Entrepreneurship, Firm Dynamics and Triple Helix

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Triple helix of university-industry-government relationship is accepted as an important driver of technology innovation and entrepreneurship. In this paper, we investigate the role of the triple helix in the entrepreneurial activity of the U.S. We use firm dynamics factors such as firm birth, death, and turbulence rate as the measures of entrepreneurial activity, and conduct the regression analysis between the firm dynamics factors and the triple helix and habitat factors. There is a regional difference of the level of entrepreneurial activity, and the role of the industry and habitat is very important for entrepreneurial activity. Especially, in the habitat, racial variety, low housing cost, and high quality of health care can be crucial factor for entrepreneurial activity. Policy makers in the region with low firm birth rate should first make regional supportive habitat, and then invite the industrial R&D and VC investment to raise the level of firm birth rate.

Introduction

The importance of entrepreneurship in economic development and job creation has been highlighted by many previous literatures. As a result, various researches and educational programs of entrepreneurship have been emerged and rapidly disseminated in many developed and developing countries in recent decades. Among these studies, researches on the determinant of entrepreneurial activity - new firm formation and firm dynamics - have been highly valued in the perspective of public policy. These studies suggested various factors that determine entrepreneurial activity, such as population, income, R&D employees, educational degrees, university R&D, creativity, foreign population, political structure, land costs, taxes, natural amenities, etc (Spilling 1996; Armington and Acs 2002; Lay 2003; Lee, Florida, and Acs 2004; Audretsch and Lehmann 2005; Wang 2006; Woodward, Figueiredo, and Guimaraes 2006; Brixy and Grotz 2007; Kirchhoff et al. 2007).

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However, structural approaches based on theoretical backgrounds such as *triple helix* has not been carefully attempted in finding the determinant of entrepreneurial activity. Most of entrepreneurship researchers have been just selected major economic indicators and demographic factors without consideration of university-industry-government relationship. On the other hand, the triple-helix model has been introduced in the study of innovation system in recent years (Etzkowitz and Leydesdorff 2000; Etzkowitz 2003). They suggested triple helix model and explained the innovation system through the supportive relationships among university-industry-government. However, the role of triple helix and the relationship among its three spheres in the entrepreneurial activities has not been carefully dealt with.

Therefore, in this paper, we examine the determinants of entrepreneurial activity through the structural framework of triple helix in order to discover the relative role of three spheres and the importance of collaboration among them in entrepreneurial activity. We examine the case of U.S. as an empirical verification considering the number of triple helix and its diverse distribution in the perspective of its characteristics and relationship. Considering regional variations in the entrepreneurial context in the U.S., we distinguish fifty states into four major regions and separate regional effect on entrepreneurial activity from the effects of triple helix during the periods between 2000 and 2004. We also include habitat factor which has not been carefully considered in the entrepreneurship research together with triple helix. Habitat has been generally accepted as an important factor in entrepreneurship activity (Lee, Florida, and Acs 2004) without any profound analysis in previous studies. In our study, we consider quality of life such as healthcare, housing and crime rate and demographic factors such as population, income and ethnic groups as habitat factors.

Consequently, by revealing the different role and relative importance of each sphere of triple helix as well as habitat on the entrepreneurial activity, our study contributes to entrepreneurship policy literature suggesting to establish *structural entrepreneurship policy* regarding the enhancement of entrepreneurial activity by carefully managing the collaborative relationship among university, industry, and government and clearly differentiate the policy for each sphere of triple helix. In addition, our research suggests policy-makers to consider the policy of *habitat management* in order to promote entrepreneurial activity in the regional policy perspective. Our study also illuminates the role of university as an important supplier of key entrepreneurial human resources as well as innovated research outcomes together with the role of industry its important role in triple helix is to build concrete value chain of product or service commercialization.

Entrepreneurship, firm dynamics and triple helix

Many researchers have examined the determinant of entrepreneurial activity in the perspective of regional variation of new firm formation. However, the selection of factors which explain entrepreneurial activity has been *situational* rather than *structural*. In other words, previous studies more likely attempted to analyze entrepreneurial activity by selecting those potential factors in some situational context such as population, income, R&D employees, educational degrees, university R&D, creativity, foreign population, political structure, land costs, taxes, natural amenities, etc (Spilling 1996; Armington and Acs 2002; Lay 2003; Lee, Florida, and Acs 2004; Audretsch and Lehmann 2005; Wang 2006; Woodward, Figueiredo, and Guimaraes 2006; Brixy and Grotz 2007; Kirchhoff et al. 2007). They focused on the factors related with demographics, employment, industry structure, investment on

research and development (R&D), and individual entrepreneurial characteristics. In the case of the measure of entrepreneurial activity, firm dynamics factor, especially, firm birth rate has been generally accepted as the most relevant measure. However, structural approaches in the perspective of a regional entrepreneurial context such as a triple helix system of university, industry, and government relationship together with habitat have not been explored, although it is important to find the structural factors that influence entrepreneurial activity for policy making.

Recently, the concept of 'triple helix' has been introduced in the study of innovation system as one of promising structuralized regional approach. Etzkowitz and Leydesdorff (2000) and Etzkowitz (2003) introduced the triple helix model of university-industry-government relationship in their studies of innovation system in a knowledge-based economy and explained that innovation is increasingly based upon the interaction among each component of a 'triple helix'. Before the advent of knowledge-based society, one of major explanation of this triple helix relation was 'etatistic' model. In this model, innovation is achieved by the government's control and plan, and industry and university played their roles on their own function under the government's direction. On the other hand, 'laissez-faire' model also significantly contributed to innovation study explaining that the roles of university, industry and government are separated while the market coordinates the whole system. Later, the knowledge-based society has made three spheres close to each other in the innovation system (Etzkowitz and Klofsten 2005). One sphere "takes the role of the other" in new triple helix model (Etzkowitz 2003). These relations enhance the transfer of new knowledge from one sphere to the others, and let the other spheres commercialize it.

These studies on the triple helix mostly used theoretical approaches in order to explain the importance of the triple helix and their interactions. However, no empirical study has been attempted regarding its role in entrepreneurial activity at regional level, although entrepreneurial activity is one of critical factors in innovation system. Here, in this study, we examine what factors in triple helix affect entrepreneurial activity in the region and how different they are, in addition to illuminating the importance of collaborative and systematic interaction among the spheres of triple helix.

Regarding the measure of entrepreneurial activity, a variety of approaches has been made, although entrepreneurship cannot be precisely measured. Some researchers suggested the concept of firm dynamics; Fritsch (1996) used four types of indicators for market dynamics in his analysis: entry rate, exit rate, turbulence rate, and net entry rate in order to investigate the relationship between several aspects of market dynamics and economic development in West Germany in 1986-1989. He divided the number of new firms and exits by the number of incumbent establishments, which can be labeled as 'ecological' approach. On the other hand, Reynolds, Miller, and Maki (1995) suggested a 'labor market' approach by using workforce data as a denominator in order to standardize the number of firm's entries and exits.

