

ABSTRACT

HENRY RENSKI: An Investigation of the Industrial Ecology of Business Start-up Survival

(Under the Direction of Edward Feser)

This study examines the influence of external economies on the survival and longevity of new independent businesses in the continental U.S. It hypothesizes that new firms with access to the sources of specialized inputs, labor, product markets and knowledge spillovers will outlive those in areas of relative isolation. The size of the region and the diversity of its industrial base are also considered as possible sources of beneficial external economies.

The findings show that while external economies have a statistically significant influence on new firm survival, the effects are typically very modest. The most consistently significant effects are found for localization, which lowers the risk of new firm failure in five of the nine detailed study industries examined: farm and garden machinery, metalworking machinery, motor vehicle parts, advertising and computer and data programming services. After controlling for other sources of external economies, the size of the region is insignificant for most industries. By contrast, regional industrial diversity reduces hazard rates for new firms in drugs, advertising, computer and data processing, and research and testing services.

Measures representing the specific sources of localization are statistically significant in fewer industries than the broadly defined measures of localization, but when significant they often have a stronger influence on new firm longevity. Among the specific sources of

localization, proximity to specialized input suppliers is the most consistently significant, reducing hazard rates for new firms in metalworking machinery, advertising, and computer and data processing services. Proximity to intermediate product markets is only significantly beneficial in the professional services sector. Labor pooling is either insignificant or found to increase new firm hazard rates, but only after the other sources of localization are controlled. Industry knowledge spillovers significantly reduce hazard rates for new firms in the drugs and motor vehicle parts industry, but the accuracy of the variable may be sensitive to industry-specific differences in the economic value of patenting.

This study also investigates whether and how the size of the establishment influences new firms' ability to benefit from their external environment. The evidence suggests that smaller businesses are the most common beneficiaries of external economies, but not in all cases. There are several examples, most commonly for urbanization, where external economies increase the failure rates of larger plants while having little effect on smaller ones. There are also several industries where an increase in external economies produces a relative reduction in hazard rates for medium sized plants, but have little effect on smaller plants.

Overall the research implies that entrepreneurial development strategies are likely to be more effective if designed to capitalize upon a region's existing strengths and assets. The beneficial influence of localization and diversity are often strongest when estimated at larger spatial scales, i.e. those approximating the size of commuting sheds and labor market areas. That provides some conditional support for rural development strategies aimed at strengthening ties to nearby metropolitan areas.

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Background

Recent years mark a sea change in our understanding of the role of small and new firms in national and regional development. For much of the 20th century it was widely believed that large firms were the dominant force in regional development, innovation, and growth. Large firms pay higher wages and offer greater job stability than small firms (Galbraith 1956; Brown *et al.* 1990). Large employers also invest more in R&D and produce more patents than small firms (Galbraith 1956; Acs and Audretsch 1990). The historical emphasis on size is reflected in the amount of fiscal incentives leveraged in pursuit of large manufacturing branch plants (Hanson 1993; Peters and Fisher 2004). But with increasing numbers of branch plants opting for low cost sites off-shore, policy makers are looking inward for new strategies to stimulate job growth and long run economic prosperity (Eisinger 1995).

Entrepreneurial development strategies offer a possible alternative. New firms are a key source of jobs and employment growth. Roughly 26 percent of the jobs added to the economy between 1991 and 1996 came from establishment births, compared to approximately 17 percent attributed to the expansion of existing firms (Acs and Armington 2004). In fact, much of the job generation previously attributed to small firms (Birch 1987) is more accurately attributed to new firms, the vast majority of which happen to be small (Haltiwanger and Krizan 1999).

