of the entrepreneurial nurturing system of each county described earlier.

Individual-level factors (**Ω**) that matter in this context are the human capital levels of the self-employed or entrepreneurs, access to capital and other population characteristics described in more detail below. Human capital, including on-the-job experience is important not only because it gives individuals potential ideas about and an enhanced alertness to new opportunities and possibilities (Kirzner 1979), but also the wherewithal and knowledge to act upon those opportunities.

Financial capital is important for entrepreneurs to leverage their assets and implement their ideas, and the lack of access to such capital is often given as a constraint to entrepreneurship within certain regions and communities. At listening sessions conducted last year by The Northeastern Regional Center for Rural Development, access to capital was mentioned frequently as a constraining factor (Farrigan 2006). An entrepreneur's

wealth may itself increase his or her credit worthiness, in addition to serving as collateral, and provide greater access to venture capital (Phelps 2006, p.13).

Population characteristics, such as gender, place of birth and ethnic origin are frequently related to labor market discrimination, including institutionalized barriers such as "glass ceilings" within executive occupations. Self-employment is a potential means of escaping such discrimination. In addition, certain ethnic groups not only have social networks that facilitate self-employment but also cultures and expectations of self-employment or entrepreneurship that are passed on from generation to generation. The presence of members from different ethnic groups may also suggest greater tolerance to individual ethnic differences, so that ethnic minorities feel more welcome in a community.

Another measure of entrepreneurial spirit is introduced here that has not been used previously. This is the degree to which the local population is independent or conservative (as "rugged individualists"), which may in turn play a role in self-employment formation. The political science literature suggests that the concentration of votes in a county favoring one political party during the presidential election is an appropriate measure. Prior work merely has used rural county (non-metro) status as a measure of economic independence that is postulated to yield higher entrepreneurship rates.

For the county-level features (**Θ**) I distinguish among establishments associated with creative activities, general supporting industries including those that provide educational services, industry controls, and other pertinent county-level characteristics that are subject to policy influence. In addition, county measures not subject to policy influence are included. These variables are now described in greater detail.

Establishments that reflect creative interests and abilities include art dealerships, musical instrument stores and high-tech establishments. Florida (2002) maintains that places that are open to new ideas and welcome differences between people also attract creative individuals who in turn become sources of innovation and subsequent eco-

nomic growth. This phenomenon is captured with these variables (in addition to the ethnic diversity variable described above).

Also included in this category are cumulative patents registered within the county in the preceding decade, as a measure of raw local creativity. Citing Schumpeter, Phelps (2006, p.4) cautions, however, that "[i]nnovations … rarely spring quickly and reliably from recent inventions by scientists and engineers, which are infrequent in any case. Rather, innovations are normally the creation of business people informed by their observations and own experience." This means that, even though patent activity is often credited with stimulating economic growth (e.g., Advanced Research Technologies 2005), the time lags involved may be substantial.

Big-box retailers have been shown to drive out small local businesses, such as self-employed mom-and-pop stores, by taking advantage of enormous scale economies and providing consumers with a more convenient one-stop shopping experience. These operations may also exert local monopsony power in smaller communities and they have been accused of anti-trust violations. A growing body of research, starting with the seminal work of Stone (1997; also Basker 2002, Card 2005) suggests that big-boxes displace other stores and reduce retail employment. However, often ignored is the fact that not only the are mom-and-pop retailers affected, but so are the local firms that previously supplied those retailers, including logistics, business support services, wholesalers, accountants and so forth. Big-boxes provide these services out of a centralized office. To the extent that mom-and-pop businesses also create local social capital, the arrival of big-boxes may undermine civic activity and capacity in communities. Goetz and Rupsingha (2006*a*) present evidence that this is indeed the case.

Sobel and Dean (2006) point out that prior research on the impact of big-boxes is based on a false understanding of the Schumpeterian destructive process. The authors write that existing research focuses on displacement of similar businesses, i.e., those that provided the same kinds of retail services as are provided by big-boxes. Instead, Schumpeter argued that entirely new kinds of businesses emerge from the creative de-

structive process, in different industries, and this is missed by the existing research. Money that consumers save by shopping at big-boxes is instead spent on goods and services provided by these new firms. For example, a mom-and-pop hardware store may be replaced by an upscale restaurant or a computer consulting business. Thus, one would expect no net effect of the presence of big-boxes in a community on self-employment, according to these authors. If labor resources are reallocated to better opportunities, we would expect the returns to self-employment to be higher in communities with more big-box stores.

Entrepreneurs and the self-employed are more productive if they can outsource certain functions to other specialized firms in the local community. For example, they need to outsource wholesaling and tax accounting activities in order to focus on their core business. An econometric issue here is that these supporting services may themselves be provided by self-employed workers, creating an endogeneity problem. On the other hand, endogeneity should not be an issue for the returns to self-employment in equation (2). The presence of these kinds of firms should independently raise the returns to self-employment by increasing the productivity of the self-employed.

Self-employed workers who are unable to learn relevant skills on the job or from their parents need basic training in how to run a business. This includes the development of a business plan, assessing the market potential for their goods and services, and developing effective communications or advertising programs targeted at their customers. Or, nascent entrepreneurs need technical training on how to manufacture a new product at lower cost. The presence of educational establishments, such as community colleges or technical schools, is hypothesized to be associated with higher self-employment rates and earnings in the communities in which they are located. In testing for the effect of such educational institutions, a problem arises in that these institutions tend to employ large numbers of scientists, faculty and staff. This reduces county self-employment ratios by increasing the denominator, illustrating the danger of another possible ecological fallacy. To address this concern, the percent of civilian employment

in professional, scientific, management, administrative, waste management, education, health and social services is included in the regression as a control variable.

Certain industries, such as construction, are inherently more amenable to self-employment both for reasons of tradition and low barriers to entry (e.g., Van Stel and Storey 2004). For example, custom home builders are often self-employed, and contract with crews of self-employed carpenters, bricklayers, plumbers, electricians and landscape architects. A vector of industry controls is included in this study to capture this effect. Along with construction, the agricultural sector supplies disproportionately larger numbers of non-farm self-employed workers. The fact that farmers are "jacks of all trades" and have the ability to multi-task as well as the multiple skills required of entrepreneurs, is usually advanced as a reason (e.g., Simon 2004; Lazear 2005 further discusses entrepreneurs as "generalists vs. specialists"). American farmers, in particular, also have a culture of independence and self-reliance.

Industry churn and job displacement – critical variables in a dynamic market economy (Cox 1999; Levernier et al. 2000) – are expected to be associated with higher shares of self-employment and lower returns to such activities, as individuals are pushed into such self-employment rather than seek it voluntarily. The prediction for lower returns is based on the empirical regularity that workers who switch between industries tend to experience a drop in earnings.

A number of other stylized factors that vary from county to county theoretically influence the propensity of individuals to become self-employed. These are separated into those that can and cannot be changed by local elected leaders. For example, in communities with a higher level of social capital individuals may be more likely to "buy locally" and support firms that are run by their neighbors, even if price and quality compare unfavorably to those of items mass-manufactured elsewhere (Lyson 2002, for the case of agricultural products). To some extent, local civic capacity and activity can be influenced by group action (i.e., public policy). Inclusion of this factor, which economists are

only slowly recognizing as being important, is the result of the multi-disciplinary perspective taken here.

Basic transportation infrastructure – both for physical and virtual movement of goods and services – makes it easier and more profitable for self-employed individuals to run a local business. Two measures are included to capture this effect: interstate highway access and the presence of broadband service providers. Other relevant variables subject to varying degrees of policy influence range from effective local demand as reflected in per capita income to the rules and regulations under which local businesses operate, such as zoning ordinances that facilitate or impede self-employment efforts (see also Pink 2002, Ch. 12; Boettke and Coyne n.d. discuss the importance of institutions in facilitating entrepreneurship).