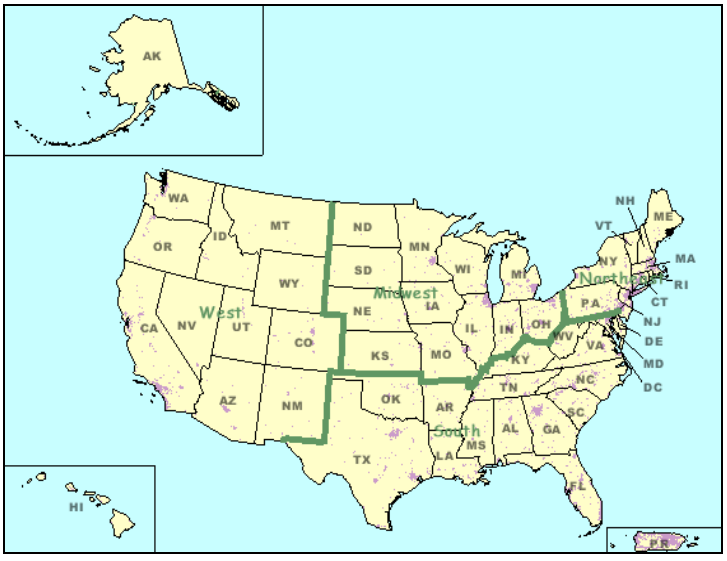
These two approaches have been commonly applied in the literature related with firm formation. In the ecological approach, incubator firms provide breeding grounds for new entrepreneurs and role models for other potential founders (Smith 1991). This approach focuses on the phenomenon of new firm spinouts by incumbent firms. On the other hand, the labor market approach has a more rational appeal in terms of the theory of entrepreneurial choice (Audretsch and Fritsch 1994). This approach assumes that new entrepreneurs are recruited from within the labor market of a region (Spilling 1996). Spilling (1996) pointed that the ecological approach will result in a measurement bias that overestimates firm dynamic rates in areas where firm sizes are above average, and underestimates firm dynamic rates in areas with many small firms. He mentioned that the labor market approach generally provides a better explanation compared to the ecological approach. Nevertheless, the ecological approach is widely used in the literature on account of its simplicity of calculation and its convenience in terms of data collection.

Therefore, in this paper, we examine the role of those factors that comprise triple helix and surrounding habitat in the enhancement of entrepreneurial activity in the regional context. We consider three factors of firm dynamics: firm birth rate, firm death rate, and firm turbulence rate derived from both the ecological and the labor market approach. In addition, we investigate how important the collaboration and interaction among those factors are in explaining the role of triple helix. Fifty states in the U.S. are divided into two groups according to the level of entrepreneurial activity and these two groups are compared in terms of the conditions that promote entrepreneurship.

Data & Descriptive Statistics

The factors in triple helix and habitat are derived at the state level in the United States; six triple helix factors and six habitat factors are selected to test whether these variables affects entrepreneurial activities. In addition, six factors of firm dynamics are selected as the measure of entrepreneurial activity. Regarding the population of our study, we consider all 50 states except the District of Colombia. The period of data covers from 2000 to 2004 and total observations are 250 (n = 250). In order to examine reduce heterogeneous effect in our empirical analysis we divide the states into four major geographical regions according to the statistics of the U.S. Census Bureau. The four major regions are the West (13 states), the Midwest (12 states), the South (16 states), and the Northeast (9 states). The geographical division used in this analysis is presented in Figure 1.

Figure 1
Four major geographical regions in the U.S



Factors of firm dynamics

According to the terms of the Statistics of U.S. Businesses by the U.S. Census Bureau, a firm is ‘a business organization consisting of one or more domestic establishments in the same state and industry that were specified under common ownership or control’. The firm and the establishment are same for single-establishment firms. For each multi-establishment firm, establishments in the same industry within a state are counted as one firm.

Six firm dynamics factors that we consider as the measure of entrepreneurial activity and as dependent variables are presented in Table 1. The data on the number of firm births and deaths are from the Small Business Economy, an annual report to the President made by the Small Business Administration (SBA). Turbulence rate are calculated as the sum between the firm birth and the firm death. These three factors are divided by the number of incumbent firms and by the labor force in each state. The data of the number of existing firms has been also collected from the the Small Business Economy of the SBA. Labor force data has been measured from Local Area Unemployment Statistics (LAUS). This data is constructed by the Bureau of Labor Statistics (BLS). As a result of these calculations, six entrepreneurship variables are obtained.

Table 1
Types of firm dynamics factor

Dynamic indicators	Ecological Approach	Labor Market Approach
Birth rate	BIRTHRATE_F	BIRTHRATE_L
Death rate	DEATHRATE_F	DEATHRATE_L
Turbulence rate	TURBULRATE_F	TURBULRATE_L

Triple helix variables

As mentioned above, the triple helix factors of the university-industry-government relationship are considered. Two variables from each sector are selected and a total of six variables are considered, as represented in Table 2. In each sphere, we consider one R&D related variable and one other critical variable that has been generally used in previous studies on the determinants of entrepreneurial activity. Two variables in the case of university sphere are 'Degree' which represents educational attainment and UNIVRD_R which denotes university and college R&D expenditures per capita.

In the case of government, we use government R&D (GOVRD_R) and tax rate (TAXRATE). 'Government R&D' is a measure of the federal obligations for R&D and for R&D plants per capita. 'Tax rate' has been used in various types in previous studies that examined the determinants of entrepreneurial activity. In our study, we select *total tax burden per capita* because other taxes such as corporate tax as well as the property tax can affect firm formation and termination process. In the case of the private sector, INDUSTRYRD_R represents the industrial R&D expenditures per capita. Venture capital investment per capita can be obtained by MoneyTree^{TM} Report (VCINVEST_R). The MoneyTree^{TM} Report is a popular quarterly study of venture capital investment activity in the United States. All triple helix variables with absolute values such as R&D and VC investment are divided by state population in order to escape the bias originated from state size.

Habitat variables

Habitat variables are important in the point that they can explain the changes of entrepreneurial activity which cannot be explained by the factors of triple helix. In our study we consider housing price, crime and health care index which are generally accepted as the measure of quality of human life (Goldstein and Drucker 2006). Therefore, our habitat

variables consist of demographic variables, crime index, and health care index. The description and the sources of habitat variables are also represented in Table 2. HOUSEPRICE represents the median housing value of owner-occupied housing units and CRIME is the total crime rate, which is the sum of the violent and property crime rate per 1,000 people. Due to diverse characteristics of expenditures regarding health care, we simply select a factor that explains how many people owe to public health insurance. Health insurance coverage (HINSUCOV) means the level of coverage of basic health care enable us to evaluate how well basic welfare policy is operated in a region. We also use the natural log of state population estimates (ln_POP) and the natural log of state average annual pay (ln_INCOME) as demographic factors in the analysis.

