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The influence of industry mix on regional new firm entry

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Abstract

Per capita rates of entry are commonly used to measure regional entrepreneurial climate. Yet entry rates vary widely by industry and tend to mirror existing regional specializations. Without controlling for industry mix, factors associated with regional differences in entry may describe the industry base rather than entrepreneurial climate. This study finds that while industry mix explains a potentially large portion regional variation in entry, it does not radically alter the relative standing of the most highly ranked regions. Most of the factors commonly associated with the regional entrepreneurial climate remain significant after purging the data of industry mix effects. However, a number of commonly-cited factors—namely, educational attainment, homeownership, University R&D, and unemployment—were found to be contingent upon industry structure.

JEL classification: R11, M13, L26, O18

Key words: New Firm Formation; Entrepreneurship; Regional Analysis

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Introduction

The United States, like many other developed nations, is awash in “benchmarking” studies that compare states and regions according to a variety of indicators reflecting technological capacity, innovation infrastructure, and performance in science-related industries. Well-known examples include national reports from the Small Business Administration Office of Advocacy (ADVANCED RESEARCH TECHNOLOGIES, 2005) and the Kauffman Foundation (ATKINSON and CORREA, 2007) as well as state-sponsored studies such as the Index of the Massachusetts Innovation Economy (JOHN ADAMS INNOVATION INSTITUTE, 2008). These studies are widely read by commissioners, state legislators, and other decision makers responsible for charting the course for state and local economic development policy.

Entrepreneurship is a common theme of such studies, with new business starts per capita often used as a barometer of the region’s entrepreneurial climate. Academics refer to this as the ‘labor-force approach’ to measuring entry because it scales the number of entrants by the population most “at-risk” of starting a new business—that is, the resident population or work force (AUDRETSCH and FRITSCH, 1994b). Despite their popularity, the value of using labor-based entry rates as a comparative measure of a region’s entrepreneurial climate is questionable. Although accounting for regional size differences, the labor force approach does not control for a region’s industry mix. This may result in a skewed perception of the region’s entrepreneurial climate which may, in turn, erroneously influence the design of policy (JOHNSON, 2004). It is well known that entry rates vary greatly from industry to industry (DUNNE and SAMUELSON, 1988; JOHNSON, 2004; KLEPPER, 1996), due to differences in knowledge requirements and appropriability (e.g. R&D intensity, innovation focus, risk), demand conditions (market size, growth and segmentation), and other facets of industry structure that create systematic barriers to entry such as costs of inputs, capital intensity, and industrial concentration (BAIN, 1956; SHANE, 2003). By not accounting for industry mix effects, comparative benchmarking studies may simply be highlighting regions blessed with a high concentration of industries that produce many new firms revealing little about the relative competitiveness of a region as fertile ground for growing new enterprises. It is much more valuable for policy makers to understand whether their region is above or below expected rates of entry given their current industry mix.

The measurement of entry rates also has implications for how scholars understand the conditions that influence regional variations in new business starts. As with their policy counterparts, academic studies of regional new firm creation also tend to favor the labor-force approach due, in part, to its connections to theoretical models of entrepreneurial choice (EVANS and JOVANOVIC, 1989). Influential studies using the labor-force approach in the U.S. context include REYNOLDS (1994; 2007), ACS and ARMINGTON (ACS and ARMINGTON, 2006), ARMINGTON and ACS (2002), REYNOLDS et al. (1995), LEE et al. (2004), and KIRCHHOFF et al. (2007). But if industrial mix explains a significant portion of observed regional variation in entry rates, there is a good chance that we may mistakenly identify the factors associated with either the causes (e.g. unemployment rates, educational attainment or average firm size) or consequences (e.g. employment growth) of entrepreneurship. In other words, without controlling for industry mix effects, studies using a labor market approach may simply be describing the region's existing industrial base rather than its broader entrepreneurial climate. JOHNSON (1983) was the first to explore this issue, using VAT registration data for U.K. firms. More recent contributions include STOREY AND JOHNSON (1987) and JOHNSON (2004) for U.K. regions, FRITSCH (1997) and FRITSCH AND FALCK (2007) for Germany, NYSTROM (2007) for Sweden, and CHENG (2011) for U.S. states. The aforementioned studies all agree that industry-specific conditions explain a substantial portion of regional variation in entry.

This paper examines the relationship between industry-specific and regional variations in new firm entry rates. Modifying the approach of FRITSCH (1997) to the case of new single-unit establishments in the U.S., I estimate regional new firm entry rates controlling for industry mix effects in a cross-sectional framework. With a policy audience in mind, I then explore how controlling for industry mix changes the relative standing of different regions versus the more common labor force-based entry rates. Then, with a research audience in mind, I conduct a spatial regression analysis to examine how correcting for industry mix affects which regional attributes are significantly associated with higher rates of new firm formation using one of the comprehensive set of explanatory variables to date.

The relationship between industry mix and regional entry

New firms are often viewed as a dynamic vehicle through which the Schumpeterian gales of creative destruction continually tear down existing markets and, in the process, create new economic opportunities and force incumbents to become more innovative and competitive (BOSMA et al., 2011). However, the creation of new firms also reinforces regional patterns of industrial specialization over time, because the industry mix of a region’s entrants largely mirror that of its incumbents (DUMAIS et al., 2002). There are several possible reasons for this, but of primary importance is the strong tendency of founders to start their new enterprises close to home and in industries where they have prior knowledge and experience.

Many, if not most, new businesses are started close to the existing residence of the founder, a phenomenon sometimes referred to as the “home-field advantage” (FIGUEIREDO et al., 2002; STAM, 2007). Unlike large incumbent firms whose expansion and relocation decisions may be guided by extensive site selection searches—new independent firms face considerable information and resource constraints that preclude a multi-region search. There are also strategic advantages in staying close to home. The decision to start a new business is often contingent upon the founder’s knowledge of local market conditions and opportunities, which mitigates some of the inherent risk and uncertainty associated with the creation of a new enterprise (STAM, 2007). The ability to access critical support networks and resources also relies upon locally contingent knowledge (SORENSON, 2003). A founder with local ties may have established relationships with potential clients, suppliers, and distributors, and may be more familiar with peer networks and small business assistance programs. The founder may also have relationships with banks and other local sources of start-up capital – including informal sources such as friends and family (REYNOLDS, 2007). Divorced from these local networks, the new firm may face considerably greater hazard in navigating the rough and tumble early years of life (SORENSON, 2003). Lastly, social and familial ties, quality of life preferences, and other place-based ties can be extremely influential factors in the decision to start a new business in place (STAM, 2007; THORNTON, 1999).

The founder's prior work experience helps shape her decision about what type of business to start. People rarely start a new business in a market that is completely novel or foreign. Rather, they draw upon their prior experience and knowledge (SHANE, 2000; SORENSON and AUDIA, 2000). Because of the home bias effect, this experience is often acquired while working for another similar type of company in their home region (SORENSON and AUDIA, 2000). The new business may be a direct spin-off from an existing company that decides to shed peripheral activities and then subcontract with its former workers (HARRISON, 1994). In other cases, a new business is founded to exploit market opportunities discovered while working for another company (ACS and ARMINGTON, 2006; AUDRETSCH and KEILBACH, 2004). The founder might also decide to strike it out on their own following a layoff or business closure.

Measuring the Industry Mix Component of New Firm Formation

This section describes my approach for measuring regional rates of new firm formation that account for variations in industry mix. Data on new firm entry comes from a recently developed data series, the Statistics of U.S. Businesses (SUSB) produced by the U.S. Census Bureau. The SUSB excludes non-employer businesses (i.e. sole proprietors with no paid employees) as well as workers and businesses in farming, domestic service, and government. The SUSB is based on on a March 1st survey, putting it slightly off of the calendar year. I describe the timing of entry according to the year of the initial March survey. For example, 1998 entrants are those starting between March 1st 1998 and the end of February 1999. The SUSB reports establishment counts of single-unit establishment start-ups (i.e. new firm start-ups or new firms for short), as well as start-ups for establishments that are part of a multi-unit enterprise.[i] In this paper, I focus solely on new firm start-ups, recognizing that the decision of an existing company to establish a new branch or subsidiary is vastly different then the decision to start an entirely new enterprise (BOSMA et al., 2008; FESER et al., 2008).