Other factors important conceptually but not directly subject to policy influence include basic controls of Census region and metropolitan status of a county. In addition, natural amenities such as mountain vistas, lakes and pleasant climate capture locally-varying shifters of the self-employment share and earnings equation. Footloose and lone-eagle businesses are hypothesized to be attracted by pleasant natural surroundings, and to be willing to give up financial compensation in exchange.

**b. Impact of proprietorship formations**

Following Van Stel and Storey (2004) growth in wage-and-salary employment ($\Delta E$) is regressed on lagged growth in the same variable ($\Delta E_{-1}$). This picks up the inherent momentum that may or may not exist within each county based on past growth and a positive coefficient estimate is expected on this regressor. A second key regressor is the change in wage-and-salary earnings over the same lagged time period ($\Delta W_{-1}$). Here a negative relationship is expected: in counties with higher wage pressure, firms are reluctant to hire additional workers, preferring instead to economize on the scarce factor (see also Pagoulatos et al. 2003).

The variable of central interest here is that of lagged growth in proprietorships ($\Delta S_{-1}$). In particular, our interest lies in assessing whether this variable has a statistically significant effect on wage-and-salary employment growth, controlling for other factors. These include population density ($D_0$) as a catch-all for all variables related to (dis)economies of scale as well as metropolitan status ($M_0$). Metro areas have generated a larger share of jobs than rural areas in recent years, but the costs of doing business increases with population density. These latter variables are stock variables measured at the beginning of the period over which wage-and-salary employment growth rates are calculated.

The direction of the effect $\partial(\Delta E)/\partial(\Delta S_{-1})$ is indeterminate *a priori*. As Van Stel and Storey (2004) point out, if proprietors stimulate greater competition through creative innovation in the county or region then wage-and-salary employment may result. Likewise, proprietors themselves are a source of demand for local goods and services and may spawn additional employment in local firms. Conversely, to the extent that the proprietors are a relatively small portion of the economy, they may not exert a statistically significant county-wide effect. Furthermore, if these new firms are created only as a result of subsidies, they may actually undermine local competitiveness that leads to fewer jobs as the proprietorships are dissolved after the subsidies are removed.

The following basic equation is estimated and analyzed:

$$(3) \qquad \Delta E = \alpha + \beta_1 \Delta E_{-1} + \beta_2 \Delta W_{-1} + \beta_3 \Delta S_{-1} + \beta_4 D_0 + \beta_5 M_0 + \beta_6 \text{Region} + \varepsilon$$

Because spatial autocorrelation is a potential issue, Moran's I statistics are calculated and asymptotic Lagrange Multiplier (LM) tests carried out.

**Data and Data Sources**

The dependent variables are calculated as the ratio of self-employed to wage-and-salary workers ($s$) in a county and the total annual net earnings from self-employment divided by the total number of self-employed workers ($e$). As noted, these numbers are

compiled by the Commerce Department's Bureau of Economic Analysis in the *Regional Economic Information System*. They are based on Schedule C filings from tax form 1040, which every self-employed worker or proprietor has to file each year with the Internal Revenue Service.

The county-level population characteristics are from the national 2000 US Census of Population data file and serve as proxies for characteristics of the population pool from which the self-employed are potentially drawn. Educational attainment is measured as the percent of adult (25 years or older) population having completed high school but not college, and the percent of adult population completing at least a bachelor's degree. Age is measured using the population median and reflects work experience. While these variables represent an imprecise match between the level of each characteristic (such as educational attainment) and the actual number of share of self-employed, measurement errors can be assumed to average to zero over the entire population.[4]

Access to collateral and ownership of wealth are measured using local bank deposits per capita, homeownership rates and median home values. These are also from the 2000 US Census of Population as are the percent of population that is foreign-born and percent females in the labor force. The ethnic concentration index is that proposed by Alesina et al. 1999. It measures the probability that two individuals randomly selected from a county are members of different ethnic groups (using Census of Population classifications and data). Thus, a higher value for this variable implies greater ethnic diversity and, presumably, more tolerance. Another personal characteristic, designed to capture propensity towards becoming entrepreneurially-engaged, is dependence on federal welfare programs (Food Stamps and Temporary Assistance to Needy Families) per capita. This variable is from the Regional Economic Information System.

The other new variable included in the regression equation to measure entrepreneurial spirit and the degree of conservatism of voters, i.e., the extent to which they believe

[4] Furthermore, by using the county-wide average of variables, such as the level of amenities, for example, the specific location of an individual within the county geography largely becomes irrelevant.

Americans should be independent and work for themselves, is the share of population voting for President Bush (as the Republican or Conservative candidate) in the 2000 national election.[5] In addition to capturing an inherent tendency to wanting to work for oneself, this measure may also capture the degree to which entrepreneurs face regulatory burdens and other barriers to entry within a community that lower their productivity.

To capture creative energies within counties five different variables are included. Data on cumulative patents granted over the period 1990-1999 are obtained from the US Office of Patents and Trademarks.[6] High-tech establishments are as defined in Goetz and Rupasingha (2002) and based on data from the Department of Commerce's County Business Patterns files. The number of Wal-Mart stores, used to represent the presence of big-boxes, is from the Rand McNally Road Atlas sold in the chain (as compiled in Goetz and Swaminathan 2006). The number of art dealerships (NAICS 453920) and musical instruments supplies stores (451140) are also from the County Business Patterns data files.

Business-supporting establishments include couriers and messenger services (NAICS 492), office supply and stationary stores (453210), computer and software stores (44312), business support services (5614), temporary help services (561320), and child daycare providers (624410). Educational facilities include establishment counts of junior colleges (NAICS 611210), colleges, universities and professional schools (611310), business schools and computer and management trainings (6114), and technical and trade schools (6115). These variables are also from the County Business Patterns data set.

The self-employed can work in any sector or industry but they are most commonly found in construction and agriculture, as well as in professional occupations, and they are relatively less common in education, health and social services. For retail trade, the expected effect is indeterminate, because even though many retailers are independent,

[5] See http://www.uselectionatlas.org/
[6] See http://www.uspto.gov/

mom-and-pop stores are becoming less important as big-box operations spread across the country. The following variables are included as industry or occupational controls: construction establishments, retail trade stores, and the percent of civilian population in professional, scientific, management, administrative and waste management services; the percent employed in education, health and social services; and farm proprietors as a percent of all workers. The latter variable is from the Regional Economic Information System while the former are from the US Census of Population.

The industry churn variable, also used by Levernier, Partridge and Rickman (2000), is the sum of the absolute differences in employment shares calculated for one-digit industries in 1990 and 2000, divided by 2. The greater this value the greater the economic dislocation in a county as workers shifted between industries over the decade. More churn is expected to produce relatively more self-employment and lower returns to self-employment.

Social capital is measured as the first principal component of a vector of variables that include social-capital generating establishments (such as bowling alleys, golf courses and membership associations), non-profit organizations, voter participation in the national election, and participation rates in the 2000 Census of Population. This variable is described in greater detail in Rupasingha, Goetz and Freshwater (2006).

Access to broadband is measured with an indicator variable equal to 1 for counties that had at least three ISP providers in 1999 and zero otherwise. This variable is from Form 477 filings to the Federal Communications Commission.[7] Interstate highway access, from a US Office of Highway Transportation map, is included as an indicator variable (=1 if an access ramp exists in the county) to measure access to physical transportation infrastructure as a complement to on-line customer and supplier access.

The county unemployment rate is from the US Census Bureau, Department of Commerce and the Herfindahl expenditure index of government units is from Grassmueck

[7] See http://www.fcc.gov/wcb/iatd/comp.html/

(2006). This measures the relative fiscal power of local government units in a county, or the degree of consolidation. A higher index value (closer to 1.0) implies more consolidation and more relative power of the government in a county, or less competition among government units. Grassmueck (*op. cit.*, Table 7-5) finds that higher index values are associated with statistically significant, *smaller* income, population and job growth rates.