Table 2
Variable descriptive statistics (observed *n*=250)

Variable	Description	Source	Mean				
			Overall	West	Midwest	South	Northeast
BIRTHRATE_F	Number of new firm created per 100 existing firms	SBA	14.42	18.17	10.86	14.54	13.49
DEATHRATE_F	Number of firm terminated per 100 existing firms	SBA	15.26	18.24	12.50	14.96	15.15
TURBULRATE_F	Sum of firm birth and death per 100 existing firms	SBA	29.67	36.42	23.36	29.50	28.65
NETRATE_F	(firm birth - firm death) per 100 existing firms	SBA	-0.84	-0.07	-1.64	-0.41	-1.66
BIRTHRATE_L	Number of new firm created per 1000 work force	SBA, BLS	6.20	8.28	4.46	5.78	6.24
DEATHRATE_L	Number of firm terminated per 1000 work force	SBA, BLS	6.56	8.30	5.16	5.92	7.03
TURBULRATE_L	Sum of firm birth and death per 1000 work force	SBA, BLS	12.75	16.57	9.63	11.70	13.27
NETRATE_L	(firm birth - firm death) per 1000 work force	SBA, BLS	-0.36	-0.02	-0.70	-0.14	-0.79
DEGREE	% of 25+ population with bachelor's degree	Census	25.88	26.03	25.62	23.73	29.86
UNIVRD_R	University and college R&D expenditures per capita (dollars)	NSF	124.79	127.19	122.23	111.74	147.95
GOVRD_R	Federal obligations for research and development and for R&D plant per capita (dollars)	NSF	289.37	362.78	136.54	314.65	342.17
TAXRATE	Ratio of total tax burden per capita to average annual pay	Census, BLS	5.74	5.99	5.81	5.49	5.73
INDUSTRYRD_R	Industrial R&D expenditures per capita (dollars)	NSF	539.81	509.60	536.27	337.76	947.36
VCINVEST_R	Venture capital investment per capita (dollars)	MoneyTree™	85.73	108.23	31.84	55.40	178.98
MELTINGPOT	% of foreign-born population	Census	7.53	10.32	4.62	5.95	10.16
ln_POP	Log of Population estimates	Census	15.08	14.69	15.15	15.38	15.01
ln_INCOME	Log of Average Annual Pay	BLS	10.42	10.41	10.39	10.38	10.57
HOUSEPRICE	Median housing value of all(03-04) or specified(00-02) owner occupied housing units (thousand dollars)	Census	136.01	167.89	109.80	108.27	174.22
CRIME	Total crime rate (violent and property crime rate) per 1000 people	FBI	39.38	44.67	35.89	43.74	28.62
HINSUCOV	% of private or government health insurance coverage	Census	86.23	83.79	89.14	84.50	88.93

NOTE: SBA = Small Business Administration; BLS = Bureau of Labor Statistics; Census = U.S. Bureau of the Census; NSF = National Science Foundation; FBI = Federal Bureau of Investigation

Here is another interesting index as a habitat variable in our analysis. MELTINGPOT is the percentage of the foreign-born population. Melting pot index was used in the paper of regional analysis of new firm formation by Lee, Florida, and Acs (2004). In addition, Saxenian (2002) found that the most successful entrepreneurs of Silicon Valley rely heavily on ethnic resources. Kirchhoff et al. (2007) also concluded that a foreign population has a positive effect on new business formation. In this analysis, the same relationship between entrepreneurship and ethnic variety is expected.

Descriptive statistics

Descriptive statistics of 50 states in U.S. for the six variables for firm dynamics and twelve triple helix and habitat variables are presented in Table 2. The averages of firm birth and death rate are highest in the *West region* which includes California, Washington, and Colorado. *Midwest region* which includes Illinois, Ohio, and Iowa has the lowest birth rate and death rate. In the *Northeast region* which includes New York, Massachusetts, and Pennsylvania, firm birth and death rate with the ecological approach are lower than average, while those with the labor market approach are higher than average.

Northeast region has the highest level in educational condition. The percentage of 25-over population with bachelor's degree is 3.83% higher than *West region*. *Northeast region* was overwhelming in university R&D. On the other hand, regarding the government R&D, *West region* surpassed *Northeast region*. The government R&D of *Midwest region* records below half of other regions, while *Midwest region* surpasses other regions except for *Northeast region* in industrial R&D. *Northeast region* shows the best habitat, the environment of business and industry.

Interestingly, *West region* with relatively low condition of triple helix has high firm dynamics compared to *Northeast region*, which we examine the reason later through our statistical analysis considering their habitat. However, the melting pot index which explains the racial diversity shows highest number and population has grown rapidly which seems to explain some of the reason of high firm dynamics. In addition, housing price in *West region* is cheaper than those of *Northeast region*.

Empirical Results

This section examines the results of the multivariate regression of the triple helix and habitat factors associated with state variations on the six firm dynamics factors which represent entrepreneurial activity of each state.[1]

For our convenience, the three variables from the ecological approach, BIRTHRATE_F, DEATHRATE _F, and TURBULRATE_F are termed 'ECOL', and the three variables from the labor market approach, BIRTHRATE_L, DEATHRATE_L, TURBULRATE _L, and NETRATE_L, are termed 'LABOR'. The results of the correlation analysis are presented in Table 3. The six firm dynamics factors had similar characteristics in common in the correlation analysis. They have positive correlation coefficients in terms of degree, government R&D, industrial R&D, VC investment, melting pot index and house price. These six factors were negatively and significantly associated with health insurance coverage.

[1] As noted above, all triple helix variables regarding R&D and VC investment are divided by state population. Without this treatment, we have strong correlations among these variables giving us size dependent bias in the estimation.

Full model regression

In our analysis, consider six triple helix factors and six habitat factors in all 50 states in the U.S. except the District of Colombia. Six firm dynamics models are examined: BIRTHRATE_F, TURBUL RATE_F, DEATHRATE_F in the 'ECOL' and BIRTHRATE_L, TURBULRATE_L, DEATHRATE_L in the 'LABOR'.