From the SUSB, I obtained county-level counts of new-firm establishment births by highly detailed industry codes (five-digit NAICS) for the years between 1998 and 2005.[ii] In 2002 the Census Bureau revised its industrial classification system, creating a discontinuity in the time series that precludes a full longitudinal or multidimensional analysis (BOSMA and SCHUTJENS, 2010; FRITSCH and FALCK, 2007; NYSTROM, 2007). Instead, I conduct a cross-sectional analysis with entry rates averaged within two separate three-year periods, 1998-2000 and 2003-2005—the former based on 1997 NAICS-based industry definitions and the later using 2002 NAICS definitions. The primary geographic units are the 719 Commuting Zones (CZs) in the Continental U.S. CZs are discrete groups of neighboring counties that share in a common labor pool.[iii] Given that many new firms locate within commuting distance of the residence of the founder, CZs provide an accurate representation of the regional context in which most entrepreneurs both live and work. Unlike the more commonly used Metropolitan Statistical Area (MSA) designation, which are limited to counties encompassing center cities and their suburbs, CZs include all counties (urban, suburban and rural) and thus provides a more comprehensive scope of coverage.

I calculate regional new firm formation rates using two different methods. The first is the standard labor market approach, whereby entry is aggregated across all industries and divided by the size of the civilian labor force (measured in 1,000’s of persons). The second approach largely follows FRITSCH (1997), accounting for industry mix effects by first estimating the number of entrants that each region would have if it generated entrants at national rate for each industry. The industry entry rate (*EntryRate* $_i$) is simply the number of entrants in the industry, divided by the number of incumbent establishments in the industry measured in the previous year. This predicted value is then subtracted from the actual number of entrants for the industry in the region, summed across all industries, and divided by the size of the civilian labor force, or:

$$IR_{i,r} = \frac{\sum_i Entrants_{i,r} - \left(EntryRate_i * Incumbents_{i,r}\right)}{CivLF_j}$$

where *i* and *r* respectively index industry and region. This is equivalent to the "formative" component of regional firm formation rates under the decomposition method proposed by JOHNSON (2004).

My method only differs from FRITSCH (1997) in how it estimates industry entry rates ($EntryRate_i$). I call this the 'residual approach' for reasons that will soon be obvious. Rather than predict regional entry in each industry based on national rates, I use the predicted values from a series of linear regression models, one for each industry, where regional new firm entry is regressed on the number of incumbent establishments in the region, or:

$$Entrants_{i,r} = \beta_i Incumbents_{i,r} + \varepsilon_{i,r}$$

I exclude the intercept so that the coefficient (β_i) measures the average regional rate of new firm entry in each industry. Counts of incumbent establishments are taken from the U.S. Census Bureau County Business Patterns series, with incumbents measured as the number of establishments just prior to the year of entry to avoid double counting. The residuals provide an estimate of whether the region produced more or fewer new firms than expected given the number of incumbent establishment. Summing over all industries in each region and dividing by the size of the civilian labor force accounts for regional size differences. Both the residual approach and the FRITSCH (1997) approach produce similar estimates of industry-specific entry rates, with Pearson correlation coefficients typically in excess of .93. The residual approach has an added advantage in that it produces a series of useful diagnostics, such as R^2 values (i.e. the percent of variation in regional entry that is explained by incumbents alone) and standard errors for industry entry rates.

I ran separate regressions for each year from 1998 to 2000 and again from 2002 to 2005, averaging the results within each period to smooth annual fluctuations. With roughly 650 industries, the model results are too voluminous to describe in detail. Industry entry rates follow a skewed distribution, with 43% of industries having between .05 and .10 entrants per regional incumbent (Figure 1). The results are nearly identical between the two study periods, with a mean of .075 for 1998-2000 and .074 for 2003-2005. This means that, on average, there were approximately seven and a half new firms for every 100 same-industry incumbents in the region.

[Figure 1]

The R^2 values measure how well same-industry incumbents explain new firm entry, on average, across CZs. As shown in Figure 2, industrial composition alone explains a considerable portion of the regional variation in new firm formation in nearly all industries – commensurate with FRITSCH'S (1997) results for Germany and JOHNSON'S (2004) results for the U.K.. From 2003 to 2005, the number of same-industry incumbent establishments explained approximately

65% percent of the regional variation in new firm formation rates when averaged across all industries, with a median of 75%. The distribution is highly skewed, with incumbent establishments explaining more than 70% of the regional variation in entry for more than 60% of all industries. The distribution for 1998-00 is similarly distributed, with a mean R^2 of .63 and a median of .73.

[Figure 2]

There is considerable variation in entry rates across industries. This is summarized in Table 1, which represents the entry rate of broad (~2-digit NAICS) industry sectors by the median entry rate of its more detailed (5-digit) industry components. Going by their 2003-2005 entry rates, the construction and professional, scientific and technical services sectors have the highest entry rates, each with median entry rates in excess of ten entrants per 100 incumbents. A close second tier of sectors with entry rates in excess of eight entrants per 100 incumbents include: agriculture, forestry, fishing and hunting; arts, entertainment, and recreation; accommodations and food services; and educational services. These industries typically have fairly low barriers to entry, such as start-up capital requirements (BAIN, 1956). Conversely, management of companies and enterprises; utilities; and manufacturing have the lowest entry rates, each with fewer than five entrants per 100 incumbent firms in the region.

[Table 1]

There is also considerable variation across industries in the share of regional entry explained by prior-year incumbents (Table 1). Locally-oriented and spatially ubiquitous sectors have the highest correspondence between regional incumbents and entrants. Other services (ex. public administration); professional, scientific and technical services; administrative, support and waste management services; construction; and retail all have average 2003-05 R^2 values in excess of .85. At the low end are industries where entry is rare and specialized to a relatively limited number of regions; such as utilities, mining, and manufacturing, each with R^2 values less than .4.

Does the Measurement of Entry Rates Affect the Ranking of Entrepreneurial Regions?

For better or worse, policy makers and local development officials in the U.S. are keenly interested in seeing how their region compares against others. This section indulges such curiosities by ranking each region according to both measures of entry rates, emphasizing movement up and down in the rankings.

With industry mix explaining upwards of 70% of regional entry in most industries, one might naturally expect the spatial distribution of entry to change dramatically once regional entry rates are purged of industry mix effects. Instead, I found what is best described as modest changes. The Spearman's rank order correlation coefficient between the labor force and residual new firm formation rates is .55 for 2003-05 and .61 for 1998-00. Figure 3 emphasizes shifts in the overall rank-order distribution. Given 719 CZs, the maximum possible change in rank is 718. Under the residual method, roughly 25% of all CZs stayed within 50 units of their original ranking under the labor market method. Just under 30% changed ranks by more than 200 units up or down. Regions where the labor force ranking was considerably higher than the residual ranking are predominantly rural areas in the northern great plains, northern New England, and along much of the northeastern seaboard. Regions where the residual ranking was considerably higher than the labor force ranking are largely found in the southeast, the southern plains and Texas, and along the south Western borderlands with Mexico (Figure 4).

[Figures 3 and 4]

Most of the movement in rankings was at the middle and bottom-end of the rank order distribution. Region's ranking high under the labor force method generally retained their high standing under the residual based calculations, with fifteen of the top 25 CZs under the labor force method also appearing among the top 25 under the residual approach (Table 2). By contrast, there was only one CZ that scored among the bottom 25 regions for both methods (Table 3). While the next section examines the factors associated with higher or lower entry rates under the labor force and residual-based methods, a cursory examination suggests that regions ranking consistently high under both methods tend to be small to mid-sized metros that are often located in fast growing areas of the nation. They also have higher than expected entry rates across a broad range of industry sectors—thus leading to more uniform rankings whether or not one controls for industry mix. Those ranking toward the middle and bottom under either method tend to be far more variable.