New firms also play an important part in dynamic processes of technological evolution. Many new firms are entrepreneurial endeavors that take existing intellectual, social, human, and financial resources, and reorganize them in pursuit of market opportunities (Baumol 1993). By connecting new ideas with markets, entrepreneurs provide a medium for translating new knowledge into economic growth (Audretsch 1995; Geroski 1995; Audretsch and Keilbach 2004) and are a central mechanism through which regional economies adapt to exogenous technological change (Malecki 1994). Entrepreneurs also continually push the bounds of the technological frontier and challenge existing competitors to stay sharp (Audretsch 1995; Geroski 1995).

Given the strong ties between entrepreneurship, innovation, and economic growth it is imperative for economists and policy makers to understand the conditions that nurture and sustain new business activity. External economies provide a theoretical rationale for how small businesses are able to compete successfully in an economy dominated by larger and more established enterprises (Marshall 1920 [1890]; Young 1928). Cities have long been viewed as “incubators” for new firms and emerging industries, namely by affording larger markets for niche production (Vernon 1960; Leone and Struyk 1976; Norton and Rees 1979). But an increase in the extent of the market also increases opportunities for specialization in intermediate inputs and skilled labor markets (Marshall 1920 [1890]; Stigler 1951; Malecki 1990; Krugman 1991). By specializing in core competencies and looking to the market for peripheral inputs and services, closely settled small plants may be able to produce at comparable efficiencies as larger competitors (Marshall 1920 [1890]; Carlsson 1996; Oughton and Whittam 1997; Sweeney and Feser 1998; Feser 2001). It is also widely believed spatial proximity aids the transmission of tacit knowledge (Breschi and Lissoni 2001; Howells 2002). Knowledge spillovers are believed to be particularly important to the formation and successful commercialization of innovation by entrepreneurial firms (Nelson and Winter 1982; Winter 1984; Audretsch 1991; Audretsch 1995). New firms also rely heavily on external information networks to help reduce the inherent ambiguity of new business ventures (Minniti 2005).

Research Question and Methods

This study uses establishment survival and longevity data to investigate the relationship between external economies and the post-entry performance of new independent businesses in the continental U.S. Survival has particular appeal as a gauge for local entrepreneurial policy. It is well known that most new firms fail within the first few years, with expected failure of over 50 percent within five years of formation (Acs *et al.* 1999; Knaup 2005). Such a high likelihood of failure limits the attractiveness of entrepreneurial development strategies in the eyes of regional development policy makers, venture capitalists, and other potential investors (Ettliger 1994).

I hypothesize that new firms with access to the sources of specialized inputs, labor, product markets and knowledge spillovers will outlive those in areas of relative isolation. The size of the region and its industrial diversity are other potential sources of beneficial externalities, such as access to superior infrastructure, cultural amenities, greater opportunities for niche production

and the spread of new ideas between persons of differing backgrounds. Longevity data comes from the Bureau of Labor Statistics' *Longitudinal Database* (LDB). The LDB is a virtual census of private-sector business activity in the United States, covering all establishments subject to state unemployment insurance (UI) reporting requirements. With the aid of unique establishment identifiers in the LDB, I identify new firms born in 1994 and 1995 and track each from its birth until it either exits the market or survives beyond seven full years. To account for industrial heterogeneity, I focus on a representative set of manufacturing and business and professional service industries, most defined by three-digit SICs. Proxy measures for different types of external economies and control variables are calculated from numerous secondary data sources for the territory surrounding each new firm.

I use a discrete event duration model to study the influence of external economies on the new firm hazard rate –the instantaneous probability that a plant fails at a given time provided that the plant has survived to the start of the interval. The first set of models represents external economies with broadly defined indicators of localization and urbanization, measured as same-industry industrial specialization and the size of the region, respectively. The second set replaces these broad measures with indicators of the specific sources of localization (i.e. labor pooling, input suppliers, intermediate goods markets, and knowledge spillovers) and urbanization (region size and industrial diversity). Each model is tested with and without additional regional controls, and estimated at multiple spatial scales.