The OLS regression results by STATA^{TM} 10.0 S.E. are reported in Table 4 to Table 6. First, the regression result of firm birth rate in the ECOL and the LABOR is represented Table 4. Trend and regional variables are significantly related with birth rate in both approaches. The number of new firm has been increasing by 0.54% and the number of new firm per a thousand of work force has been rising by 0.23 firms for each year. *West region* has 7% higher in the number of firm birth and have 3.22 firms more in the number of new firm per a thousand of work force than *Northeast region*. *South region* with lower firm birth than *West region* has high firm birth rate compared to *Northeast region,* and *Midwest region* shows the lowest level of firm birth rate. We can find that firm birth rate is increasing by year and the order of firm creation in a region is *West, South, Northeast* and *Midwest region.*

Table 3
Correlation analysis

Variables	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1 BIRTHRATE_F	1.00																	
2 DEATHRATE_F	0.63**	1.00																
3 TURBULRATE_F	0.91**	0.90**	1.00															
4 BIRTHRATE_L	0.89**	0.55**	0.79**	1.00														
5 DEATHRATE_L	0.55**	0.87**	0.78**	0.70**	1.00													
6 TURBULRATE_L	0.78**	0.77**	0.86**	0.92**	0.92**	1.00												
7 DEGREE	0.21**	0.05	0.15*	0.24**	0.09	0.18**	1.00											
8 UNIVRD_R	0.08	0.09	0.10	0.06	0.07	0.07	0.58**	1.00										
9 GOVRD_R	0.28**	0.20**	0.27**	0.16*	0.09	0.14*	0.40**	0.61**	1.00									
10 TAXRATE	-0.19**	-0.03	-0.12	-0.01	0.17**	0.09	-0.23**	-0.08	-0.10	1.00								
11 INDUSTRYRD_R	0.17**	0.23**	0.22**	0.17**	0.21**	0.21**	0.57**	0.30**	0.15*	-0.12	1.00							
12 VCINVEST_R	0.21**	0.11	0.18**	0.18**	0.08	0.14*	0.40**	0.23**	0.20**	-0.14*	0.42**	1.00						
13 MELTINGPOT	0.44**	0.32**	0.42**	0.32**	0.20**	0.28**	0.45**	0.16**	0.23**	-0.22**	0.39**	0.37**	1.00					
14 ln_POP	0.15*	0.04	0.11	-0.14*	-0.27**	-0.22**	0.16*	0.01	0.06	-0.55**	0.25**	0.26**	0.49**	1.00				
15 ln_INCOME	0.24**	0.14*	0.21**	0.15*	0.04	0.10	0.68**	0.42**	0.28**	-0.38**	0.71**	0.39**	0.66**	0.51**	1.00			
16 HOUSEPRICE	0.34**	0.28**	0.34**	0.33**	0.26**	0.32*	0.64**	0.43**	0.28**	-0.02	0.54**	0.36**	0.72**	0.17**	0.69**	1.00		
17 CRIME	0.39**	0.25**	0.36**	0.17**	0.03	0.11	-0.13*	-0.04	0.12	-0.20**	-0.16*	-0.07	0.22**	0.29**	-0.04	0.01	1.00	
18 HINSUCOV	-0.37**	-0.19**	-0.31**	-0.30**	-0.13*	-0.23**	0.26**	0.14*	-0.14*	0.26**	0.28**	0.09	-0.27**	-0.22**	0.06	0.09	-0.44**	1.00

Correlation is significant at *5%, **1%

Table 4
Regression results – Birth rate by 'ECOL' and 'LABOR' approach

Variables	(1) BIRTHRATE_F				(2) BIRTHRATE_L			
	Coefficient	Standard Error	t	p-value	Coefficient	Standard Error	t	p-value
Trend	**0.5413*****	0.1501	3.61	.000	**0.2304*****	0.0751	3.07	.002
West	**7.0000*****	0.7623	9.18	.000	**3.2243*****	0.3816	8.45	.000
Midwest	**-2.2915*****	0.6030	-3.80	.000	**-1.4427*****	0.3019	-4.78	.000
South	**2.4972*****	0.6915	3.61	.000	**0.6568***	0.3462	1.90	.059
DEGREE	**0.1598*****	0.0590	2.71	.007	**0.1503*****	0.0295	5.09	.000
UNIVRD_R	-0.0060	0.0044	-1.35	.180	-0.0023	0.0022	-1.02	.309
GOVRD_R	**0.0011***	0.0006	1.74	.083	-0.0005	0.0003	-1.40	.164
TAXRATE	**-0.3386***	0.1837	-1.84	.067	-0.0222	0.0920	-0.24	.810
INDUSTRYRD_R	**0.0016*****	0.0005	3.12	.002	**0.0008*****	0.0003	3.25	.001
VCINVEST_R	0.0005	0.0012	0.41	.680	0.0004	0.0006	0.60	.550
MELTINGPOT	**0.2306*****	0.0591	3.90	.000	**0.0821*****	0.0296	2.78	.006
ln_POP	**0.4626***	0.2643	1.75	.081	-0.1480	0.1323	-1.12	.264
ln_INCOME	-1.4720	2.3657	-0.62	.534	-0.7440	1.1844	-0.63	.530
HOUSEPRICE	**-0.0298*****	0.0068	-4.40	.000	**-0.0151*****	0.0034	-4.46	.000
CRIME	0.0175	0.0234	0.75	.455	-0.0134	0.0117	-1.14	.255
HINSUCOV	**0.3160*****	0.0763	4.14	.000	0.0609	0.0382	1.59	.112
Constant	-9.2090	24.2042	-0.38	.704	7.6749	12.1178	0.63	.527
R-square(Adj.)	.619				.610			

Beta means a standardized coefficient. Significant at *10%, **5%, ***1% (n=250).

In the factors of triple helix, both of firm birth rate in the ECOL and the LABOR are positively related with degree and industrial R&D expenditure. In the ECOL model, firm birth rate is positively associated with government R&D and is negatively related with tax rate unlike in the LABOR model. These results satisfy general forecast that the government R&D expenditure helps people to create ventures and low tax rate stimulate to do a business. On the other hand, two firm birth rate factors are not related with university R&D expenditure. We can explain this result; university R&D does not have direct effect on the firm birth unlike government R&D and industrial R&D.

Among habitat factors, the states with relatively high melting pot rate have high firm birth rate. This outcome corresponds with the studies of Saxenian (2002) and Kirchhoff et al. (2007) which perorated that the racial variety can provide the vitality and the flexibility in the environment of firm creation. We can find through our result that 1% increase of melting pot index can give a rise of 0.23 firms per 100 incumbent firms or a rise of 0.08 firms per a thousand of work force. In the case of house price, as we predicted, higher price leads lower firm birth rate. If the average of house price increases by 10 thousand dollars in the U.S., the number of firm birth per 100 existing firms is reduced by 0.3 firms and the number of firm created per a thousand of work force shrinks by 0.15 firms. Health insurance coverage is

positively and significantly related with firm birth rate in the ECOL only, and 1% increase of the coverage can have a positive effect of 0.32 firms increase on the firm birth.

Both of the ECOL and the LABOR model have no variable that represents a contrary sign to our predictions. Through the full regression of firm birth rate models, we can find that government and industrial R&D expenditure are more important than university R&D on the firm creation, that tax reduction and deduction can make a favorable condition to conduct a business, and that racial variety, house price and health care coverage are directly associated with a decision of making a firm.