[Tables 2 and 3]

Regional Determinants of New Firm Formation with and without Industry Mix Effects

Data, Model Specification and Measurement

The preceding section shows that while industry mix is an important determinant of regional entrant rates, controlling for industry mix only has only modest effects on the relative ordering of regions. This suggests that other forces beyond the existing industrial distribution of incumbent firms are also relevant in explaining regional variations in new firm formation. This section investigates how controlling for industry mix alters our understanding of the forces that influence regional new firm entry. I develop two sets of exploratory regression models for each study period, one using new firm formation rates estimated by the labor force method and the other by the residual method that corrects for industry-mix effects. Comparing the two provides helps us distinguish industry-specific factors from those that are associated with broader aspects of regional entrepreneurial climate.

Each model was first estimated using standard Ordinary Least Squares, but preliminary tests revealed significant spatial dependence. Robust Lagrange Multiplier tests and post-hoc model fit statistics slightly favored a spatial error specification, which I estimate using a maximum likelihood correction based on a first-order queen contiguity weights matrix. Three CZs were excluded—Nantucket, MA and Friday Harbor, WA because they are islands with no adjacent neighbors; and New Orleans, LA due to the anomalous impacts of Hurricane Katrina.

I identified potential influences on regional new firm formation through a detailed review of theoretical and empirical studies (Table 3). For the sake of parsimony, the original set of candidate variables was culled to include only those showing a high level (probability <= .05) of independent significance in at least one of the four models. Adapting and expanding the taxonomy developed by REYNOLDS (1994) and REYNOLDS et al. (1994), I grouped the independent variables into five broad types: local demand, labor force and household characteristics, industrial organization, quality of life and amenities, and social capital. Whenever possible, the independent variables are measure in the closest year just prior to the study period to avoid potentially confounding circular influences.

[Table 3]

Local demand

Recent growth in population and per capita personal income represent an expansion in local market opportunities and the demand for new products and services (REYNOLDS, 2007). Fast growing areas provide opportunities for new businesses in unsaturated local markets. Likewise, growth in personal income deepens each resident's capacity to purchase new products and services, and may also relate to increased demand in niche product markets often served by new independent firms.

Labor force and household characteristics

Labor force characteristics relate to regional variations in the supply of potential entrepreneurs. I include the proportion of the adult population (24+ years) with bachelor’s degrees or higher to represent regional variation in education attainment, and the share of the population between 35 and 49 years old to accommodate differences in regional age profiles. Persons with higher education are more likely to start their own business (REYNOLDS and WHITE, 1997). The likelihood of starting a new business also varies with the founder's age— peaking around age 40 (BONTE et al., 2009). Mid-lifecycle adults are likely to have more experience, network contacts, and higher asset wealth than younger workers, but are still somewhat risk adverse compared to older workers. Variables representing young adult and elderly age-cohorts were also tested, but not included in the final specification.

An increase in the unemployment rate is commonly viewed as an expansion in the regional supply of potential entrepreneurs (ACS and ARMINGTON, 2006; ARMINGTON and ACS, 2002; LEE et al., 2004; REYNOLDS, 1994). Conversely, unemployment rates may have a negative relationship to entry if symptomatic of constricted demand (AUDRETSCH and FRITSCH, 1994a; STOREY and JOHNSON, 1987). Other cross-sectional studies have found no significant relationships between regional firm formation and unemployment (REYNOLDS, 2007; SUTARIA and HICKS, 2004). For these reasons, I do not hypothesize a relationship between new firm formation and unemployment.

Ability to finance a new enterprise is another influential factor in the decision to start a new firm. I include the regional homeownership rate as a potentially important source of household equity and collateral (REYNOLDS, 1994). A variable representing the availability of local debt financing (measured as bank deposits per capita) was also considered but not included in the final model due to lacking significance.

Regional industrial organization

With the dependent variable scaled by the regional labor force, population enters the right hand side of the model to capture urbanization economies. The urban incubator hypothesis contends that new firms should be more prosperous in larger urban areas due to niche market opportunities, access to specialized services and labor, infrastructure, or other advantages (HOOVER and VERNON, 1959; LEONE and STRUYK, 1976; RENSKI, 2009). There may be offsetting diseconomies of higher labor and land costs—although these are not expected to greatly discourage entry as most start-ups hire few workers and require little space.

Average establishment size represents a variety of factors pertaining to industrial structure, culture, and institutional support available to new businesses. Areas where small firms proliferate are more likely to have a regional ethos that is more supportive of new business and tolerant of risk (CHINITZ, 1961; SAXENIAN, 1994). The supply of potential entrepreneurs may be curtailed in regions dominated by large plants because task specialization does not provide workers with experience in the range of technical and managerial skills necessary for small business success (O'FARRELL and HITCHENS, 1988). Subsidiaries and branch operations of large firms are also less likely to source inputs from local providers, resulting in fewer local market opportunities for new businesses (CHINITZ, 1961; MASON, 1991).

Industrial diversity is another facet of regional industrial organization that is often associated with urbanization. JACOBS (1969) and GLAESER *et al*. (1992), among others, view industrial diversity as a potential source of knowledge spillovers, in that new ideas often come from the confluence of diverse perspectives. Conversely, a highly diversified economy may signify the absence of strong regional industrial clusters with their associated advantages of localization economies, specialized networks, and institutional support (FESER et al., 2008; ROCHA and STERNBERG, 2005). Therefore, the direction of the relationship between industrial diversity and new firm formation is uncertain.

University research is a key source of the basic knowledge that fuels regional innovation (ANSELIN et al., 1997, 2000; AUDRETSCH and FELDMAN, 1996; JAFFE, 1989). Entrepreneurship provides the missing link that transforms basic research into economic growth (ACS et al., 2009; AUDRETSCH and KEILBACH, 2004; MUELLER, 2006). It is also believed that University R&D also encourages new firm creation directly (BANIA et al., 1993; KIRCHHOFF et al., 2007; KIRCHOFF et al., 2002; WOODWARD et al., 2006), such as through attempts by faculty and students to commercialize their research (SHANE, 2004). Beyond their role as producers of research, Universities also contribute to the entrepreneurial climate by providing access to university facilities, students and graduates as a source of skilled labor, and a number of less tangible influences such as serving as a cultural hub (DRUCKER and GOLDSTEIN, 2007; LUGER and GOLDSTEIN, 1997).

The final measure of regional industrial organization is its employment share in farming and agriculture. Although not covered by the SUSB, a dominant farming sector may influence entry in other industries. The highest rates of new firm formation and self-employment are often found in rural areas (ACS and ARMINGTON, 2006; REYNOLDS, 2007). SHANE (SHANE, 2008) attributes this to a lack of alternate employment opportunities, noting that highly touted 'entrepreneurial' places such as Silicon Valley have many fast growing businesses that lure workers away from self-employment. However, controlling for urbanization and growth, an farm-dependent economy may reflect a dearth of residents with high-career capacity, and is expected to have a negative relationship with entry (REYNOLDS 2007).

Quality of life and amenities

Quality of life factors may also help explain regional differences in the supply of nascent entrepreneurs. Entrepreneurship is a highly place-embedded form of economic activity and the decision where to start a business and is often closely intertwined with residential location preferences. FLORIDA (2002, 2005) emphasizes the importance of cultural, recreational and lifestyle amenities in attracting entrepreneurial workers. Building on this work, LEE et al. (2004) incorporate indices representing the regional concentration of artisan occupations into a labor market model of regional firm formation, where are found to be significant and positive. In this study, I include a variable measuring the share of employment in the arts, recreation, and entertainment to similar affect. In addition to arts and culture, I tested a number of variables representing other quality of life factors cited in studies of business location preferences including average travel time to work, the high school dropout rate, local tax burden, crime rate, and access to health care services (CALZONETTI and WALKER, 1991; LOVE and CROMPTON, 1999; SALVESEN and RENSKI, 2002). These were not included in the final model specification due to lacking significance and, in the case of travel time to work, highly correlated with educational attainment, unemployment, and homeownership.

Lastly, I include several measures representing preferred natural amenities (MCGRANAHAN, 1999). The mean temperature in January and mean summer humidity capture the offsetting preferences for mild winters but distaste for sweltering summers. I also include a dummy variable identifying hilly and mountainous areas. Dummies representing other varieties of topographical variation were considered, but insignificant.