Per capita income data, average wage-and-salary earnings per worker, average non-farm proprietor earnings (lagged to 2000 in the 2004 earnings equation and contemporaneous but instrumented in the 2004 self-employment ratio equation) and the coefficient of variation of returns to self-employment are all from the Regional Economic Information System of the Census Bureau.

The state-level right-to-work indicator variable and per capita state tax data are from the US Statistical Abstract. In right-to-work states unions have less political power to exclude individuals from the labor market, including those who are self-employed. Thus, we expect states with these laws to provide self-employed workers with more opportunities to work for themselves, and conceivably to generate higher rents or earnings. Previous research suggests that self-employment rises with tax rates, due to the higher incentive to shirk from paying taxes.

Metro county status and the amenity index reflecting measures of topography, lakes, days of sunshine and temperature extremes in January and July, are from the USDA's Economic Research Service (ERS).[8] Regional Census designations are from the US Census Bureau. Variable descriptions and summary statistics are provided in Table 2.

[8] See www.ers.usda.gov

**Table 2: Descriptive Statistics for Self-Employment Shares and Returns Regressions**

| Variables | Mean | St.Dv | Min. | Max. |
|---|---|---|---|---|
| **Dependent Variables** | | | | |
| Nonfarm proprietors employment/total nonfarm employment, 2004 | 23.10 | 8.92 | 2.47 | 65.29 |
| Nonfarm proprietors income($)/nonfarm proprietors empl., 2004 | 16566 | 8300 | 2693 | 138545 |
| Log of previous variable | 9.63 | 0.40 | 7.90 | 11.84 |
| **1. Basic Population Characteristics** | | | | |
| Pct of pop. 25+ yrs with at least high school but no BS degree, 2000 | 60.98 | 6.88 | 27.59 | 81.08 |
| Pct of pop. 25+ yrs with at least bachelors degree completed, 2000 | 16.36 | 7.60 | 4.92 | 60.48 |
| Median age of population, 2000 | 37.41 | 3.91 | 20.70 | 54.30 |
| Median age of population, squared, 2000 | 1415 | 292 | 428 | 2948 |
| ***Access to Collateral*** | | | | |
| Deposits: Total as of June 2000($1000) over population 2000 | 11.98 | 7.89 | 0.90 | 201.95 |
| Median value of owners occupied housing units, 2000($) | 80477 | 41705 | 20800 | 583500 |
| Pct owners occupied housing unit relative to total housing units, 2000 | 74.34 | 7.14 | 19.54 | 89.54 |
| ***Other Relevant Population Characteristics*** | | | | |
| Pct population foreign born, 2000 | 3.40 | 4.74 | 0.00 | 46.13 |
| Percent female in labor force, 2000 | 51.63 | 6.94 | 23.21 | 78.47 |
| Ethnicity Concentration Index, 2000 | 0.22 | 0.17 | 0.00 | 0.70 |
| Percent of county votes for President Bush, 2000 | 57.07 | 11.81 | 11.77 | 92.47 |
| Per Capita Welfare transfers ($1000), 2000 | 0.09 | 0.07 | 0.00 | 0.75 |
| **2. County-Level Characteristics** | | | | |
| ***Creative-Class Measures*** | | | | |
| Cumulative utility patents from 1990 through 1999 | 196 | 948 | 0 | 27617 |
| Number of High Tech Establishments, 1999 | 53 | 270 | 0 | 7927 |
| Number of Wal-Mart Stores, 1998 | 0.93 | 1.59 | 0 | 27 |
| Art dealerships, 2000 | 1.86 | 10.48 | 0 | 415 |
| Musical Instruments Supplies Stores, 2000 | 1.40 | 4.54 | 0 | 120 |
| ***Supporting Industries Measures*** | | | | |
| Couriers and Messengers establishments, 2000 | 3.85 | 17.30 | 0 | 474 |
| Office Supplies and Stationary Stores, 2000 | 2.75 | 9.65 | 0 | 280 |
| Computer and Software stores, 2000 | 4.11 | 14.69 | 0 | 397 |
| Business support services, 2000 | 11.02 | 47.36 | 0 | 1343 |

**Table 2, continued**

| Variables | Mean | St.Dv | Min. | Max. |
|---|---|---|---|---|
| Temporary Help Services establishments, 2000 | 8.98 | 39.06 | 0 | 860 |
| Child Day Care Services establishments, 2000 | 21.22 | 59.26 | 0 | 1476 |
| Junior Colleges, 2000 | 0.25 | 1.10 | 0 | 30 |
| Colleges, Universities and Professional Schools, 2000 | 0.97 | 4.41 | 0 | 139 |
| Business Schools and Computer and Management Trainings, 2000 | 2.13 | 9.30 | 0 | 209 |
| Technical and Trade schools, 2000 | 2.23 | 8.73 | 0 | 262 |
| ***Industry Control Measures*** | | | | |
| Construction establishments, 2000 | 228 | 581 | 0 | 12197 |
| Retail Trade , 2000 | 355 | 1002 | 0 | 28126 |
| Percent employed civilian population in professional, scientific, management, administrative and waste management services, 2000 | 5.25 | 2.56 | 0.00 | 23.47 |
| Percent employed civilian population in education, health and social services, 2000 | 20.25 | 4.25 | 7.75 | 47.06 |
| Pct farm proprietor's employment relative to total employment, 2000 | 7.37 | 7.26 | 0.00 | 48.64 |
| ***Other Pertinent County Characteristics Subject to Policy Influence*** | | | | |
| Social Capital Index, first principal component, 1997 | -0.01 | 1.27 | -4.06 | 7.66 |
| Broadband more than 3 | 0.50 | 0.50 | 0.00 | 1.00 |
| County with highway connection (yes=1) | 0.43 | 0.50 | 0.00 | 1.00 |
| Civilian population unemployed: %, 2000 | 5.74 | 2.54 | 0.21 | 21.84 |
| Industry Churn: abs(industry share2000-Industry share1990)/2 | 0.13 | 0.03 | 0.04 | 0.44 |
| Per Capita Income, 2000 | 17441 | 3857 | 7069 | 44962 |
| Herfindahl index of government units (Expenditure), 2002 | 0.55 | 0.22 | 0.04 | 1.00 |
| Average nonfarm proprietor's income, 2000 | 16843 | 7363 | 4379 | 158876 |
| CV of average non farm proprietor income1994_2003 | 16.66 | 7.98 | 2.86 | 66.21 |
| Right to work state =1 (Forced Union state=0) | 0.56 | 0.50 | 0.00 | 1.00 |
| Per capita tax_Total($), 2000 | 1775 | 332 | 1228 | 2986 |
| *Not subject to Policy Influence* | | | | |
| Metro county, 2003 | 0.34 | 0.47 | 0.00 | 1.00 |
| Amenity Scale | 0.04 | 2.28 | -6.40 | 11.17 |
| Northeast region (yes=1) | 0.07 | 0.26 | 0.00 | 1.00 |
| Mid west region (yes=1) | 0.35 | 0.48 | 0.00 | 1.00 |
| Western region (yes=1) | 0.13 | 0.34 | 0.00 | 1.00 |

Sample size=3,019 counties, except for Herfindahl index (2,983).

**Methods: Modeling Issues and Strategy**

To address the inevitable statistical problems that arise in this kind of work alternative specifications are used for the equations estimated, as a robustness test of the parameter estimates. For most regressors, the results are robust across different specifications, providing a higher degree of confidence in the interpretation. In other cases, the results are sensitive to the specification used. This is stressed in the discussion.

Even in a temporally-lagged model, returns to self-employment and some of the other county-level characteristics in equation (1) may be endogenous. Therefore, alternative specifications are estimated, using both reduced form and instrumental variables estimation. Lagged values (by four years) are used to assess whether unexplained variation remains in the data after the dependent variable is included as a regressor in equation (1). Another statistical issue for both equations is that of spatial spillovers across county-borders, as well as multicollinearity among regressors.