Summary of Findings

The study finds that external economies have a statistically significant influence on new firm survival, but the effects are typically very modest. The most consistently significant effects are found for localization, defined as the relative specialization of own-industry establishments. Industrial specialization significantly lowers the risk of new firm failure in five of the nine detailed study industries examined: farm and garden machinery, metalworking machinery, motor vehicle parts, advertising and computer and data programming services. After controlling for localization, urbanization –measured as total regional employment –is largely insignificant in most industries. I view this as the likely outcome of offsetting positive economies from infrastructure and market access and diseconomies from the higher congestion, land, and factor input costs associated with large cities. After including additional controls for regional human

capital, population growth, local university strength and the possible dominance of large employers, an increase in the size of the region increases the likelihood of failure for new firms in most industries. Only in computer and data programming services do new firms consistently benefit from location in bigger places.

In general, measures representing the specific sources of localization are significant in fewer industries than when localization is represented by a single measure of own-industry specialization. But when they are significant, the detailed measures typically have a stronger effect on new firm hazard rates. This suggests that while the detailed measures of the sources of localization may provide a closer approximation of the theoretical forces of agglomeration, they lack sufficient spatial variation to effectively distinguish their separate effects in most industries.

Among the specific sources of localization, proximity to specialized input suppliers was the most consistently significant, reducing hazard rates for new firms in metalworking machinery, advertising, and computer and data processing services. These results add to the growing body of evidence that specialized input suppliers are an important source of proximity benefits (Dumais *et al.* 1997; Feser 2001, 2002; Rosenthal and Strange 2001; Rigby and Essletzbichler 2002). Proximity to intermediate product markets is only significantly beneficial in the professional services sector. Labor pooling is either insignificant or found to increase new firm hazard rates, but only after the other sources of localization are controlled. Industry knowledge spillovers significantly reduce hazard rates for new firms in the drugs and motor vehicle parts industry, but the accuracy of the variable may be sensitive to industry-specific differences in the economic value of patenting. Regional industrial diversity also reduces hazard rates for new firms in several industries, particularly drugs, advertising, computer and data processing services, and research and testing services.

This study also explores how the size of the establishment mediates the relationship between external economies and new firm survival. Theory suggests that smaller firms should benefit relatively more from access to external economies, because access to local resources can partially compensate for deficient internal resources and scale economies. If the forces of agglomeration act differently on plants of different sizes, failing to account for these differences may cause the analyst to falsely reject the null hypothesis of no external economies. My evidence suggests that smaller businesses are the most common beneficiaries of external economies, but not in all cases. There are several examples, most commonly for urbanization,

where external economies increase the failure rates of larger plants while having little effect on smaller ones. There are also several industries where an increase in external economies produces a relative reduction in hazard rates for medium sized plants, but either harmed or had no effect on smaller plants.

Implications for Research

My research has several important implications for future research on external economies and spatial influences on new business performance. Industry specific conditions apparently play an important role in mediating a new firm's ability to tap into local resources. My findings of endemic industrial heterogeneity suggest that researchers and policy makers should be careful in drawing broad inferences from single cases. The existing research on the relationship between external economies and the performance of small and medium sized enterprises is dominated by case studies of single industries in specific regions. While such studies foster a deeper appreciation of the complex interactions of economic, sociological, historical and cultural forces that collectively define a particular region's entrepreneurial milieu, their relevance to policy and theory is best viewed within the context of the larger body of research.

Researchers should be equally wary of in falling prey to the ecological fallacy that analysis on aggregated sectors accurately represents specific sub-industries. Industrial aggregation makes a large difference on the significance, magnitude, and direction of the estimated agglomeration effects. More specifically, I found that localization and access to specialized input suppliers are predominantly negative and significant when estimated for specific manufacturing industries, but positive and significant when estimated for the whole sector. For most other types of external economies, industrial aggregation tends to wash out industry-level estimates. The larger sample of new firms in manufacturing and professional services often assures significant coefficients, but the balance of positive and negative effects among the component industries result in much smaller estimates at the sector level.