In the case of firm turbulence rate, we also conducted full model regressions in the ECOL and the LABOR approach (Table 5). It is important that turbulence rate is the sum of firm birth rate and firm death rate. The combined effect between the death rate model and the birth rate model can strengthen the effects of explanatory variables on the turbulence rate or dilute those, or even melt those. For instance, trend effect disappears in the ECOL and the LABOR model. Degree and government R&D leave out of a group of significant factors in the ECOL model. In the LABOR, government R&D, crime index, health insurance coverage newly enter the group of significant factors at 10% of the significant level, so that they do not have much power to explain the relationships. The result of the turbulence rate model is similar to the one of the birth rate model, and we can find same signs of the coefficients of the significant variables in both regressions, between the model (1), (2) and the model (3), (4).

The fact that turbulence rate is the sum of the firm birth rate and the firm death rate can accompany a difficulty in analyzing the effects of the explanatory variables on the result from two contradictory cir

Table 5

Regression results – Turbulence rate by 'ECOL' and 'LABOR' approach

Variables	(3) TURBULRATE_F				(4) TURBULRATE_L			
	Coefficient	Standard Error	t	p-value	Coefficient	Standard Error	t	p-value
Trend	0.3386	0.2807	1.21	.229	0.1467	0.1400	1.05	.296
West	**11.8905*** **	1.4256	8.34	.000	**5.4238*** **	0.7110	7.63	.000
Midwest	**-4.9828*** **	1.1277	-4.42	.000	**-3.1343*** **	0.5624	-5.57	.000
South	**3.6285*** **	1.2933	2.81	.005	0.6271	0.6450	0.97	.332
DEGREE	-0.0279	0.1103	-0.25	.800	**0.1454*** **	0.0550	2.64	.009
UNIVRD_R	0.0067	0.0083	0.81	.420	0.0038	0.0041	0.91	.365
GOVRD_R	0.0019	0.0012	1.56	.119	**-0.0010** *	0.0006	-1.73	.085
TAXRATE	**-0.6991** **	0.3436	-2.03	.043	-0.0278	0.1713	-0.16	.871
INDUSTRYRD_R	**0.0050*** **	0.0010	5.21	.000	**0.0024*** **	0.0005	5.11	.000
VCINVEST_R	-0.0036	0.0022	-1.60	.110	-0.0014	0.0011	-1.26	.209
MELTINGPOT	**0.4616*** **	0.1105	4.18	.000	**0.1749*** **	0.0551	3.17	.002
ln_POP	**0.8673** *	0.4943	1.75	.081	-0.4009	0.2465	-1.63	.105
ln_INCOME	-6.2213	4.4244	-1.41	.161	-2.7410	2.2065	-1.24	.215
HOUSEPRICE	**-0.0440*** **	0.0126	-3.48	.001	**-0.0244*** **	0.0063	-3.87	.000

CRIME	0.0081	0.0438	0.18	.854	**-0.0389***	0.0219	-1.78	.076
HINSUCOV	**0.6234*****	0.1427	4.37	.000	**0.1195***	0.0712	1.68	.095
Constant	26.7763	45.2666	0.59	.555	34.3400	22.5748	1.52	.130
R-square(Adj.)		.586				.599		

Beta means a standardized coefficient. Significant at *10%, **5%, ***1% (n=250).

-cumstances in some cases. Though the turbulence rate can be represented the level of entrepreneurial activity through a high correlation between birth rate and turbulence rate. In this analysis, we can find that the activeness of entrepreneurial activity is high in order of *West, South, Northeast* and *Midwest region.* We can also know that high industrial R&D, high melting pot index, high health insurance coverage, and low house price can cause high level of entrepreneurial activity.

The only one strange fact is that government R&D has a negative effect on the turbulence rate in the LABOR model. This result explains that government R&D can be an obstacle for entrepreneurial activity because of the side effect such as a moral hazard.

The regression result of firm death rate in the ECOL and the LABOR is represented Table 6. As the case of birth rate and turbulence rate, *West region* has the highest level in the death rate and *Midwest region* is lowest. On the other hand, Trend and South are not significant variables in both regression models, model (5) and (6).

In the case of triple helix factors, we found several interesting facts. The death rate is negatively and significantly related with the venture capital investment, and positively and significantly associated with industrial R&D and university R&D. This result explains that among the sources of investment on entrepreneurial activity, venture capital with high pressure of retrieving the investment can reduce a failure rate than industrial R&D and university R&D with relatively low retrieving pressure. In the case

Table 6

Regression results – Death rate by 'ECOL' and 'LABOR' approach

Variables	(5) DEATHRATE_F				(6) DEATHRATE_L			
	Coefficient	Standard Error	t	p-value	Coefficient	Standard Error	t	p-value
Trend	-0.2027	0.1833	-1.11	.270	-0.0837	0.0867	-0.97	.335
West	**4.8906*****	0.9309	5.25	.000	**2.1995*****	0.4404	4.99	.000
Midwest	**-2.6913*****	0.7364	-3.65	.000	**-1.6916*****	0.3484	-4.86	.000
South	1.1313	0.8445	1.34	.182	-0.0297	0.3995	-0.07	.941
DEGREE	**-0.1877*****	0.0720	-2.61	.010	-0.0049	0.0341	-0.14	.886
UNIVRD_R	**0.0127****	0.0054	2.34	.020	**0.0060****	0.0026	2.35	.020
GOVRD_R	0.0008	0.0008	0.97	.334	-0.0006	0.0004	-1.58	.114
TAXRATE	-0.3604	0.2244	-1.61	.110	-0.0056	0.1061	-0.05	.958
INDUSTRYRD_R	**0.0034*****	0.0006	5.43	.000	**0.0016*****	0.0003	5.42	.000
VCINVEST_R	**-0.0041*****	0.0015	-2.79	.006	**-0.0018****	0.0007	-2.55	.011
MELTINGPOT	**0.2311*****	0.0721	3.20	.002	**0.0928*****	0.0341	2.72	.007
ln_POP	0.4047	0.3228	1.25	.211	**-0.2529***	0.1527	-1.66	.099

ln_INCOME	-4.7493	2.8891	-1.64	.102	-1.9969	1.3669	-1.46	.145
HOUSEPRICE	**-0.0142***	0.0083	-1.72	.086	**-0.0093****	0.0039	-2.38	.018
CRIME	-0.0095	0.0286	-0.33	.741	**-0.0255***	0.0135	1.88	.061
HINSUCOV	**0.3074*****	0.0932	3.30	.001	0.0586	0.0441	1.33	.185
Constant	35.9852	29.5594	1.22	.225	**26.6651***	13.9846	1.91	.058
R-square(Adj.)		.414				.475		

Beta means a standardized coefficient. Significant at *10%, **5%, ***1% (n=250).

of habitat factors, house price has negative effect on the firm death rate and health insurance coverage is positively associated with the death rate. We can interpret that expensive house price can make the entrepreneur tensioned in the management of the firm and high health insurance coverage can relatively defuse the managerial tension and enhance the failure rate.