For equation (1) inclusion of the lagged value, as a measure of self-employment clustering, captures virtually all of the variation in the dependent variable and leaves no variation to explain. Therefore, a lagged value (self-employment share in 2000) is not included here, because the goal is to identify key independent shifters of the function rather than to explain the current variable with its past values. For equation (2), inclusion of the lagged dependent variable leaves meaningful variation to be accounted for by the other regressors.

Multicollinearity is an issue for variables measured in the form of establishment counts. With their greater population sizes, larger cities inherently have more such establishments than smaller cities or rural counties. However, because a key goal of this study is to capture potential benefits of spatial clustering, these variables are retained in this form. Separate tests are conducted for potential multicollinearity.

Using the county-level data behavioral relationships are thus modeled based on the average characteristics of each county's population as the representative pool from which entrepreneurs are potentially drawn. Although this approach is not completely free of concerns, it circumvents some of the problems that arise in using individual-level data, such as selection bias, representativeness, and the issue of how to link an individual entrepreneur to the county-wide averages of other indicators.

Another innovation of this study is (*a*) that spatial spillovers across county lines or other Census geographies are modeled using spatial econometrics to reduce statistical bias that arises due to county hot spots and cold spots of entrepreneurial effort and returns and (*b*) that interactions among causes of entrepreneurship can be discovered statistically. For example, higher levels of educational experience or age may compensate for a lack of natural amenities in a community in stimulating local entrepreneurship (numbers of entrepreneurs and their incomes). Likewise, demographic characteristics such as female labor force participation or concentrations of specific ethnic groups may interact differently with the variables considered here. In this manner, the statistical interactions (complementary or otherwise) between individual-level characteristics and community-level features can help explain why certain demographic groups are more or less likely to start new firms.

Prior research by the author and his colleagues points to other relationships between self-employment and county-wide variables (e.g., Goetz and Rupasingha 2006*b*). For example, Wal-Mart Corp. in its location decisions avoids communities with high rates of self-employment. Why that is the case is not obvious. In general, big-box development is revolutionizing retail services -- many of which were historically provided by small businesses -- potentially creating both opportunities for and threats to entrepreneurship. Furthermore, counties with higher self-employment rates have lower poverty rates. This is noteworthy because average returns to self-employment nationally are lower than average returns to wage-and-salary employment.

For equation (3) the following regressions are carried out. The percent change in wage-and-salary employment in US counties over three different periods is regressed on lagged net new proprietorship formations, population density, changes in wage-and-salary earnings per job, lagged wage-and-salary employment growth and rural-urban indicator variables. The time periods are 2000-2004; 1995-1999; and 1990-1994 for the dependent variable and 1995-1999; 1990-1994; and 1985-1989 for the independent variables. The data are from the Commerce Department's Regional Economic Information System as well as the U.S. Census (various years).

The percent change in wage-and-salary employment ($\Delta E$) for 2000-04 is defined as:

(4) $[(\text{No. of wage-and-salary jobs})_{2004} / (\text{No. of wage-and-salary jobs})_{2000} - 1] * 100$

and analogously for the other time periods and the lagged dependent variables ($\Delta E_{-1}$). Changes in wage-and-salary earnings per job ($\Delta W_{-1}$) are calculated as:

(5) $[(\text{Total wages \& salary/job})_{1999} * 1{,}000 - (\text{Total wages \& salary/job})_{1995} * 1{,}000]$

while relative change in the share of proprietors ($\Delta S_{-1}$) is defined as the net change in proprietor employment over the period in question normalized by the size of the total workforce:

(6) $[(\text{proprietors/total workforce})_{1999} - (\text{proprietors/total workforce})_{1995}]$

This can be thought of as the increase in proprietorships spawned in one period relative to the number spawned in an earlier period. In brief, $\Delta S_{-1}$ captures the ability of a workforce of a given size to give rise to proprietors and the effect of this variable on wage-and-salary job creation is measured in a subsequent period.

Population density is calculated at the beginning of the period over which $\Delta E$ is measured, using base year population (in 1,000s) divided by county area (miles$^2$). The above variables represent the base model also estimated by van Stel and Storey.

Van Stel and Storey (2004) do not consider possible spatial dependency in job growth. Because our unit of observation is the county, spatial dependence bias may exist due to measurement errors (Anselin 1998; LeSage 1999). Most importantly, spatial dependency in job growth may arise because job markets extend across county lines, creating a job growth spillover effect. The spatial dependency may operate through both spatial lags in the dependent variable and error terms. A general form of the model with spatial weights matrix (W) that nests both spatial lag and spatial error models is (LeSage 1999):

$$Y = \rho W(Y) + \mathbf{X\beta} + \mu,$$
$$\mu = \lambda W\mu + \varepsilon$$
$$\varepsilon \sim N(0, \sigma^2_\varepsilon),$$

where $Y$ is an $n \times 1$ vector of observations on the dependent variable, $\rho$ a spatial autoregressive parameter (or spatial autocorrelation coefficient if W is row-standardized), W a spatial weight matrix of dimension $n \times n$, W$Y$ is the spatially lagged dependent variable, $\mathbf{X}$ an $n \times k$ matrix of observations of exogenous variables, $\boldsymbol{\beta}$ a $k \times 1$ vector of parameters to be estimated, $\lambda$ a spatial autoregressive parameter similar to $\rho$ but for error lag W$\mu$ and $\varepsilon$ is an $n \times 1$ vector of shocks. Depending on how the spatial dependency operates, the general model can be simplified into a spatial lag or spatial error model. If $\lambda=0$ and $\rho\neq0$, $\mu=\varepsilon$ and the spatial lag model is appropriate. On the other hand, $\lambda\neq0$ and $\rho=0$, $\mu\neq\varepsilon$ suggests that the spatial error model is appropriate. If $\lambda=0$ and $\rho=0$, $\mu=\varepsilon$ OLS is appropriate. The case $\lambda\neq0$ and $\rho\neq0$, $\mu\neq\varepsilon$ implies the need for a more general model.

## Empirical Results

### *a. Results for the Determinants of Self-Employment Rates and Returns*

In general the empirical results reported here are consistent with prior expectations, although a few important differences emerge that lead to new insights in understanding entrepreneurship and self-employment, and how community characteristics influence the returns to and relative shares of these endeavors. For the most part the statistical results are robust to differences in the empirical specification. Special mention is made of differences where they exist. Results for individual-level and county-level factors are reported as standardized beta coefficients in Table 3 and discussed in turn.

1. Individual-level factors (**Ω**)

Greater educational attainment among the pool of individuals from whom the self-employed are potentially drawn is unequivocally associated with a higher share of self-employment (ratio of self-employed to all workers). However, relative to the excluded category (less than a high school degree), returns to self-employment in counties with greater shares of individuals completing high school but not college are *lower*. There is no effect statistically of the share of college graduates on earnings relative to the share of individuals not completing high school. Of course, this result is subject to a possible ecological fallacy and needs to be interpreted with caution.

