



The effect of the triple helix system and habitat on regional entrepreneurship: Empirical evidence from the U.S.

Younghwan Kim^{a,1}, Wonjoon Kim^{b,*}, Taeyong Yang^b

^a KAIST, Industrial and Systems Engineering, 335 Gwahangno, Yuseong-gu, Daejeon 305-701, Republic of Korea

^b KAIST, Graduate School of Innovation and Technology Management and Department of Management Science, 335 Gwahangno, Yuseong-gu, Daejeon 305-701, Republic of Korea

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ABSTRACT

The 'triple helix' of the university–industry–government relationship and habitat are accepted as important determinants of innovation and entrepreneurship. However, empirical explorations of the effects of these variables and their interrelationships on regional entrepreneurial activities are highly limited. To fill this gap, we investigate the effect of the triple helix system and habitat on birth and death rates of U.S. firms at the state level. As expected, we find that industrial R&D expenditure plays an important role in promoting regional firm birth. However, university and government R&D also generate a synergistic effect that indirectly influences regional firm birth rates. In addition, we find that the synergy between university and industrial R&D enhances the sustainability of firms, while the interactions between (1) university and government R&D and (2) government and industrial R&D are associated with an increase in firm death. Other factors linked to more favorable conditions for firm formation include higher educational attainment in a region, lower tax rate, and habitat factors affecting quality of life, such as lower housing prices and higher rates of health insurance coverage. In regions with high entrepreneurial activity, we find positive synergistic effects of the interactions between (1) university and government R&D and (2) university and industrial R&D on firm birth rate, suggesting that university R&D plays an important role as an 'entrepreneurial mediator' among the three spheres in the triple helix system. In low entrepreneurial regions, the only triple helix system factors significantly influencing firm birth rate were tax rate. This finding suggests that the independent and interdependent components of the triple helix system and habitat are less powerful in low entrepreneurial regions.

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1. Introduction

The importance of entrepreneurship in economic growth has been a major topic in economics since Schumpeter's (1942) seminal work. Scholars from disciplines such as accounting, finance, management, marketing, political science, psychology, and sociology have also engaged in explorations of the relationship between entrepreneurship and economic growth (Ireland and Webb, 2007). Among these studies, research on determinants of entrepreneurial activity – new firm formation and firm dynamics, specifically – has been highly valued from the perspective of public policy, because of the insights it lends to policymakers and the policy contributions they can make as a result. Potential determinants of entrepreneurship that have been presented in the literature include population (e.g., size), income, number and type of R&D

employees, educational degrees, university R&D, creativity, foreign population, political structure, land costs, taxes, natural amenities, and others (Armington and Acs, 2002; Audretsch and Lehmann, 2005; Brixy and Grotz, 2007; Kirchoff et al., 2007; Lay, 2003; Lee et al., 2004; Spilling, 1996; Wang, 2006; Woodward et al., 2006). Although these factors might interact with one another to synergize entrepreneurial activities, to date most investigators have treated the factors as independent, rather than considering the effects of their potential interrelations and interdependency.

As far as factors influencing entrepreneurship, since evolutionary economists introduced the concept of a 'knowledge-based society' (Abramowitz and David, 1996; Foray and Lundvall, 1996), the triple helix model of university–industry–government relationships has been developed to study the knowledge infrastructure in networks of bonds among the institutional constituents of a regional innovation system (Etzkowitz et al., 2000; Leydesdorff et al., 2006; Powell and DiMaggio, 1991). Specifically, the model provides important insights into understanding innovation in the context of the supportive relationships among university–industry–government players (Etzkowitz, 2003; Etzkowitz and Leydesdorff, 2000). However, despite its

* Corresponding author. Tel.: +82 42 350 4336; fax: +82 42 350 4340.

E-mail addresses: younghwankim@kaist.ac.kr (Y. Kim), wonjoon.kim@kaist.edu (W.J. Kim), tyang@kaist.ac.kr (T. Yang).

¹ Tel.: +82 42 350 4346; fax: +82 42 350 4340.

valuable contributions to understanding regional innovation and economic growth, comprehensive empirical explorations of the role of the triple helix model and the interrelationships among university–industry–government constituents in regional entrepreneurial activities are rare.

To address this lacuna, we investigate the determinants of entrepreneurial activity using a structural and holistic framework focusing on the interrelationships among university–industry–government in the triple helix model. In addition, we consider the role of habitat in our exploration, as this factor represents the highly important ecological environment for both entrepreneurial activities and the evolution of the triple helix that influences regional innovation (Goldstein and Drucker, 2006; Lee et al., 2004).

Specifically, we consider regional variations in firm birth and death in the U.S. during the period between 2000 and 2004 as regional entrepreneurial activity. As habitat variables, we consider quality-of-life factors such as healthcare, housing, crime rate, and demographic status (e.g., population, income, and ethnic groups). We also examine the interdependent relationships among triple helix and habitat factors.