Especially, the degree becomes one of the factors that affect the death rate in the ECOL model. In other words, the states with low percentage 25+ population with bachelor's degree have high firm death rates. One percent increase in DEGREE reduces 0.19 firms in the number of firm terminated per 100 incumbent firms. This shows that the educational attainment is related with sustainability of the firm as well as the firm creation.

Factor regression analysis

We selected six triple helix factors of university, industry and government and six habitat factors to explain whether entrepreneurial activity in the full model regression. Three spheres of the triple helix model have two factors for each. In the factor regression analysis, we examine a structure of triple helix and habitat and relative importance in the explanation of three firm dynamics factors; birth rate, turbulence rate and death rate. The ECOL and the LABOR model are analyzed in this analysis. First, the variables of three spheres and habitat are unified. Each sphere and habitat part has one representative factor. We calculated factor scores of each sphere and habitat through the factor analysis in the SPSS^{TM} 15.0, the statistics software package. For our convenience, the four representative factors from the factor analysis are termed 'F_Academy', 'F_Gov', 'F_Industry', 'F_Habitat'. Then we conduct regressions to examine the relationship between six firm dynamics factors and four representative factors. Trend and three regional dummies are also included in the analysis.

The OLS regression results by STATA^{TM} 10.0 S.E. are reported in Table 7 to Table 9. First, the regression result of firm birth rate in the ECOL and the LABOR is represented Table 7. The relative importance and explanatory power of the components, three spheres and habitat part, are very essential for the interpretation of this analysis, so that we add the beta coefficient in the result table. Table 7 shows that the results of the ECOL model and the LABOR model are different. First, in the ECOL, all regional dummies are significant and have great explanatory power. This fact accords with the result of the full model regression. The academy factor (F_Academy) does not have significance in the regression while the government factor (F_Gov), the industry factor (F_Industry) and the habitat factor (F_Habitat) are significantly associated with birth rate in the ecological approach. We also found that government, industry and habitat factors have similar explanatory power. Strictly, the coefficient of the government factor is slightly higher than the one of industry and habitat factor. This fact means that the role of government is very important for growth of firm birth rate.

On the other hand, the birth rates in *South region* and *Northeast region* are not different in the LABOR model. We can find the reason in the fact that the population growth rate in South region is higher than the other regions. The government factor and habitat factor are not

significantly related with the birth rate in the labor market approach. This fact is possible to explain after thinking about the concept of birth rate in the labor market approach. Supportive policy and regulation of government, such as government R&D and low tax rate, bring the population growth, and then the birth rate in the labor market approach becomes lower, so that government factor and habitat factor simultaneously leave out from the regression model. Nevertheless, the industry factor is significantly related with two firm birth rates. This fact emphasizes the crucial role of the industry part for firm creation.

The regression result of firm turbulence rate in the ECOL and the LABOR is represented Table 8. As the full model regression, the combined effect between the death rate model and the birth rate model can strengthen the effects of explanatory variables on the turbulence rate. The signs of all significant variables are similar with the firm birth rate model and the significant variables are same between the

Table 7

Factor Regression results – Birth rate by 'ECOL' and 'LABOR' approach

Factors	(1) BIRTHRATE_F					(2) BIRTHRATE_L				
	Coefficient	S.E.	t	p-value	Beta	Coefficient	S.E.	t	p-value	Beta
Trend	0.1482	0.1335	1.11	.268	.054	**0.1451****	0.0669	2.17	.031	**.108**
West	**5.4513*****	0.5284	10.32	.000	**.620**	**2.3408*****	0.2649	8.84	.000	**.538**
Midwest	**-1.2186****	0.5538	-2.20	.029	**-.135**	**-1.4693*****	0.2777	-5.29	.000	**-.329**
South	**2.0754*****	0.5669	3.66	.000	**.251**	0.0044	0.2843	0.02	.988	.001
F_Academy	-0.1952	0.2418	-0.81	.420	-.051	0.1490	0.1213	1.23	.220	.078
F_Gov.	**0.6566*****	0.2090	3.14	.002	**.170**	-0.0375	0.1048	-0.36	.720	-.020
F_Industry	**0.6158****	0.2469	2.49	.013	**.159**	**0.3814*****	0.1238	3.08	.002	**.199**
F_Habitat	**0.5754****	0.2510	2.29	.023	**.149**	-0.1632	0.1259	-1.30	.196	-.085
Constant	**12.1810*****	0.5753	21.17	.000		**5.5033*****	0.2885	19.08	.000	
R-square(Adj.)			.556					.544		

Beta means a standardized coefficient. Significant at *10%, **5%, ***1% (n=250).

Table 8

Factor Regression results – Turbulence rate by 'ECOL' and 'LABOR' approach

Factors	(3) TURBULRATE_F					(4) TURBULRATE_L				
	Coefficient	S.E.	t	p-value	Beta	Coefficient	S.E.	t	p-value	Beta
Trend	-0.1148	0.2504	-0.46	.647	-.023	0.1216	0.1231	0.99	.324	.049
West	**9.0097*****	0.9910	9.09	.000	**.571**	**3.7421*****	0.4873	7.68	.000	**.468**
Midwest	**-3.0264*****	1.0387	-2.91	.004	**-.187**	**-3.3444*****	0.5107	-6.55	.000	**-.407**
South	**2.5284****	1.0633	2.38	.018	**.170**	-0.8522	0.5228	-1.63	.104	-.113

F_Academy	-0.3786	0.4536	-0.83	.405	-.055	0.3261	0.2230	1.46	.145	.093
F_Gov.	**0.9406****	0.3920	2.40	.017	**.136**	-0.2712	0.1928	-1.41	.161	-.077
F_Industry	**1.0290****	0.4631	2.22	.027	**.148**	**0.6424*****	0.2277	2.82	.005	**.183**
F_Habitat	**0.9708****	0.4708	2.06	.040	**.140**	**-0.4399***	0.2315	-1.90	.059	**-.125**
Constant	**27.5910*****	1.0790	25.57	.000		**12.4895*****	0.5306	23.54	.000	
R-square(Adj.)			.514					.543		

Beta means a standardized coefficient. Significant at *10%, **5%, ***1% (n=250).

model (1), (2) and model (3), (4) except for the habitat factor of the LABOR model. We also found that government, industry and habitat factors have similar explanatory power in the ECOL model. In the ECOL and the LABOR, among the four representative factors, the industry factor has largest effect on the firm turbulence rate. This fact supports that the momentum of the entrepreneurial activity is the revitalization of the industry part.