Even so, this suggests that when individuals become self-employed their returns are greater if they have not completed high school than if they have. These individuals may operate in fields such as carpentry, plumbing or electrical work, where a high school degree is not necessary to ensure high productivity. This should give pause to those who argue that greater levels of human capital, created through formal education, are unequivocally essential at any cost. Skilled craftsmen and women, in particular, may enjoy high returns to their labor even without formal education (Kauffman Foundation 2005, p.69).

| Table 3: OLS Regression Results for Determinants of Self-Employment Ratio and Returns | | | | | | |
|---|---|---|---|---|---|---|
| Variables | Ratio 2004 | | | Returns 2004 | | |
| (t-statistic on constant: -2.70 and -1.00) | Beta | | *t*-stat | Beta | | *t*-stat |
| Perc. of adult pop. with at least bachelors degree completed, 2000 | 0.196 | *** | 5.03 | -0.052 | | 1.64 |
| Median age of population, 2000 | 0.178 | *** | 7.26 | 0.392 | *** | 2.81 |
| Median age squared | | | | -0.384 | *** | 2.77 |
| Total Deposits, June 2000 ($1,000) over population, 2000 | -0.025 | | 1.57 | 0.050 | *** | 3.93 |
| Median value of owner occupied housing units, 2000($) | 0.267 | *** | 7.75 | 0.120 | *** | 4.37 |
| Perc. Owner-occupied housing unit/total housing units, 2000 | 0.198 | *** | 9.40 | -0.021 | | 1.23 |
| Perc. Population Foreign Born, 2000 | 0.091 | *** | 4.54 | -0.036 | ** | 2.21 |
| Percent Female in Labor Force, 2000 | 0.015 | | 0.51 | -0.023 | | 0.94 |
| Ethnicity Concentration Index, 2000 | -0.051 | ** | 2.44 | -0.008 | | 0.45 |
| Percent voting for Pres. Bush, 2000 | 0.036 | ** | 1.99 | 0.027 | * | 1.83 |
| Per Capita Welfare Transfers ($1000), 2000 | 0.054 | ** | 2.40 | -0.022 | † | 1.22 |
| Cumulative Utility Patents from 1990 through 1999 | 0.072 | ** | 2.15 | 0.027 | | 1.02 |
| Number of High Tech Establishments, 1999 | -0.113 | | 1.60 | -0.216 | *** | 3.87 |
| WalMart Stores, 1998 | -0.061 | ** | 2.19 | 0.032 | † | 1.42 |
| Art Dealerships, 2000 | 0.052 | | 1.51 | 0.072 | *** | 2.68 |
| Musical Instruments Supplies Stores, 2000 | -0.093 | * | 1.73 | -0.011 | | 0.26 |
| Couriers and Messenger Establishments, 2000 | 0.029 | | 0.85 | 0.060 | ** | 2.16 |
| Office Supplies and Stationary Stores, 2000 | 0.086 | | 1.15 | 0.133 | ** | 2.23 |
| Computer and Software Stores, 2000 | -0.199 | *** | 2.69 | -0.004 | | 0.07 |
| Business Support Services, 2000 | 0.143 | | 1.50 | -0.361 | *** | 4.85 |
| Temporary Help Services, 2000 | 0.191 | *** | 3.54 | 0.249 | *** | 5.94 |
| Child Daycare Services, 2000 | 0.235 | *** | 3.41 | 0.119 | ** | 2.16 |
| Junior Colleges, 2000 | 0.020 | | 0.67 | 0.047 | * | 1.95 |
| Colleges, Universities and Professional Schools, 2000 | -0.078 | | 1.64 | -0.113 | *** | 2.97 |
| Business Schools and Computer & Management Training, 2000 | 0.092 | | 1.49 | 0.127 | *** | 2.59 |
| Technical and Trade Schools, 2000 | 0.123 | * | 1.66 | 0.098 | * | 1.64 |
| Construction firms, 2000 | -0.193 | *** | 2.89 | -0.161 | *** | 3.04 |
| Retail Trade firms, 2000 | -0.231 | * | 1.85 | 0.090 | | 0.90 |
| Empl. Civ. Pop. (%) prof., sci., mgt., adm. & waste mgt. srv., 2000 | 0.066 | ** | 2.32 | 0.090 | *** | 3.96 |
| Empl. Civ. Pop. (%) in education, health and social services, 2000 | -0.045 | ** | 2.30 | 0.006 | | 0.40 |
| Perc. farm proprietor's employment relative to total employ., 2000 | 0.338 | *** | 16.6 | -0.073 | *** | 4.47 |
| Social Capital Index, Principal Component, 1997 | -0.080 | *** | 3.52 | 0.073 | *** | 4.05 |
| Broadband: more than 3 ISPs | -0.016 | | 0.93 | 0.018 | †† | 1.27 |
| County with Highway Connection (yes=1) | -0.031 | ** | 2.01 | 0.006 | | 0.51 |
| Civilian population unemployed: %, 2000 | 0.009 | | 0.36 | 0.069 | *** | 3.54 |
| Industry Churn (see text) | 0.014 | | 0.95 | -0.071 | *** | 6.14 |
| Per Capita Income, 2000 | -0.062 | | 1.33 | 0.010 | | 0.25 |
| Herfindahl index of government units (Expenditure), 2002 | 0.047 | *** | 3.01 | -0.016 | †† | 1.24 |
| Returns to Self-Employment (2000 or 2004, instrumented; see text) | -0.185 | *** | 5.84 | 0.490 | *** | 31.8 |
| CV of average non farm proprietor income: 1994 to 2003 | -0.038 | ** | 2.33 | 0.163 | *** | 14.6 |
| Average wage and salary income, 2000 | -0.293 | *** | 12.0 | 0.027 | †† | 1.38 |
| Right-to-Work state =1 (Forced Unionism state=0) | 0.006 | | 0.33 | 0.088 | *** | 5.48 |
| Per Capita Taxes, total ($), 2000 | -0.090 | *** | 4.93 | -0.016 | † | 1.12 |
| Metro county | 0.088 | *** | 4.72 | -0.008 | | 0.56 |
| Amenity Scale | 0.042 | ** | 2.54 | 0.005 | | 0.34 |
| Northeast region (yes=1) | 0.082 | *** | 4.22 | 0.016 | | 1.03 |
| Mid west region (yes=1) | -0.018 | | 0.67 | 0.069 | *** | 3.20 |
| Western region (yes=1) | 0.021 | | 0.92 | 0.072 | *** | 3.84 |
| Sample size=2,983; Adjusted R-square | 0.488 | | | 0.670 | | |

††: means the variable differs stat. from 0 at the 5 % level; †: 10 % level or lower in the log specification.

Individuals such as Bill Gates and Michael Dell are frequently listed as examples of entrepreneurs who succeeded despite dropping out of college. Citing Bhide (2000), Simon 2006 argues that soft people skills may be more important than formal human capital for entrepreneurs. Furthermore, if formal human capital is a signaling device that identifies those individuals who are less gifted entrepreneurially, these individuals are disadvantaged when they seek credit (Orzach and Tauman 2005, cited in Parker 2006). Alternatively, there is room for improving the productivity of those self-employed who have invested more years in formal education.

Greater life experience, as reflected in the average age of the population (again, which comprises the potential pool or ecosystem from which self-employed are drawn), is associated with a statistically higher ratio of self-employment and earnings. In fact the standardized coefficients on age are second only to the lagged earnings coefficient in terms of their relative magnitude. In equation 2 (earnings not logged), age reaches a maximum at the relatively young age of 38 years.

Higher bank deposits per capita are associated with a lower self-employment ratio (significant in some of the specifications) but higher returns to self-employment. On the other hand, higher median home values and greater homeownership rates both lead to more self-employment while greater returns to self-employment are associated only with a higher median home value but not homeownership. Thus, access to capital is a key requirement for self-employment but it is not clear why greater local deposits reduce the self-employment ratio. The size of the standardized coefficient on median home values is the third largest of all regressors shown in Table 3 (confirming the findings reported in Farrigan 2006).

As predicted, a higher share of foreign-born population and greater ethnic diversity are associated with higher self-employment ratios. Female workforce participation, however, has no effect statistically. For each of these three variables, the returns to self-employment also are negative but in a statistically significant manner only for the for-

eign-born population share. Minority and female self-employment are important areas for further research (see also Kauffman Foundation 2005, p.53).

Counties in which voters are more conservative, or in which a higher share of the population voted for President George W. Bush in November 2000, also have higher shares of self-employed. Perhaps even more interesting is the fact that in those counties the self-employed also enjoy higher earnings. This is likely to be the result of reduced regulatory burdens on businesses and a greater entrepreneurial spirit.

Another feature of the population, reliance on the food stamp program, is associated with more self-employment four years later, but lower returns to self-employment. This suggests that a number of those who were on the welfare roles were able to move into self-employment, or became self-employed while receiving welfare benefits, but they also experienced lower returns than those who had not relied on government transfers (the latter result is only significant statistically in the logged earnings equation, however).