More research is needed to identify the underlying source(s) of industry-specific variation in external economies. At its core, agglomeration is a theory of the organization of industry in space (Marshall 1920 [1890]; Stigler 1951; Richardson 1972). Framing the empirical study of external economies within the context of industrial organization could help to advance our understanding of how the technological requirements of production and competition in specific

industries interact with the local environment to influence establishment production decisions. I found few obvious patterns in the types of industries where external economies were or were not relevant, and can only speculate on the potential sources of industry heterogeneity. Diversity apparently favors service-based industries. It was significant for all three business and professional services industries and for the more knowledge-intensive drugs manufacturing industry. There was little evidence that localization economies are of greater relevance to the most technologically intensive industries. Instead, new firms in durable equipment manufacturing industries –farm and garden equipment, metalworking machinery and motor vehicle parts –and professional services appear to be the greatest beneficiaries.

Spatial aggregation may influence the empirical modeling of external economies and spillovers. Localization economies and industrial diversity both tend to have the strongest influence when measured at larger spatial scales, i.e. those approximating the size of metropolitan areas and/or expanded labor market areas. Urbanization diseconomies are most prevalent at intra-regional distances. This result is consistent with historical trends of decentralizing metropolitan employment caused by higher land and congestion costs in the city core (Hansen 1990). The spatial range of the specific sources of localization –labor pools, input suppliers, intermediate goods, and knowledge spillover –are more difficult to summarize, because of their sporadic significance.

Implications for Regional Development Policy

In his highly influential, but controversial, analysis of job creation in the U.S., Birch (Birch 1987) claims that job losses from failure are largely constant across space. He advises policy makers to focus their energies on new firm creation, rather than retention, arguing that survival is governed by seemingly random forces that are largely beyond the control of local and regional policy. Although I do not test the validity of Birch's claims directly, I do show that new business survival rates are influenced by regional factors.

Whether these influences are strong enough to justify regional development policy is another matter. Even the most influential of the external economies have only modest effects on firm survival and hazard rates. Consider the case of industrial localization in the motor industry parts industry, where a unit increase in the regional own-industry location quotient reduces the risk of failure by roughly 19 percent. To bring about this 19 percent risk reduction would require a

dramatic change in the region's industry mix, roughly equivalent to doubling the number of local motor vehicle industry establishments. The marginal benefit of recruiting one or two more business is unlikely to have noticeable spillover benefits for entrepreneurs. Even the most ambitious and successful industrial recruitment or business development initiatives cannot expect to change the composition of a regional economy by the amount necessary to noticeably improve the survival chances of individual new firms.

Rather than try to build capacity in entirely new industries, my research suggests that entrepreneurial development strategies may be more effective if designed to capitalize upon a region's *existing* strengths and assets, as advocated by the industry cluster approach to economic development. There is little indication that competition with existing business in the same industry retards the potential development of new business. Instead, new firms benefit more from access to the same resources that favor incumbents, such as input suppliers and producer services, formal and informal information networks and supporting institutions. A region may also be able to build upon its inherent industrial diversity by supporting entrepreneurship in industries like professional services and drugs that prefer a diverse environment.

A policy recommendation of building on regional strengths offers little guidance for the many rural and peripheral areas that lack a critical mass in growing industry agglomerations (Barkley and Henry 1997). In recognition of this deficiency, much contemporary research on industry clusters is focused on identifying potential clusters in rural places and developing policy solutions to capitalize any advantages that do exist. A common recommendation is to strengthen ties to clusters in nearby metropolitan areas, typically through the improvement of infrastructure and business networks (Henry and Drabenstott 1996; Phelps *et al.* 2001; Porter *et al.* 2004). My research provides conditional support for such recommendations, because spatial externality fields are found to extend over fairly large distances. The influence of localization and diversity are often strongest and most significant at a spatial range of 80 and 160 kilometers. At these distances, peripheral areas may be able to "piggyback" on the specializations of neighboring jurisdictions.

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