The result of the factor regression of the death rate in the ECOL and the LABOR model is different from the birth rate model and the turbulence rate model (Table 9). There is no significant representative factor to explain the death rate in the ecological approach except for two regional dummies, West and Midwest. The death rate from the ecological approach only responds to regional variables. Therefore, there is no principle explanatory factor in the determinants of the death rate except for regional factors.

On the other hand, in the LABOR model, we can find that all regional dummies and the government factor, the industry factor and the habitat factor are significantly related with the death rate. The order of relative explanatory power except for the regional factors is; habitat, industry, and government. We can find that favorable habitat can reduce the failure rate of the firm through this analysis.

Partitioned model regression

Through the full model regression analysis and the factor regression analysis, we examined the relationships between the firm dynamics factors such as firm birth rate, firm death rate and firm turbulence rate and triple helix of university-industry-government relationship and habitat factors. In addition, the relative importance of the three spheres' factors of university, industry and government and the habitat factor in entrepreneurial activity was detected. In our partitioned model regression analysis, all 50 states in the U.S. are divided into two groups according to the firm birth rate by the eco-

Table 9

Factor Regression results – Death rate by 'ECOL' and 'LABOR' approach

Factors	(5) DEATHRATE_F					(6) DEATHRATE_L				
	Coefficient	S.E.	t	p-value	Beta	Coefficient	S.E.	t	p-value	Beta
Trend	-0.2631	0.1639	-1.61	.110	-.098	-0.0235	0.0760	-0.31	.758	-.018

West	**3.5584*** **	0.6484	5.49	.000	**.411**	**1.4013*** **	0.3009	4.66	.000	**.324**
Midwest	**-1.8078*** **	0.6796	-2.66	.008	**-.203**	**-1.8751*** **	0.3154	-5.95	.000	**-.422**
South	0.4530	0.6957	0.65	.516	.056	**-0.8566*** **	0.3229	-2.65	.009	**-.210**
F_Academy	-0.1833	0.2968	-0.62	.537	-.048	0.1770	0.1377	1.29	.200	.093
F_Gov.	0.2840	0.2565	1.11	.269	.075	**-0.2336***	0.1190	-1.96	.051	**-.123**
F_Industry	0.4131	0.3030	1.36	.174	.108	**0.2609***	0.1406	1.86	.065	**.137**
F_Habitat	0.3954	0.3081	1.28	.201	.104	**-0.2767***	0.1430	-1.94	.054	**-.145**
Constant	**15.4100*** **	0.7060	21.83	.000		**6.9861*** **	0.3276	21.32	.000	
R-square(Adj.)			.311					.406		

Beta means a standardized coefficient. Significant at *10%, **5%, ***1% (n=250).

logical approach (BIRTHRATE_F), and these two groups are used in the regression analysis to explain how the triple helix and habitat factors differently affect entrepreneurial activity in the two groups; the group of the states with high firm birth rate (HIGH) and the group of the states with low firm birth rate (LOW). We compare the results from the partitioned regression model with the results from original regression model. Finally, we find what factor among university, industry, government and habitat representative factors contributes to the firm birth rate in the two groups through the factor regression analysis. The group 'HIGH' includes top 26 states such as Washington, Nevada, Utah, Colorado and California, and has totally 130 samples. The group 'LOW' consists of bottom 24 states such as Illinois, Nebraska, Wisconsin, Ohio and Iowa, and has totally 120 samples.

First, we examine the regression results used triple helix variables and habitat variables (Table 10). In the case of the group HIGH, the coefficients of the significant explanatory variables are larger than those of the in the full model regression in the Section 4.1. On the other hand, degree and income variable leaves out of the regression equation. Therefore, the effects of important explanatory factors are stronger in the region with high firm birth rate than in the full model regression analysis. In detail, trend and regional variables are significantly related with the birth rate. The number of new firm has been rising by 0.77 firms per 100 incumbent firms for each year. In *West region,* 7.6 firms are more created than in *Northeast region* per 100 existing firms. *South region* with lower firm birth than *West*

Table 10
Partitioned regression results – Birth rate by 'ECOL' approach

Variables	(1) HIGH (n=130)				(2) LOW (n=120)			
	Coefficient	Standard Error	t	p-value	Coefficient	Standard Error	t	p-value
Trend	**0.7737*** **	0.2773	2.79	.006	0.1666	0.1571	1.06	.291
West	**7.6336*** **	1.3138	5.81	.000	1.2688	1.6171	0.78	.434
Midwest					**-1.7017** **	0.7224	-2.36	.020
South	**3.7370*** **	1.1439	3.27	.001	**-1.4091***	0.7563	-1.86	.065
DEGREE	0.0141	0.1210	0.12	.907	-0.0233	0.0616	-0.38	.707

UNIVRD_R	-0.0048	0.0075	-0.64	.525	-0.0022	0.0039	-0.57	.568
GOVRD_R	**0.0018***	0.0010	1.90	.061	0.0010	0.0012	0.88	.383
TAXRATE	**-0.6172***	0.3589	-1.72	.088	**0.4769****	0.2000	2.39	.019
INDUSTRYRD_R	**0.0015****	0.0008	1.99	.049	0.0001	0.0007	0.15	.882
VCINVEST_R	0.0024	0.0020	1.19	.238	0.0011	0.0010	1.12	.265
MELTINGPOT	**0.2580****	0.1046	2.47	.015	-0.0869	0.0965	-0.90	.370
ln_POP	-0.1450	0.4245	-0.34	.733	0.6967	0.4359	1.60	.113
ln_INCOME	1.8927	4.3406	0.44	.664	0.7607	3.6492	0.21	.835
HOUSEPRICE	**-0.0318*****	0.0106	-3.01	.003	-0.0001	0.0091	-0.01	.989
CRIME	-0.0280	0.0406	-0.69	.493	**0.0709****	0.0274	2.59	.011
HINSUCOV	**0.3812*****	0.1219	3.13	.002	-0.0874	0.0934	-0.94	.352
Constant	-34.8806	43.4778	-0.80	.424	-2.8613	30.9624	-0.09	.927
R-square(Adj.)		.348				.423		

Beta means a standardized coefficient. Significant at *10%, **5%, ***1% (n=250).

region has high firm birth rate compared to *Northeast region,* and there is no *Midwest region* state in the group HIGH. On the other hand, there is no factor that affects the firm birth rate except for the regional factor in the regression model of the group LOW. In the regional view, the birth rate in *West* and *South region* is higher than in *Northwest region* in the group LOW, while the birth rate in *Northeast region* is higher than in *South region*. This strange result is caused by the great difference in the birth rate among the states in *South* region.