Thus, in summary, the individual-level results are generally consistent with prior expectations. These variables can be viewed as controls for the county-level measures that form the primary interest of this study and are examined next.

2. County-level features (**Θ**)

In general, the creative-class type variables do not perform as well as expected although the results are sensitive to the specification chosen (especially when returns to self-employment are excluded from eqn. 1). Patent-generating activity, for example, raises the self-employment share in a statistically significant manner but has no statistical effect on the returns to such employment. Conversely, the number of high-tech establishments is unequivocally and unexpectedly associated with lower returns to self-employment. This coefficient is the fifth-largest of all coefficients in terms of the standardized beta value.

The presence of Wal-Mart stores reduces self-employment shares in a statistically significant manner, although this result is sensitive to the specification chosen. In contrast, the chain's presence is associated with higher returns to self-employment; again, this result is sensitive to the specification of the estimating equation. Nevertheless, this result tends to support the Schumpeterian argument in those communities where displaced individuals succeed in forming their own new businesses, but the effect on self-employment rates is counter to that reported in Sobel and Dean (2006), who do not control for other factors. In other words, the reallocation of labor resources that is caused by the arrival of a big-box store creates immediate adjustment costs by reducing self-employment (depending on the model) but it also is associated with higher returns for those who remain self-employed or make the jump into self-employment after Wal-Mart arrives.

Art and musical instruments dealerships, proxies for the creative class and openness to new ideas, largely have opposite effects on the self-employment ratio, with (depending on the specification) the former associated with increases and the latter with decreases in the self-employment ratio. While these results depend on the specification chosen, they do not support unambiguously the argument of Florida (2002). For art dealerships, a statistically significant increase in returns to self-employment is observed, however.

Results for the effect of industries that support the self-employed are less ambiguous, with temporary help service, child daycare service and business support service (in some specifications) establishments each exerting a statistically significant and positive effect on self-employed worker shares. In the case of child daycare services, the standardized beta coefficient (0. 235) is the fourth highest of the coefficients shown. For business support services, some of which may be wage-and-salaried and other self-employed workers, the effect is strong in terms of the standardized beta coefficient (0.357) when the lagged returns to self-employment, the variability of those returns, and average non-farm wage and salary earnings are excluded from the regression (this equation is not shown). This strong relationship among the regressors, second only to the effect of farm proprietorships, warrants further analysis. On the other hand, the

presence of computer and software stores is clearly associated with a lower self-employment ratio, whereas no effect is observed for couriers and messengers and office supplies and stationary stores. To address the potential issue of endogeneity of these regressors, a supplemental regression equation was estimated in which the coefficient vector for these variables was restricted to zero (results are discussed below).

At the same time, and this is a highly significant finding, the presence of these supporting services, with the exception only of computer and software stores and business support services, are clearly associated with higher productivity among the self-employed as reflected in higher earnings. Hence, the presence of these establishments raises the productivity of the self-employed without necessarily changing their relative numbers. They are important for the economic well-being of entrepreneurs. The temporary help and child daycare services are two forms of establishments not usually considered in discussions of entrepreneurial promotion or expansion. Yet the temporary help services establishment coefficient (0.249) is the fourth largest of all the coefficients in the earnings equation, just after that for business support services (−0.361). The presence of computer and software stores had no effect on the productivity of the self-employed (although it significantly lowered their shares for reasons that are not entirely clear) while the presence of business support services, surprisingly, had a strong negative effect on earnings. The high standardized coefficient estimate for this variable is noteworthy and indicates that further investigation of this variable is needed.

The role of four different types of post-secondary educational institutions within counties is examined next. Here the general conclusion is that their presence, contrary to expectations, does not significantly increase or decrease the self-employment rate, except in the case of technical and trade schools. However, in the specification in which returns to self-employment are excluded from the share equation (1), technical and trade schools are associated with a higher share of self-employed (significant statistically at below the 10 percent level).

The other exception is for colleges, universities and professional schools, where the effect is negative and may be an artifact of the data, to the extent that these kinds of schools have large numbers of employees, thereby skewing the self-employment ratio in a downward direction (see, however, the comment above about the inclusion of the employed population shares in the types of jobs provided by universities). Furthermore, in the reduced form specification alluded to above, in which supporting industries are excluded, the coefficient estimates on business schools and computer and management training, and on technical and trade schools become statistically significant at below the 5 and 1 percent levels, respectively.

Most noteworthy is the fact that three of the four educational institutions unequivocally *raise* the returns to self-employment in the county in which they are located. This result is robust to the different specifications employed in this study and it suggests that further investment in these kinds of establishments is warranted as self-employment becomes a larger part of the economy (see Balsamo and Alves 2005 for examples of how community colleges are promoting entrepreneurship locally). More generally, this suggest that the role of K-12 education in supporting future self-employment also needs to be considered in this kind of framework (see, for example the work of T. Warren, as described in Hanke et al. 2005).

For colleges, universities and professional schools the effect is negative, unexpectedly. This likely reflects the fact that the mission of these types of schools does not include raising the productivity of entrepreneurs and the self-employed. In contrast, anecdotal evidence suggests that European universities are playing an increasing role in helping start-ups (Edmondson 2006).

Alternatively, in the US this also suggests that there is room for improving the transfer of technology and innovations from university labs to main street businesses. This is consistent with Kauffman Foundation (2005, p.50):

> The United States is failing to develop and commercialize much promising research. Discoveries that could lead to new therapeutic drugs, new medical devices, and other life-saving or life-enhancing technologies are

> being overlooked in laboratories or, in other cases, languishing in a system that is intended to speed practical applications, but is instead inhibiting success.
>
> [Furthermore,] Innovation activity tends to revolve around the patent-license model, thereby placing the burden within one area of the university: the technology transfer office. *Few universities understand that innovations can move through multiple pathways, requiring coordination of various activities and entities across a university* [emphasis added].

Among the industry control measures, a few interesting results stand out. First, counties with more farm proprietors are much more likely also to have a higher ratio of non-farm proprietorships (self-employed), as expected. The standardized coefficient estimate for this variable is larger than that of any other regressor. However, counties with more self-employed farm workers also have significantly lower returns to non-farm self-employment endeavors. Second, counties with higher numbers of retail establishments also have lower self-employment ratios. Surprisingly, a larger number of construction establishments is associated with both significantly lower rates of and returns to self-employment. The reason for this is not clear, but it indicates that once the other controls are introduced into the equation, construction is not associated with higher self-employment rates or returns. Of course, a larger number of such firms may indicate a smaller number of self-employed per firm, and greater competition that in turn erodes profits. This needs to be explored in future research. Below the results of including a quadratic term on this variable are discussed.

For the other county-characteristics that are to varying degrees subject to policy influence, higher stocks of social capital (a proxy for trust), interstate highway access, greater returns to self-employment and variation in those returns, higher average wage-and-salary earnings and higher per capita income taxes are each associated with lower shares of self-employed workers. In counties with more social capital stocks, higher past self-employment earnings and variation in those earnings, higher unemployment rates, and counties that are located in states with right-to-work laws on the other hand, the self-employed also have higher earnings. The greater trust among residents that is

reflected in higher social capital stocks raises the productivity and earnings of self-employed workers.

State-wide income taxes have no effect statistically on earnings (except in the log earnings specification), but they do reduce the self-employment ratio. This result is contrary to expectations since higher taxes are believed to encourage workers to move out of wage-and-salary employment and into self-employment. The self-employed in counties where industry churn is higher experienced lower earnings. This finding parallels the general result for workers who experience a reduction in earnings when economic dislocation forces them to switch into a different industry.