Social capital

Social capital is notoriously difficult to define and even harder to measure with available data. Yet, many argue that it is important to entrepreneurship because it facilitates cooperation and trust, thus reducing transactions costs (WESTLUND and BOLTON, 2003). Place attachment, measured as the share of residents in 2000 that lived in the same county five years prior, is expected to have a positive association with entry, because residents with strong attachments are more likely to start businesses close to home than move in search of paid employment (STAM, 2007; THORNTON, 1999). It may also reflect stronger personal networks, which require time and familiarity to build and maintain. I also include two measures of general civic engagement: the rate of voter turnout in the 2000 presidential election and the share of regional adjusted gross income donated to charity (RUPASINGHA et al., 2000). All are expected to have positive associations with new firm formation rates.

Results

Table 4 provides basic descriptive statistics and pairwise correlations for the independent variables. Table 5 presents the spatial regression results both with (i.e. labor force approach) and without industry mix effects (i.e. the residual approach). Both sets of models explain a considerable portion of the regional variation in new firm entry that is consistent across study periods.

[Table 4]

[Table 5]

Expanding local market opportunities, represented by population growth and per capita income growth, are strongly associated with regional firm formation under both the labor force and residual specifications for the 2003 to 2005. However, of the two, only population growth was signification in 1998-00 model.

Labor force and household characteristics were highly influenced by the inclusion of industry mix effects. The population share of 35 to 49 years old and homeownership were positive and significant, but only for the labor force specification. Educational attainment was also significant and positive in both labor force models, although negative in the 2003-05 residual model and barely above the 90 percent significance threshold. Although generally thought to benefit all kinds of industries, the relatively weak performance of these measures in the residual models suggests that their influence may only span to those particular industries that produce more entrants. For example, the weak showing of educational attainment in the residual model may be because high-entry industries are concentrated in areas with a highly educated workforce, although the entry rates of these regions are not higher than what would be expected given this industry mix. Coefficients estimates for the 35 to 49 year old population and homeownership were notably larger in 2003-05, while the influence of educational attainment was larger in 1998-2000. The unfettered expansion of the knowledge economy during the later 1990s may have temporarily raised the premium on regional human capital in some specific high-entry industries, such as computer software, thereby effecting labor force estimates but not residual-based estimates. The tolerance values on educational attainment are also just above the .20 threshold used for identifying possible multi-colinearity bias. However, exclusion of the variables with the strongest cross-correlations with entry rates only had minor effects on coefficient estimates and significance values.

Regional differences in unemployment rates were insignificant in the labor force models, consistent with REYNOLDS (REYNOLDS, 2007; SUTARIA and HICKS, 2004) SUTARIA and HICKS (2004). Upon correcting for industry mix, unemployment becomes positive and significant in both study periods and notably higher during the economy recovery period of 2003 to 2005. The positive coefficient suggests that once industry-specific variability has been removed, regional differences in the unemployment rate better reflect the potential supply of entrepreneurs and not structural deficiencies in demand, as one might find in perpetually lagging regions. This does not rule out cyclical effects, however, as the role of unemployment in encouraging or discouraging business creation likely depends on how entrepreneurs perceive market opportunities given the health of the broader economy.

Average establishment size has a negative association with entry rates in both periods, consistent with past studies using the labor force approach (ACS and ARMINGTON, 2006; ARMINGTON and ACS, 2002; AUDRETSCH and FRITSCH, 1994a; KEEBLE and WALKER, 1994; LEE et al., 2004). However, average establishment size is also likely to reflect a region's industrial composition. The fact that this variable remains significant even after purging the data of industry mix effects lends even greater credence to the view that domination by larger plants can stifle the local entrepreneurial climate (CHINITZ, 1961; DRUCKER and FESER, 2012;

MASON, 1991). The importance of having a small firm environment also appears to have increased between 1998-00 to 2003-05, with coefficient estimates that are notably smaller (i.e. more negative) in the latter period.

Urbanization economies are also significant and positive across both measures of entry rates. However, the influence of urbanization was weaker in 1998-2000—with insignificant estimates in the labor force model. Industrial diversity was negative and significant in all four models, although only at a 90 percent significance threshold in the labor force model over the 2003-05 period. . This suggests that after controlling for other factors often associated with diversity such as urbanization and average establishment size, new firms were more likely to form in areas with a specialized industry structure. Consistent with REYNOLDS (2007) the share of employment in farming and agricultural was negative and significant, but only for the labor market models. This suggests that agricultural areas may be deficient in the types of industries that produce high numbers of new firms, but otherwise neither wanting or advantaged in their ability to produce new businesses.

Contrary to KIRCHHOFF et al. (2007), I find that University R&D has a negative influence on labor force based entry rates, with notably stronger effects in the latter 1990's. Although seemingly counterintuitive, most past studies finding a positive association between Universities and entry are restricted to high-tech industries (BAE and KOO, 2009; WOODWARD et al., 2006). Estimated on a broader set of detailed industries, BANIA et al. (1993) find that University R&D does not engender new firm creation in most industries. The negative significance of University R&D only appears in the labor force models, suggesting that University towns tend to specialize in rather low-entry industries as opposed to having a more broadly deficient environment for business creation. While viewed as innovative, many science- and knowledge-intensive industries that are drawn to research institutions actually have low-entry rates, presumably due specialized knowledge and equipment requirements and greater reliance on scarce ‘patient capital’ necessary to support the enterprise through an often lengthy product development phase. Regardless, one should interpret the results for University R&D with cautious skepticism, as University R&D is heavily concentrated in a fairly small number of regions making estimation rather precarious.

The proportion of employment in arts, entertainment and recreation was significant in both specifications, providing some credence to FLORIDA’S (2002, 2005) assertion that entrepreneurs favor places rich in the arts. The influence of arts and entertainment establishments on entry was also notably higher in the 2003-05 period—particularly so in the labor force model—commensurate with the resurgence of many U.S. cities in the early years of the new millennium. Considering natural amenities, entrepreneurs seem to prefer hilly and mountainous areas with relatively mild winters and low humidity.

Variables representing civic participation and social commitment have positive associations with regional new firm formation in both time periods. However, my measure of place attachment—the proportion of the non-migrant population—is insignificant in the standard labor-force specification and negatively associated with entry in the residual model. While some of the positive aspects of place attachment may be captured elsewhere, the negative association between this variable and firm formation emphasizes that regions that are magnets for new business creation are dynamic areas characterized by high volumes of in and out migration. Rather than measuring strong local networks, as originally hypothesized, this variable seems to be more indicative of immobile population in areas suffering from long-term economic distress.[iv]

Conclusions

This paper addresses an important, but underappreciated, question in the study of regional entrepreneurship – how much of the observed regional variation of new firm entry rates is due to industry-specific conditions and how much is due to place-based factors that transcend industries? The combination of place attachment, industry experience, and regional specialization create an uneven landscape of firm formation that largely mirrors the existing industry mix. The presence of same industry incumbents explain upwards of 70% of the observed variation in regional firm formation for most industries. Yet, correcting for industry mix primarily effects the relative ordering of regions in the middle and at the low end of the spectrum. Regions producing the most new firms under standard entry rates tend also to be those producing the most new firms after accounting for industry mix.

This suggests that there are other aspects of the firm formation process that transcend industry-specific conditions but vary by region, coinciding with the conclusions of FRITSCH AND FALCK (2007). To explore this issue further, I compare two sets of regression models of new firm formation—one where entry is scaled by the size of the labor force and the other controlling for industry mix effects. Despite the fact that industry-specific differences in entry rates explain a potentially large portion of the amount of new firm creation in a region, most of the key explanatory variables remain significant and with consistent signage regardless of whether industry-mix effects are included or excluded from the calculation of regional entry rates. Population and personal income growth; urbanization economies; industrial specialization; predominance of smaller establishments; employment in arts, leisure and recreational industries; mild winters with low humidity; hilly and mountainous areas, and civic commitment in the form of charitable giving and voter turnout—these factors remain significant determinants of regional variation in entry regardless industry mix.

However, there are some important results that appear to be purely contingent upon regional variations in industry mix. Demographic factors—such as the share of residents between 35 and 49, educational attainment, and homeownership—that are positively associated with entry according to the labor force method were instead discovered to be the result of regional variation in industrial composition. University R&D and dependence on farming and agriculture, which had a dampening effect on entry rates under the labor force specification, were also found to be contingent upon the inclusion of industry mix effects. Unemployment rate (+) and place attachment (-) were only significant after correcting for regional variations in entry due to industry mix effects. These two factors would likely be overlooked in standard models based on labor force entry rates.