Therefore, the following questions represent our specific interests in this study: What are the important determinants of regional entrepreneurial activities from the perspective of the triple helix system? How important are the interaction and synergy among the spheres or sub-dynamics of the triple helix in entrepreneurial activities at the regional level? How important is the habitat's role in regional entrepreneurial activities? Answering these questions will reveal the different roles of each sphere of the triple helix, as well as their interrelationships and the habitat, with regard to entrepreneurial activity. Thus we have taken a more structural and holistic point of view that considers the collaborative and systematic interaction of key factors related to regional innovation than past investigators have. Consequently, this study deepens our understanding of the determinants of regional entrepreneurial activity and contributes to the entrepreneurship policy literature. For example, our findings could enable more structuralized entrepreneurship policy based on the co-evolutionary relationship among university, industry, and government, along with the habitat, in promoting regional entrepreneurial activity.

2. Entrepreneurship, firm dynamics, and the triple helix model

Perspectives on and definitions of entrepreneurship have been multifaceted, thus attracting researchers from diverse disciplines: economics, marketing, management, operations, regional science, and others (Ireland and Webb, 2007; Tamasy, 2006). Those emerging literatures have been focused largely on determinants of entrepreneurship, and the subjects under study may be categorized into three broad groups: individual, regional or national, and international. Individual-level studies investigate the characteristics of successful entrepreneurs by exploring individual characteristics such as personality, education, and ethnic origin (Bergmann and Sternberg, 2007; Levie, 2007; Storey, 1994; Wagner and Sternberg, 2004). At the regional level, factors associated with regional variation in new firm formation at an aggregated (regional) level have been explored through studies of structural differences in geographical, industrial, and organizational variables (Armington and Acs, 2002; Audretsch and Lehmann, 2005; Brixy and Grotz, 2007; Kirchhoff et al., 2007; Lay, 2003; Lee et al., 2004; Love, 1996; Reynolds et al., 1993, 1995; Saxenian and Hsu, 2001; Spilling, 1996; Wang, 2006; Woodward et al., 2006). At the international level, determinants of entrepreneurial activities have been examined through the lens of inter-country differences in GDP, regulation,

immigration, and other measures (Djankov et al., 2002; Ho and Wong, 2007; Kannianen and Vesala, 2005; Reynolds et al., 1994; van Stel et al., 2007).

Among the varied attempts at defining entrepreneurship and identifying its determinants to date, regional-level studies have attracted many researchers because these investigations' findings and outcomes can suggest more direct insights into regional and national entrepreneurship policies by answering a crucial question policymakers face: Which factors are more important in promoting entrepreneurial activities and increasing firm creation? (Tamasy, 2006) Regional-level studies are also attractive to researchers because entrepreneurial activity and resulting firm creation has been recognized as one of the most important drivers of regional economic growth (Acs and Armington, 2004; Audretsch and Keilbach, 2005). In addition, the phenomenon of "geographical inertia" (i.e., the tendency of a given firm to stay in the region where it was first established, due to the resources it has established and/or utilized there), which highlights the importance of geographically localized networks of contacts for entrepreneurial activities and firm creation, has been found to be empirically significant (Sorenson and Audia, 2000) in entrepreneurship research (Tamasy, 2006), further reinforcing the value of regional-level entrepreneurship research.

Nevertheless and surprisingly, the selection of factors that affect regional entrepreneurial activities has been within a *situational* and *partial* context that considers each in isolation, rather than representing a *structural* and *holistic* approach that posits and examines a *co-evolutionary relationship* among the factors. In other words, previous studies have been limited in their analysis of the determinants of entrepreneurial activities and firm creation by considering only a partial group of those potential factors, such as population, income, R&D employees, educational degrees, university R&D, creativity, foreign population, political structure, and others in a specific situational context (Armington and Acs, 2002; Audretsch and Lehmann, 2005; Brixy and Grotz, 2007; Kirchhoff et al., 2007; Lay, 2003; Lee et al., 2004; Spilling, 1996; Wang, 2006; Woodward et al., 2006).

However, an important characteristic that should be considered in understanding regional entrepreneurial activities is that firm birth and death are highly dependent on regional characteristics and entrepreneurial environments including habitat, as the co-evolutionary theory has demonstrated. The theory suggests that the business entities and environments influence each other and reciprocally co-evolve together, not that the entities simply adapt to their environments, as suggested by studies of the adaptation-selection of an organization (Lewin and Volberda, 1999; Lewin et al., 1999; Porter, 2006; Tsai et al., 2009). In addition, regional factors in previous studies can be categorized into demographic, economic, geographic, industrial, and institutional environments with structural recognition of their reciprocal relationship, an idea that has not been well embraced in the extant literature. Therefore, we consider those factors that affect regional entrepreneurial activities, as informed by structural and co-evolutionary perspectives that take into account the interrelationships among those factors.

Among structural interpretations of regional factors, the 'triple helix', or university–industry–government interaction, has been increasingly recognized as the source of regional innovation that drives the transformation of scientific and technological outcomes into economic outcomes. In addition, multiple lines of thought suggest that innovation is increasingly based upon the interaction among the components of the triple helix model, which is growing in acceptance as a promising structuralized regional approach in a knowledge-based economy (Etzkowitz, 1994, 2003; Etzkowitz and Leydesdorff, 2000; Etzkowitz and Zhou, 2007; Leydesdorff and Van den Besselaar, 1994).

Although the triple helix model and co-evolutionary theory have been widely recognized as providing a heuristic for studying

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