Among these results the finding for returns to self-employment are most puzzling. Theoretically, higher returns to self-employment should be associated with greater shares of self-employed workers, *ceteris paribus*. However, here the opposite is observed. The signs of the coefficient estimates are as expected only for the risk of (variation in returns to) self-employment and the average wage-and-salary income (returns to working for someone else). When an instrumented value is used for returns to self-employment to reduce endogeneity bias the result remains the same. Similarly, the simple coefficient of correlation between self-employment earnings and shares is negative. One possible explanation for this unexpected finding is that the self-employed are better able to put up barriers to entry in those counties where their earnings are higher, thus reducing the share of self-employed. This needs to be investigated further, because the result is also contrary to that obtained in Goetz and Rupasingha (2006*b*) in the case of rates of growth in self-employment shares, as opposed to levels. Below the result of an expanded estimation including a squared term on initial period earnings is discussed.

Among the last group of variables, those not amenable to policy change, metropolitan status, greater amenity levels, the Northeastern US region (relative to the South) and greater industry churn are each associated with higher self-employment ratios. With their greater population density and all of the economic benefits that conveys, metro ar-

eas have a clear advantage in spawning self-employment. Networking activities also may be less effective in non-metro areas, holding constant the level of social capital stocks (Farrigan 2006, p.4 and 9). However, surprisingly, the metro advantage does not extend to the returns to self-employment.

Finally, when a log specification is used for equation 2, a number of differences emerge in the results, as denoted by the symbol †. Perhaps most notable among these is that access to Internet Service Providers becomes statistically significant, suggesting that this form of market access is important for raising the productivity of the self-employed. Another interesting result is that the presence of Wal-Mart stores is now associated with higher returns to self-employment (statistically significant at the 10 percent level). Nevertheless, the non-logged specification is retained for present purposes, because it tends to produce a better fit.

***Analysis of Regression Residuals***

Additional insights into self-employment shares and returns can be obtained by examining the residuals from equations (1) and (2). These residuals are calculated as the difference between the actual and predicted values of the dependent variables. Remarkably, the State of Tennessee appears a total of six times out of ten possible appearances, and especially so for having much larger-than-predicted self-employment shares (Table 4). This in turns suggests that something is different in the state that is not captured by the explanatory variables included in the regression equations.

It is noteworthy that Tennessee counties appear on both lists in Table 4, showing both very high and low actual self-employment earnings, along with the high self-employment rates. In part, this may be a result of the fact that these counties are quite small. Nevertheless, they are not the only small counties in the nation, and this suggests substantial diversity or inequality in terms of returns to self-employment in the state, which in turn is worthy of further study.

**Table 4: Self-Employment Outliers Based on Regression Residuals**

| Rank | Highest residual for self-employment share | | | Highest residual for returns to self-employment | | |
|---|---|---|---|---|---|---|
| | County | Residual (share) | $ Actual earnings | County | $ Residual (earnings) | $ Actual earnings |
| 1 | Fayette, TN | 38.4 | 10,298 | Morris, KS | 28,704 | 49,663 |
| 2 | Meigs, TN | 36.0 | 8,941 | McNairy, TN | 24,940 | 48,492 |
| 3 | Trousdale, TN | 35.7 | 6,412 | Schntdy, NY* | 24,351 | 51,168 |
| 4 | Chase, KS | 34.8 | 10,699 | Sumner, TN | 23,841 | 50,532 |
| 5 | Jackson, TN | 33.6 | 10,141 | Osceola, MI | 21,016 | 41,556 |

*Source*: Author's calculations; *=Schenectady County, New York

***Extension of Regression Results***

The use of spatial econometrics yielded statistically significant lag parameters but results for the other regression parameters were not materially affected. Therefore, only the OLS results are reported here. A separate regression equation also was estimated using data on non-metro counties only to test for the effect of remoteness and density, but again the results were relatively robust and are not reported here separately.

To investigate further the counter-intuitive results for the coefficient estimates on construction firms and returns to self-employment (both of which are, unexpectedly, negative), equation (1) was re-estimated with the addition of quadratic terms for these variables. For the number of construction firms, a U-shaped relationship appears, although the negative term is not statistically different from zero (*t*-stat=1.38). The quadratic terms is significant (*t*-stat=2.61) and the minimum occurs at $n_{min}$=2,689 firms. This is more than ten times the average number of such firms in counties (228, Table 2), and about one-half the maximum number ($n_{max}$=12,197 firms).

For earnings per self-employed worker, a highly significant U-shaped relationship emerges, with *t*-statistics of −7.52 and 5.33 on the linear and quadratic terms, respectively. This indicates a turning point (minimum) at self-employment earnings of $42,058, which is about three times the sample average ($16,843) and about one-quarter the sample maximum ($158,876). As one additional test of this relationship, a model of self-employment growth was estimated, as the percent change in the number of self-

employed between 2000 and 2004 (this is similar to the analysis in Goetz and Rupasingha, 2006).

Interaction terms among regressors can shed additional light on the complex and interrelated forces that lead to spatial variations in self-employment shares. For example, the interaction term between broadband availability and percent college-educated adults in a county is positive and statistically significant in both the rate (eqn. 1) and the share (eqn. 2) equations. This means these two variables are mutually reinforcing in the sense that broadband availability increases the impact of college attainment in stimulating self-employment, and college-educated adults are better able to leverage internet access into successful self-employment. Likewise, a positive interaction effect is observed for female labor force participation and the ethnic diversity index.

To address the multi-collinearity concern, finally, the relevant variables were collapsed into just three categories: 1. creative class; 2. educational establishments and 3. supporting industries. For self-employment shares, the creative class variable is statistically significant and positive, but the other two variables are not distinguishable from zero. For self-employment earnings, the creative class variable has a negative effect (statistically significant) while the educational establishments variable has a positive effect. No effect is discerned statistically for the supporting institutions summary variable, but patents become statistically significant (positive) in the self-employment earnings equation when only a vector of these three summary variables is included.

***b. Results for the Effect of Self-Employment on Job Growth***

Both exploratory analysis and formal tests of spatial dependency confirmed the existence of spatial dependency using a "queen" contiguity spatial weighting matrix. Queen contiguity is defined as $w_{ij}$=1 if one county shares a common side or vertices with its neighboring counties and as 0 if otherwise.

Table 5 reports the results of formal test of spatial dependency of job growth. The highly significant Moran's I statistics show strong evidence of spatial dependency in all three

periods, which is also substantiated by significant asymptotic Lagrange Multiplier (LM) error and LM lag tests results. According to the decision rule of selecting among spatial models (see Anselin, 2005) the results from LM error and LM lag tests along with their robust forms suggest that the spatial lag model is appropriate for both base and expanded models. Therefore, a spatial lag correction model is used to eliminate spatial dependence bias. Results reported are from the spatial lag models.

**Table 5: Test of Spatial Dependency for Job Growth Models**

| Tests | Base | | |
|---|---|---|---|
| | 1990-1994 | 1995-1999 | 2000-2004 |
| Moran's I (Unconditional) | 0.046 | 0.188 | 0.119 |
| Moran's I (Conditional) | **0.036 | **0.131 | **0.094 |
| LM Error | **11.07 | **144.70 | **74.95 |
| LM Lag | ****12.17** | **175.12 | **89.34 |
| Robust LM Error | 0.990 | *6.587 | *11.31 |
| Robust LM Lag | 2.089 | ****37.01** | ****25.70** |
| Appropriate model | Spatial Lag | Spatial Lag | Spatial Lag |

Significance level: *=10%, **=1% or lower.

Regression results for the basic model are reported in Table 6, for the three time periods analyzed here. As hypothesized, counties with higher lagged wage employment growth also experienced faster job growth in the period examined: in 2000-2004, for example, every one percentage point increase in the job growth rate in the earlier period (1995-1999) leads to a 0.073 percentage point increase in growth in the later period. The effect was smaller (not quite half as small) in the 1995-1999 period, and nearly twice as large in the 1990-1994 period as the national economy came out of the recession and entered into one of the longest expansions in US history.