The approach taken here is subject to a number of limitations that should be addressed in future work. Like standard shift-share techniques, the residual method is a rather segmented view of the regional economy that does not account for possible synergies between industries (DAWSON, 1982; STIMSON et al., 2006). It also implicitly views entrepreneurship as driven by top-down forces such as national shifts in technology and changing consumer preferences. The residual is merely what remains after these broader forces have run their course. A more realistic perspective recognizes the importance of both top-down and bottom-up forces, and that the balance of these spatial forces may differ across industries (AUDRETSCH and FRITSCH, 1999).

A further limitation is that this study focuses on entry as a measure of regional entrepreneurial capacity. From an economic development perspective, it is not simply a region's capacity to create new businesses that matters. But also whether they are able to survive and expand--thereby contributing to net job growth over the long term. While Birch (1987) once argued that most of the regional differences in job creation to is largely due to variation in entry rates because job losses from failure were largely constant across regions. More recent work finds that new firm survival rates not only systematically differ by region but do so in ways that are partly distinct from regional variations in entry (ACS et al., 2007; BRIXY and GROTZ, 2007; RENSKI, 2011; WENNBERG and LINDQVIST, 2010).

Acknowledging these limitations does not change the fundamental point of this paper—measures of regional entrepreneurship need to distinguish purely local influences from industry mix effects. This is not a trivial issue because current entrepreneurship policy is at least partly influenced by metrics that do not account for industry mix. For scholars, the best solutions are either to focus on specific industries while incorporating region-specific factors or use mixed modeling approaches that distinguish within-industry variation from within-region variation. However, single-industry and advanced modeling techniques are unlikely to find widespread adoption in the types of benchmarking studies common in the policy sphere. In this case, the residual approach presented here might serve as a viable framework that balances the need for simple and intuitive measures of regional firm formation that aligns with common perceptions of entrepreneurial climate.

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[i] For more information on the SUSB series, please visit http://www.census.gov/econ/susb/.
[ii] County-level SUSB data at the five-digit NAICS-level was obtained by special request to the US Census Bureau.
[iii] For more information on Commuting Zones and how they are defined the interested reader is referred to the USDA Economic Research Service website http://www.ers.usda.gov/briefing/rurality/lmacz/.
[iv] The highest concentrations of stationary populations are found in areas such as Central Appalachia, the Mississippi Delta, the Texas-Mexico border, and the “rust-belt” areas of Ohio, Upstate New York and Western Pennsylvania.

Figure 1

Percentage distribution of industry-specific entry rates (new firms per incumbents)

Measured as the number of regional new firm starts per incumbent in the same industry

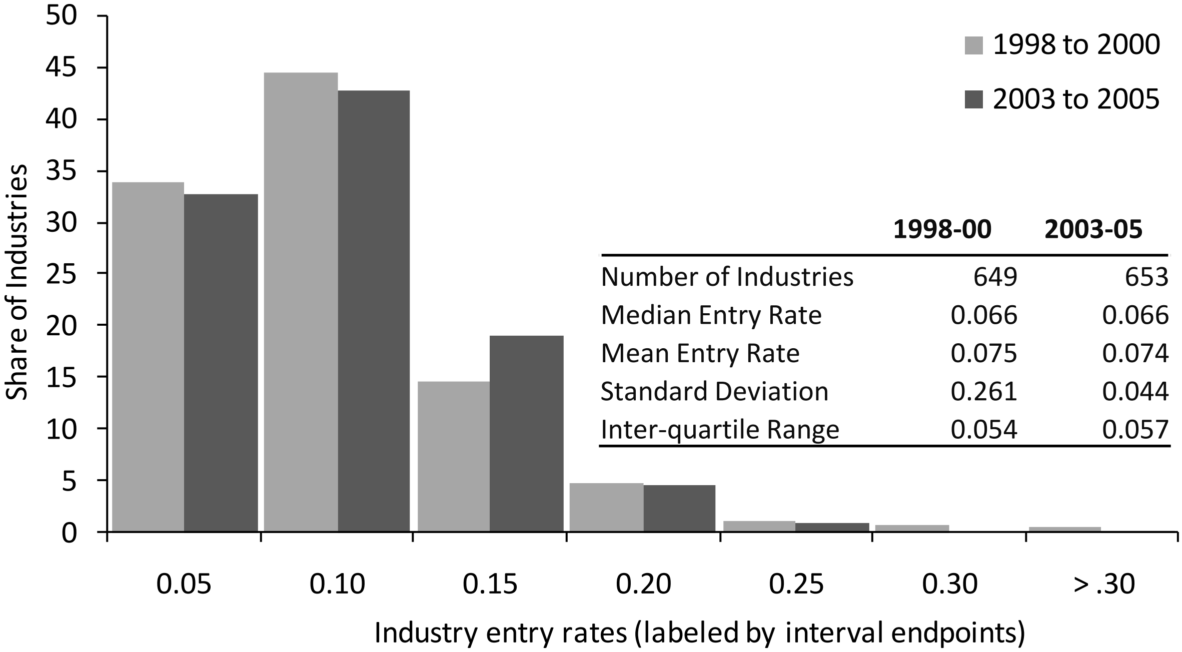
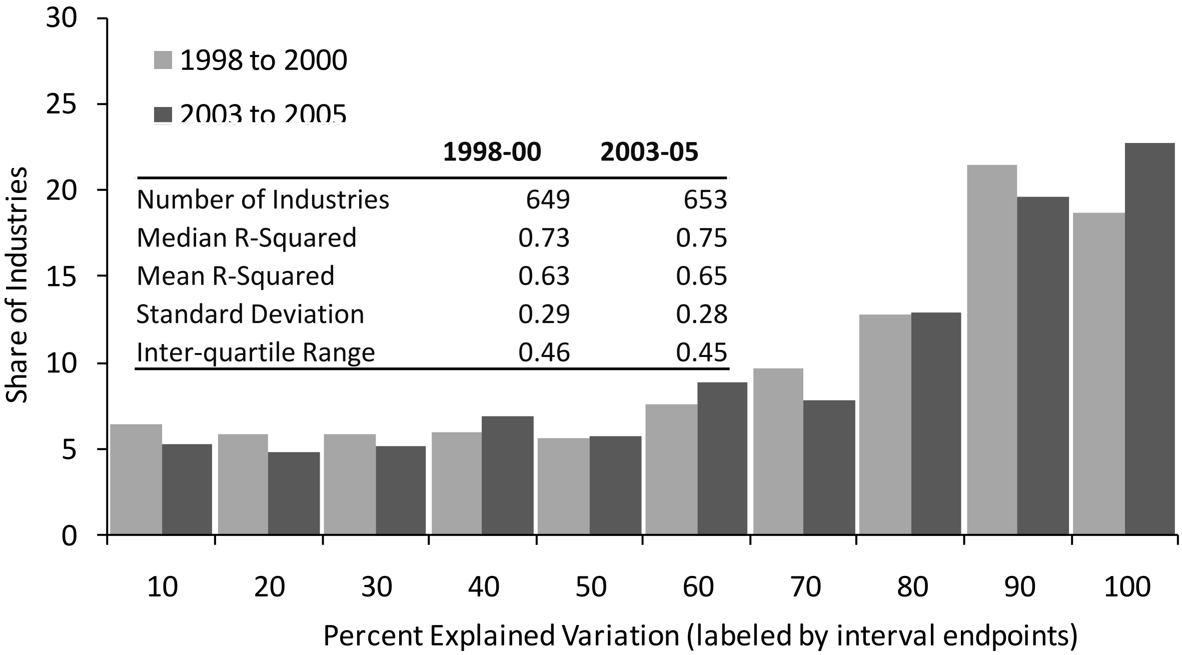


Figure 2

The share of new firms entry explained by same-industry incumbents in the region



	1998-00	2003-05
Number of Industries	649	653
Median R-Squared	0.73	0.75
Mean R-Squared	0.63	0.65
Standard Deviation	0.29	0.28
Inter-quartile Range	0.46	0.45