Conversely, in the 2000-2004 period, counties experiencing wage pressure in the previous period saw wage-and-salary jobs increase at a lower rate in the subsequent period: each one-thousand dollar increase in wages in the earlier period reduced the job growth rate by 0.217 percentage points in the subsequent period. Counties with larger increases in earnings in one period were penalized by experiencing reduced lower job growth in the subsequent period. This effect was absent in the 1995-1999 period (sec-

ond-half of the expansion, as productivity growth may have compensated for wage inflation) but four times as large in the 1990-1994 timeframe.

Turning next to the primary regressor of interest, Table 6 shows that growth in relative proprietor rates unambiguously and in a statistically significant manner increased the rate of growth of wage-and-salary jobs. For each one-point increase in the number of proprietors per total workforce, the overall rate of job growth increased by 0.100 percentage points in 2000-04, by 0.562 in 1995-99 and 0.578 percentage points in 1990-94. This is a statistically significant increase, but it has to be viewed in the context that the relative share of proprietors increased by only 0.7 percentage points (one standard deviation being 3.3 percentage points). However, even a 0.01 percentage point increase (a one-hundreth) can translate into hundreds of jobs in a larger county.

**Table 6. Determinants of Wage-and-Salary Job Growth, Basic Models Over Time**

| *Variable, independent* | Wage-and-salary job growth | | |
|---|---|---|---|
| | 1990-1994 | 1995-1999 | 2000-2004 |
| Constant | **8.55 (10.97) | **2.24 (5.03) | *-0.500 (-2.60) |
| Lagged wage employment growth, $\Delta E_{-1}$ | | | |
| 1985-1989 | **0.237 (6.87) | | |
| 1990-1994 | | **0.075 (8.62) | |
| 1995-1999 | | | **0.073(8.36) |
| Lagged wage earnings growth, $\Delta W_{-1}$, *1,000 | | | |
| 1985-1989 | **−1.89 (-5.23) | | |
| 1990-1994 | | 0.017 (0.10) | |
| 1995-1999 | | | **−0.217 (-3.90) |
| Lagged proprietorship growth, $\Delta S_{-1}$ | | | |
| 1985-1989 | **0.578 (3.39) | | |
| 1990-1994 | | **0.562 (6.30) | |
| 1995-1999 | | | **0.100 (4.01) |
| Density (adjusted for starting year), *1,000 | −0.183 (-0.71) | *−0.181 (-1.66) | *−0.106 (-2.04) |
| Metropolitan county | 0.831 (0.87) | **5.473 (13.5) | **1.116 (6.05) |
| $\rho$ | **0.111 (3.84) | **0.310 (12.4) | **0.229 (8.52) |
| *R*-squared | 0.028 | 0.164 | 0.084 |

Sample size = 3,037 counties; (asymptotic) *z*-values shown in parentheses.
Significance level: *=10%, **=1% or lower.

By order of magnitude, the coefficients for lagged proprietorship growth rates are comparable to those reported by van Stel and Storey (Table 1, p.899): −0.25 for 1984-91 (not statistically significant from zero) and 1.11 for 1991.98, although here the time periods over which job growth rates are calculated are longer. Even so, it is noteworthy in

Table 6 that the size of the coefficient in the US is declining over time; in fact, when 2000-2003 data are used instead of 2000-2004, the coefficient estimate is twice as large as that reported in Table 6: 0.213, with a *t*-statistic of 5.74. Metropolitan counties experienced more rapid population growth in the last two periods studied, but places with higher population densities has less growth, all else equal, at least in the last period studied.

***Expanded Analysis***

Next an expanded set of regressors is included to determine (a) whether the coefficient estimates remained robust in the original 2000-2004 model, and (b) to assess the independent effects of other regressors that affect spatially-varying job creation patterns. Results are available from the author upon request.

The coefficient estimate on lagged wage-and-salary growth is reduced in the expanded model, whereas the effect of wage earnings growth is relatively robust to the specification change. Adding a quadratic term for the effect of proprietorship growth produces a statistically significant effect of the quadratic term, suggesting there are limits to the effect that this variable has on the dependent variable.

An additional interaction term with metropolitan areas suggest that metro regions get an additional, independent boost over non-metro areas from lagged wage-and-salary employment growth. The greater the share of foreign born population and college graduates, the higher the rate of job creation, *ceteris paribus*. Areas rich in amenities tend to create more jobs, but highway access and availability of broadband providers (more than 3) had no significant effect. These expanded results are not reported but available from the author upon request.

Counties with Wal-Mart stores at the beginning of the period over which growth is calculated experienced a 18.5 percentage point reduction in the wage-and-salary employment growth rate between 2000 and 2003, for each store in the county. Clearly, employment expansion in these counties was subdued relative to counties that had no

Wal-Mart store. Counties with a greater concentration of voters favoring President Bush, grew more rapidly.

Last, counties with more social capital stocks (as measured in Rupasingha et al. 2006) experienced significantly lower job expansion, raising the possibility of reverse causality. Here, social capital stocks may rise in communities that are in decline. Contrary to expectations, greater presence of high tech establishments was associated with significantly lower job growth rates, rather than accelerated growth.

**Conclusion and Suggestions for Further Research**

This study confirms the merits – and importance – of examining entrepreneurial and self-employment activity within the broader context of the local communities and economies in which it occurs. Even as the Internet is widely believed to reduce if not eliminate the importance of space and distance, the locally-varying factors that distinguish one place from another are becoming increasingly critical. Perhaps most significantly, the study reveals locally-varying factors that account for differences in returns to self-employment across space. Previous studies on this topic are virtually non-existent.

The study confirms that self-employment plays an important independent role in spawning wage-and-salary employment. However, the effect may be waning over time. The results also provide strong evidence of spatial dependency in wage-and-salary job growth. Results of recent studies in other contexts are confirmed that suggest Wal-Mart's expansion and the employment efficiencies that the chain produces tend to reduce retail job creation. However, the competitive pressure created by the chain also appears to raise the returns to self-employment (although this result is sensitive to the empirical specification chosen).

This study provides numerous new insights into the variables that affect self-employment activity, including the importance of various types of local supporting businesses, educational institutions, entrepreneurial "spirit," creativity and innovation, big-

box retailing as well as salient individual-level characteristics. The study also points to areas where further research will likely have a high payoff.

The robust and statistically significant positive effect on self-employment of local voter preferences favoring the Republican party suggests that further investigation is warranted into how entrepreneurial cultures and "spirits" emerge and are sustained within counties. Most importantly, not only understanding the individual-level particularities is important, but so is a systematic assessment of how local rules and regulations affect self-employment, and how these rules and regulations themselves arise out of the local democratic process. This study provides some clues about local and state policies that make a difference, but further research is important in this area because such policies (e.g., zoning ordinances) may be relatively easy to reform if they are demonstrated to constrain local job creation. For example, it is usually more cost effective to change a counterproductive local policy that it is to increase the educational attainment of the population or access to credit.

One component of this on-going inquiry is sorting out the effect of local government structure. At The Pennsylvania State University we are completing a study on how governmental organizational form at the county-level affects economic growth. This work expands on the Herfindahl index of government fiscal power employed here and promises to yield key new insights that also need to be applied to self-employment. Again, reforming the structure of local government may be easier than effecting other county-level changes, if research can identify optimal forms of organizing government units. The results of this research were not available at the time this study was completed, but they could be included in future work.

In future research it also will be important to sort out in more detail how different types of local business service providers affect self-employment, and how and why those business providers go into business themselves. This study used time lags to deal with potential endogeneity bias between the presence of business support service providers and higher self-employment rates. In addition, a model of the emergence of various

business support services, including child daycare, needs to be developed. In some communities, resolving this conundrum could be a critical first step in stimulating entrepreneurship.

Finally, the role of research universities and their local spillover effects needs to be better understood, along with the type of institutional environment within universities that is most effective in moving the results of pure research and discovery into innovation that includes new business formation. Universities, colleges and professional schools are not yet playing the role of comprehensive local and regional engines of growth that many observers believe they can play. In fact, the negative coefficient estimate in the equation for returns to self-employment (Table 3) suggests that substantial room exists in many university and college towns to increase the productivity of the self-employed.

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