Table 1

New firm entry rates and the share of entry explained by incumbents, by industry sector

Represented by the median entry rate of five-digit NAICS industries within each sector

	1998 to 2000			2003 to 2005		
Sector	Number of Entrants (annual ave.)	Entry Rate (β)	Explained Variation (R^2)	Number of Entrants (annual ave.)	Entry Rate (β)	Explained Variation (R^2)
Agriculture, Forestry, Fishing and Hunting	3,175	0.094	0.597	2,676	0.096	0.721
Mining	1,805	0.054	0.229	1,951	0.063	0.330
Utilities	553	0.035	0.278	366	0.028	0.237
Construction	81,229	0.110	0.894	102,119	0.128	0.882
Manufacturing	10,841	0.045	0.370	9,310	0.047	0.393
Wholesale Trade	29,507	0.066	0.808	28,029	0.058	0.821
Retail Trade	73,213	0.066	0.858	75,227	0.074	0.876
Transportation and Warehousing	21,213	0.072	0.621	21,868	0.076	0.698
Information	11,020	0.081	0.766	8,537	0.074	0.774
Finance and Insurance	24,455	0.067	0.714	27,635	0.075	0.733
Real Estate and Rental and Leasing	27,835	0.076	0.809	36,493	0.077	0.828
Professional, Scientific, and Technical Services	79,676	0.106	0.874	85,677	0.100	0.891
Management of Companies and Enterprises	1,227	0.034	0.622	613	0.017	0.691
Administrative, Support, Waste Management	36,522	0.081	0.874	39,080	0.092	0.883
Educational Services	6,161	0.098	0.840	7,448	0.089	0.826
Health Care and Social Assistance	41,187	0.050	0.693	48,620	0.060	0.721
Arts, Entertainment, and Recreation	10,166	0.085	0.695	13,019	0.094	0.702
Accommodation and Food Services	46,522	0.080	0.816	58,864	0.094	0.787
Other Services (except Public Administration)	50,090	0.066	0.865	54,418	0.077	0.893

Figure 3

Distribution of Commuting Zones by change in relative rank of new firm formation rates
Labor Force method – Residual method, 2003-05

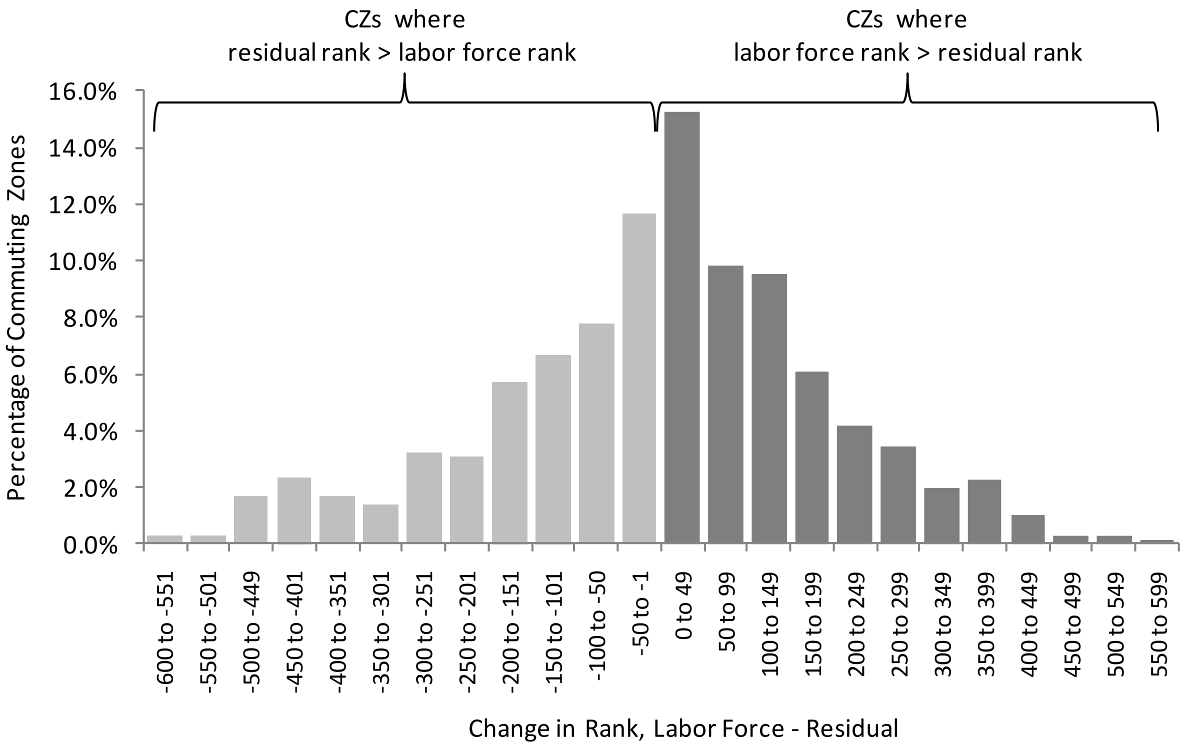


Figure 4

Change in rank ordering, Labor Force Rank minus Residual Method

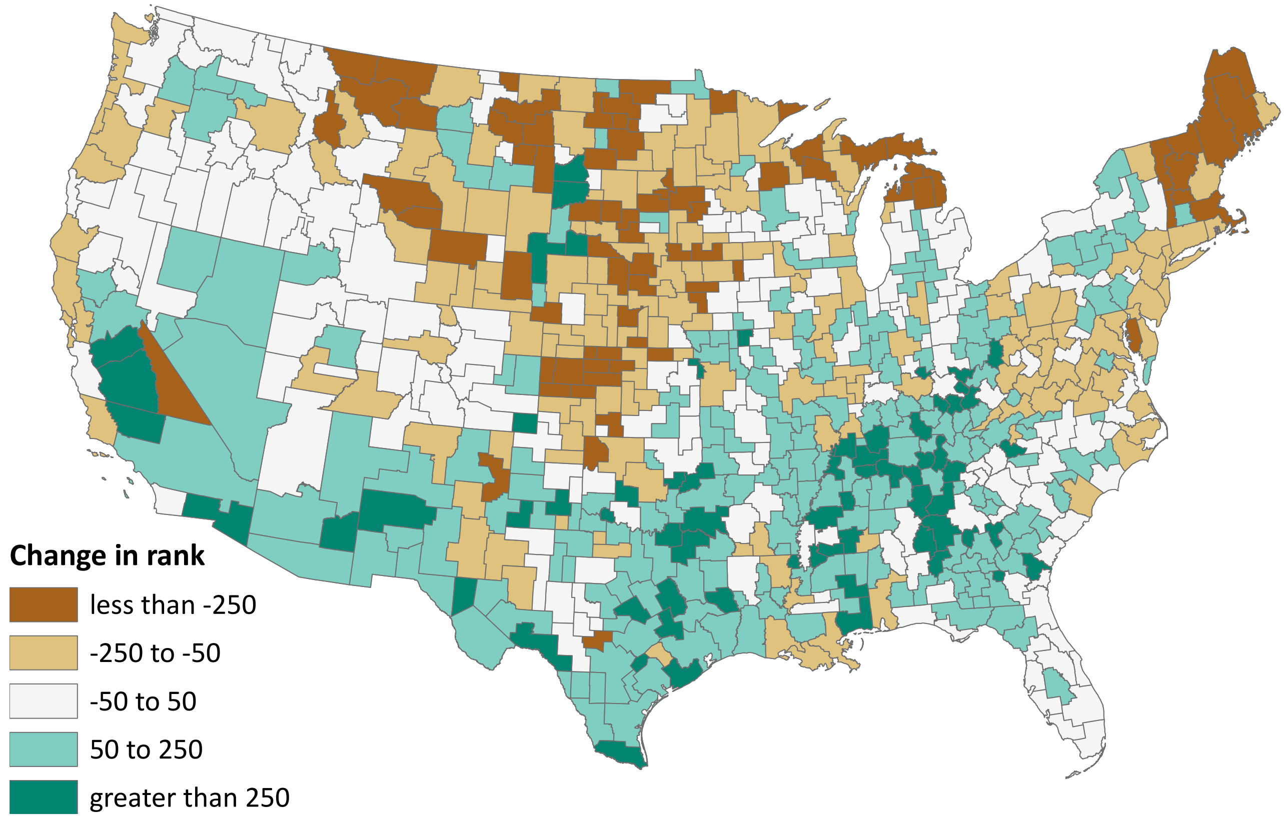


Table 2
Top Twenty Five Commute Zones
New Firm Formation Rates, Labor Market and Residual Methods

Labor Force Method				Residual Method				
Rank	Labor Market Area	Formation Rate	Z-Score	Rank	Labor Market Area	Formation Rate	Z-Score	Rank Gain/Loss
1	McCall city, ID	18.12	8.45	1	McCall city, ID	6.59	8.99	0
2	Jackson town, WY	14.35	6.16	2	St. George city, UT	3.56	5.06	11
3	Gunnison city, CO	13.75	5.80	3	Bend city, OR	2.57	3.77	11
4	Friday Harbor town, WA	12.99	5.33	4	Bozeman city, MT	2.54	3.74	2
5	Kremmling town, CO	12.96	5.31	5	Vernal city, UT	2.39	3.54	13
6	Bozeman city, MT	11.95	4.70	6	Kalispell city, MT	2.38	3.54	4
7	Salida city, CO	11.70	4.55	7	Bonners Ferry city, ID	2.38	3.54	5
8	Glenwood Springs city, CO	11.46	4.41	8	Kremmling town, CO	2.30	3.43	-3
9	Enterprise city, OR	11.33	4.33	9	Gunnison city, CO	2.23	3.34	-6
10	Kalispell city, MT	10.72	3.96	10	Jackson town, WY	2.14	3.23	-8
11	Nantucket CDP, MA	10.49	3.82	11	Enterprise city, OR	2.13	3.21	-2
12	Bonners Ferry city, ID	10.19	3.63	12	Hawthorne CDP, NV	2.02	3.07	143
13	St. George city, UT	9.75	3.37	13	Cape Coral city, FL	1.89	2.90	6
14	Bend city, OR	9.65	3.31	14	Buffalo town, SD	1.84	2.83	90
15	Craig city, CO	9.19	3.03	15	Orlando city, FL	1.83	2.82	22
16	Moab city, UT	8.71	2.73	16	Daytona Beach city, FL	1.79	2.76	27
17	Libby city, MT	8.59	2.66	17	Ocala city, FL	1.75	2.72	22
18	Vernal city, UT	8.56	2.64	18	Provo city, UT	1.74	2.71	43
19	Cape Coral city, FL	8.42	2.56	19	Sarasota city, FL	1.73	2.69	3
20	Vineyard Haven CDP, MA	8.02	2.32	20	Miami city, FL	1.67	2.62	7
21	Port Angeles city, WA	8.02	2.31	21	Salida city, CO	1.63	2.57	-14
22	Sarasota city, FL	7.92	2.26	22	Loa town, UT	1.52	2.42	16
23	Scobey city, MT	7.88	2.23	23	Blue Ridge city, GA	1.48	2.37	56
24	Franklin town, NC	7.85	2.21	24	Las Vegas city, NV	1.47	2.35	60
25	Quincy-East Quincy CDP, CA	7.79	2.17	25	Mason city, TX	1.43	2.30	33

Table 3

Bottom Twenty Five Commute Zones

New Firm Formation Rates, Labor Market and Residual Methods

Labor Force Method				Residual Method				
Rank	Labor Market Area	Formation Rate	Z-Score	Rank	Labor Market Area	Formation Rate	Z-Score	Rank Gain/Loss
698	Athens city, OH	2.59	-0.98	698	Iowa Falls city, IA	-1.34	-1.28	-256
699	Guymon city, OK	2.59	-0.98	699	Red Oak city, IA	-1.34	-1.28	-115
700	Henderson city, NC	2.59	-0.98	700	Ogallala city, NE	-1.34	-1.29	-431
701	Portsmouth city, OH	2.58	-0.99	701	Wheeling city, WV	-1.37	-1.32	-104
702	Elmira city, NY	2.58	-0.99	702	Liberal city, KS	-1.40	-1.37	-217
703	Jacksonville city, IL	2.57	-0.99	703	Dickinson city, ND	-1.40	-1.37	-407
704	Zanesville city, OH	2.53	-1.02	704	Storm Lake city, IA	-1.41	-1.37	-246
705	Plainview city, TX	2.51	-1.03	705	Lewistown city, MT	-1.42	-1.39	-554
706	Van Horn town, TX	2.49	-1.04	706	Norton city, KS	-1.42	-1.39	-444
707	Binghamton city, NY	2.49	-1.04	707	Guymon city, OK	-1.46	-1.44	-8
708	Sheboygan city, WI	2.48	-1.04	708	Petoskey city, MI	-1.46	-1.44	-614
709	Dayton city, OH	2.48	-1.05	709	Carroll city, IA	-1.48	-1.46	-292
710	Mansfield city, OH	2.42	-1.08	710	Mount Vernon city, IL	-1.48	-1.46	-65
711	Findlay city, OH	2.40	-1.09	711	Columbus city, NE	-1.49	-1.48	-93
712	McMinnville city, TN	2.34	-1.13	712	Linton city, ND	-1.52	-1.52	-504
713	Sunbury city, PA	2.33	-1.14	713	Colby city, KS	-1.53	-1.53	-564
714	Bennettsville city, SC	2.30	-1.16	714	Hastings city, NE	-1.55	-1.56	-136
715	Beeville city, TX	2.28	-1.17	715	International Falls city, MN	-1.56	-1.57	-255
716	Pearsall city, TX	2.26	-1.18	716	Parkston city, SD	-1.64	-1.68	-220
717	Washington city, OH	2.25	-1.19	717	Bowman city, ND	-1.69	-1.74	-451
718	Defiance city, OH	2.14	-1.26	718	Great Bend city, KS	-1.71	-1.77	-193
719	North Eagle Butte CDP, SD	2.12	-1.26	719	Cooperstown city, ND	-1.82	-1.91	-440
720	Crystal City city, TX	2.06	-1.30	720	Seymour city, TX	-1.87	-1.97	-171
721	McLaughlin city, SD	2.03	-1.32	721	York city, NE	-1.92	-2.04	-91
722	Rosebud CDP, SD	1.14	-1.86	722	Gettysburg city, SD	-3.17	-3.65	-148

Table 4
Independent Variables, Influences on Regional New Firm Formation

Variable Label	Measurement	Source	Expected Direction
Local demand			
Personal income growth	Per capita personal income growth in the five year period prior to the start of the entry period	US Bureau of Economic Analysis, Regional Economic Information	+
Population growth	Population growth rate in the five year period prior to the study period	US Census Bureau, Annual Population Estimates	+
Labor force and household characteristics			
Population, 35 to 49 years	Share of persons aged 35 to 49 years old in the region	US Census Bureau, Annual Population Estimates	+
Educational attainment	Share of persons 24 years and older with a Bachelors Degree or higher	US Census Bureau, 2000 Census of Population and Housing	+
Unemployment rate	Percentage of unemployed persons in the civilian labor force	US Bureau of Labor Statistics, Local Area Unemployment Series	+/-
Homeownership rate, 2000	Owner-occupied housing units as a share of total occupied housing units	US Census Bureau, 2000 Census of Population and Housing	+
Regional industrial organization			
Urbanization economies	Resident population per 100,000 persons	US Census Bureau, Annual Population Estimates	+
Average establishment size	The number of business establishments in the region divided by the total number of employees	US Census Bureau, County Business Patterns	+
Industrial Diversity	One minus the value of the Herfindhal/Hirschman Index, estimated using 2 digit NAICS employment	US Census Bureau, County Business Patterns	+/-
University R&D	University R&D expenditures in science and technology (in $ 000s) per capita	National Science Foundation, Webcaspar Database	+
Farming and agriculture	Share of total employment (public, private and proprietary) in farming or agricultural industries	US Bureau of Economic Analysis, Regional Economic Information	-
Quality of Life Characteristics			
Arts, leisure & recreation	Share of employment in the arts, leisure, recreation and entertainment services sectors	US Census Bureau, County Business Patterns	+
January temperature	Mean January temperature 1941 to 1970 (fahrenheit) - maximum value of CZ counties	US Dept. of Agriculture (USDA), Economic Research Service	+
Humidity	Mean relative humidity, July 1941-1970 - maximum value among CZ counties	US Dept. of Agriculture (USDA), Economic Research Service	-
Hilly and mountainous areas	Dummy variable indicating areas with a high degree of topographic variation	US Dept. of Agriculture (USDA), Economic Research Service	+
Social capital			
Voter turnout	Votes cast in most recent presidential election as a share of the population 18 years old or greater	Congressional Quarterly	+
Charitable Donations	Charitable donations ($) intemized on income tax returns, divided by adjusted gross income	National Center For Charitable Statistics	+
Place attachment	Share of the resident population (5+ years) living in the same county of residence five years prior	US Census Bureau, 2000 Census of Population and Housing	+

Table 5

Independent Variables, Descriptive Statistics and Pairwise Correlations

	Mean '03-05	*Std Dev '03-05*	Personal income growth	Population growth	Population, 35 to 49 yrs	Educational attainment	Unemployment rate	Homeownership rate	Urbanization economies	Ave. establishment size	Industrial Diversity	University R&D	Farming & agriculture	Arts, leisure & recreation	January temperature	Humidity	Hilly and mountainous	Voter turnout	Charitable Donations	Place attachment
Mean, '98-00			18.7	1.3	27.6	17.8	5.9	71.7	4.0	12.4	87.0	0.05	8.0	1.5	32.9	54.5	0.24	58.6	2.0	79.2
Std Dev, '98-00			6.2	5.7	2.1	6.1	1.8	5.6	11.0	3.5	4.6	0.20	7.2	1.4	12.6	15.8	0.43	8.6	0.7	5.7
			Correlation Matrix																	
Personal income growth	23.9	7.6		-0.22	-0.11	0.06	-0.12	-0.08	-0.08	-0.27	-0.09	0.02	0.20	0.06	-0.19	-0.15	0.04	0.17	-0.22	0.08
Population growth	4.5	6.0	-0.03		0.39	0.43	0.10	-0.29	0.27	0.43	0.25	0.14	-0.57	0.18	0.35	0.11	0.22	-0.20	0.43	-0.51
Population, 35 to 49 yrs	28.7	2.5	0.12	0.44		0.35	0.01	-0.21	0.39	0.51	0.17	-0.11	-0.50	0.11	0.09	0.29	0.13	-0.06	0.14	-0.08
Educational attainment	17.8	6.1	0.17	0.30	0.46		-0.33	-0.54	0.39	0.18	0.31	0.39	-0.40	0.31	-0.09	-0.07	0.11	0.28	0.33	-0.51
Unemployment rate	5.2	2.6	-0.23	0.01	-0.14	-0.38		0.05	0.04	0.10	0.01	-0.12	-0.17	-0.01	0.30	0.02	0.16	-0.33	-0.04	0.18
Homeownership rate	71.7	5.6	0.08	-0.19	-0.23	-0.54	0.02		-0.37	-0.27	-0.19	-0.33	0.26	-0.14	-0.20	0.11	-0.07	0.26	-0.14	0.42
Urbanization economies	3.8	10.4	0.09	0.12	0.36	0.39	-0.08	-0.37		0.34	0.23	0.02	-0.29	0.04	0.16	0.14	0.06	-0.10	0.17	-0.02
Ave. establishment size	12.4	3.6	0.25	0.21	0.45	0.18	-0.17	-0.24	0.33		0.15	0.11	-0.66	-0.17	0.28	0.47	-0.04	-0.32	0.30	0.04
Industrial Diversity	86.2	5.8	0.07	0.08	0.14	0.30	-0.05	-0.17	0.20	0.00		0.10	-0.30	0.08	0.13	0.01	0.08	-0.02	0.19	-0.12
University R&D	0.04	0.16	0.03	0.07	-0.06	0.39	-0.14	-0.34	0.01	0.08	0.08		-0.15	-0.01	0.03	0.02	0.00	-0.02	0.08	-0.34
Farming & agriculture	8.7	7.5	-0.26	-0.36	-0.54	-0.37	0.00	0.23	-0.28	-0.65	-0.17	-0.15		-0.12	-0.24	-0.36	-0.21	0.20	-0.34	0.19
Arts, leisure & recreation	1.5	2.2	0.01	0.18	0.16	0.20	0.01	-0.15	0.00	-0.13	0.01	-0.02	-0.04		-0.13	-0.17	0.19	0.21	0.04	-0.23
January temperature	32.9	12.6	-0.20	0.35	0.07	-0.09	0.24	-0.20	0.16	0.27	0.04	0.03	-0.25	-0.15		0.26	0.04	-0.64	0.31	-0.16
Humidity	54.5	15.8	0.28	-0.12	0.21	-0.07	-0.15	0.11	0.14	0.46	-0.05	0.02	-0.36	-0.11	0.26		-0.10	-0.11	0.07	0.25
Hilly and mountainous	0.24	0.43	-0.06	0.22	0.21	0.11	0.18	-0.07	0.06	-0.04	0.08	0.01	-0.21	0.12	0.04	-0.10		-0.05	0.05	-0.12
Voter turnout	53.6	8.1	0.23	-0.16	0.03	0.31	-0.31	0.28	-0.08	-0.33	0.03	-0.04	0.22	0.15	-0.62	-0.18	-0.02		-0.10	0.06
Charitable Donations	1.6	0.6	0.08	0.41	0.22	0.40	-0.17	-0.18	0.19	0.33	0.14	0.10	-0.36	-0.03	0.25	0.02	0.07	-0.01		-0.29
Place attachment	79.2	5.7	0.08	-0.60	-0.22	-0.51	0.22	0.42	-0.01	0.04	-0.08	-0.35	0.18	-0.16	-0.16	0.25	-0.12	0.02	-0.30	

Note: Cell values above the principle diagonal are from 2003-05, values below are from 1998-00.

Table 6

Regional influences on new firm formation rates (Labor Market vs. Residual Entry Rates) 2003 to 2005 and 1998 to 2000

	2003-2005 Study Period				1998-2000 Study Period			
	Labor Force Birth Rates		Residual Birth Rates		Labor Force Birth Rates		Residual Birth Rates	
Number of Observation	719		719		719		719	
R Squared	0.75		0.58		0.74		0.59	
Log Likelihood	-876.0		-536		-792.5		-515	
AIC	1,790		1,111		1,623		1,069	
	Est	**Prob**	**Est**	**Prob**	**Est**	**Prob**	**Est**	**Prob**
Intercept	1.717		0.638		1.414		0.098	
Personal income growth	0.013	**	0.015	***	0.007		-0.001	
Population growth	0.050	***	0.051	***	0.050	***	0.040	***
Population, 35 to 49 years	0.084	***	0.001		0.062	***	-0.001	
Educational attainment	0.039	***	-0.013	*	0.053	***	0.001	
Unemployment rate	0.002		0.046	***	-0.002		0.020	**
Homeownership rate	0.027	***	0.009		0.018	**	0.004	
Urbanization economies	0.011	***	0.009	***	0.004		0.005	**
Average establishment size	-0.301	***	-0.054	***	-0.265	***	-0.037	***
Industrial Diversity	-0.013	*	-0.012	***	-0.010	**	-0.008	**
University R&D	-0.507	***	0.031		-0.714	***	0.071	
Farming & agriculture	-0.044	***	0.009	*	-0.036	***	0.004	
Arts, leisure & recreation	0.160	***	0.041	***	0.055	***	0.030	***
January temperature	0.014	**	0.018	***	0.014	***	0.017	***
Humidity	-0.012	***	-0.008	***	-0.007	**	-0.006	***
Hilly and mountainous areas	0.248	**	0.145	**	0.246	***	0.186	***
Voter turnout	0.041	***	0.018	***	0.025	***	0.013	***
Charitable Donations	0.385	***	0.110	***	0.411	***	0.107	**
Place attachment	-0.011		-0.025	***	0.007		-0.012	**
lag coefficient (lambda)	0.496	***	0.441	***	0.485	***	0.506	***

* > 90% significance, two-tailed distribution

** > 95% significance, two-tailed distribution

*** > 99% significance, two-tailed distribution