Consequently, the government and industrial R&D are more effective than the university R&D to enhance the firm birth rate, and tax deduction and reduction stimulate the firm creation. In addition, in the view of habitat, racial variety and high level of health care lead to high level of the firm birth rate, while high housing cost dispirits the latent entrepreneurs.

We also conducted the factor regression analysis on the group of the states with high firm birth rate (HIGH) and the group of the states with low firm birth rate (LOW), as in the Section 4.2. Beta coefficients are also included in the result table (Table 11) for the examination of relative importance and explanatory power of the three spheres and habitat part. A common feature of two groups is the significance of regional dummies. However, a dramatically different point is that the industrial factor is the best and the only effective factor in the group HIGH, while the habitat factor is the best and the only effective factor in the group LOW in the explanation of the firm birth rate. There is a tendency that industry-related factors promote the entrepreneurial activity in the region with high firm birth rate, while the relatively supportive habitat leads the relatively high firm birth at that in the region with low firm birth rate.

Therefore, in the region with low firm birth rate, policy makers should first make regional supportive habitat to grow the firm birth rate, and then invite the industrial R&D and VC investment to raise the level of firm birth rate up after setting up fundamental habitat.

Table 11

Partitioned Factor Regression results – Death rate by 'ECOL' approach

Factors	**(5) DEATHRATE_F**	**(6) DEATHRATE_L**

	Coefficient	S.E.	t	p-value	Beta	Coefficient	S.E.	t	p-value	Beta
Trend	**0.3876***	0.2224	1.74	.084	**.158**	0.0854	0.1046	0.82	.416	.075
West	**4.8316*****	0.7883	6.13	.000	**.694**	**2.2622*****	0.8257	2.74	.007	**.279**
Midwest						**-0.7333***	0.4227	-1.73	.086	**-.226**
South	**2.6354*****	0.7782	3.39	.001	**.361**	**1.0013***	0.5749	1.74	.084	**.281**
F_Academy	0.2055	0.3497	0.59	.558	.059	-0.1826	0.2386	-0.77	.446	-.112
F_Gov.	-0.1456	0.3109	-0.47	.640	-.042	-0.0591	0.1616	-0.37	.715	-.036
F_Industry	**0.9387*****	0.3478	2.70	.008	**.270**	0.1256	0.2585	0.49	.628	.077
F_Habitat	0.1720	0.3222	0.53	.594	.049	**0.5845****	0.2623	2.23	.028	**.359**
Constant	**12.7162*****	0.8938	14.23	.000	-	**11.3151*****	0.4907	23.06	.000	
R-square(Adj.)			.266					.272		

Beta means a standardized coefficient. Significant at *10%, **5%, ***1% (n=250).

Conclusions

This paper analyzes the effect of triple helix factors of university, industry and government sphere and habitat factors on the entrepreneurial activity at the state level in the U.S. It uses the firm dynamics factors as new measures of entrepreneurial activity; firm birth rate, firm death rate, and firm turbulence rate. Totally, six dependent variables are utilized in the ecological approach (ECOL) and in the labor market approach (LABOR).

We use two factors from each sphere are selected and a total of six factors are considered as triple helix variables; degree and university R&D for the university sector, government R&D and tax rate for the government sector and industrial R&D and venture capital investment for the industry sector. Six habitat variables are also selected in our analysis; melting pot index, the natural log of population, the natural log of average annual pay, house price, crime rate, and health insurance coverage. We consider all 50 states in the U.S. as sample population except the District of Colombia. The period of data covers from 2000 to 2004 and total observations are 250 (n = 250).

We conduct the full model regression for firm birth rate, firm death rate and firm turbulence rate using six triple helix factors and six habitat factors by the ecological approach and the labor market approach. In the factor regression analysis, we also make each sphere of triple helix and habitat part has one representative factor. Conducting regressions to examine the relationship between six firm dynamics factors and four representative factors, trend and regional dummies, we examine structures of triple helix and habitat and relative importance in the explanation of the firm dynamics factors in the ECOL and the LABOR model. In the partitioned model regression analysis, all 50 states in the U.S. are divided into two groups according to the firm birth rate by the ecological approach, and these two groups are used in the regression analysis to explain how the triple helix and habitat factors differently affect entrepreneurial activity in the two groups; the group of the states with high firm birth rate (HIGH) and the group of the states with low firm birth rate (LOW). We also conduct the partitioned factor regression analysis of the two groups to explain the relative role of university, industry, government sphere and habitat.

First, according to the descriptive statistics, the averages of firm birth and death rate are highest in the *West region* while *Midwest region* has the lowest birth rate and death rate. In the *Northeast region*, firm birth and death rate with the ecological approach are lower than average, while those with the labor market approach are higher than average. *West region* with relatively low condition of triple helix has high firm dynamics compared to *Northeast region*, however, habitat factors in the *West region* are more supportive than in the *Northeast region.*

In the full model regression analysis, the firm birth rate is positively and significantly associated with degree, industrial R&D expenditure, and melting pot rate and negatively and significantly related with house price. The firm birth rate in the ECOL is also positively related with government R&D and health insurance coverage. We can find that government and industrial R&D expenditure are more important than university R&D on the firm creation, that tax reduction and deduction can make a favorable condition to do a business, and that racial variety, house price and health care coverage are directly associated with a decision of making a firm. Turbulence rate, the sum of firm birth rate and firm death rate, causes the combined effect between the death rate model and the birth rate model. The effect of explanatory variables can be strengthened or diluted. In our analysis, industrial R&D, melting pot index and health insurance coverage have positive and significant effect on the level of entrepreneurial activity, while house price is negatively and significantly related with the turbulence rate in the ECOL and the LABOR model. The negative effect of government R&D on the turbulence rate in the LABOR model also explains government R&D can be an obstacle for entrepreneurial activity because of the side effect such as a moral hazard. The death rate is negatively and significantly associated with the venture capital investment, and positively and significantly associated with industrial R&D and university R&D. This result is caused by the difference of pressure on retrieving investment among various sources of investment on entrepreneurial activity. Venture capital with high pressure of retrieving the investment can reduce a failure rate than industrial R&D and university R&D with relatively low retrieving pressure. On the other hand, expensive house price can make the entrepreneur tensioned in the management of the firm and high health insurance coverage can relatively defuse the managerial tension and enhance the failure rate. In addition, high degree of education helps the existing firm to survive (ECOL model).

In the factor regression analysis, the government factor, the industry factor and the habitat factor are significantly associated with birth rate in the ecological approach while the government factor and habitat factor are not significantly related with the birth rate in the labor market approach. Supportive policy and regulation of government, such as government R&D and low tax rate, bring the population growth, and then the birth rate in the labor market approach becomes lower, so that government factor and habitat factor simultaneously are not significant more. In the case of the turbulence rate, we also found that government, industry and habitat factors have similar explanatory power in the ECOL model and the industry factor has largest effect on the firm turbulence rate in common like the case of the firm birth. In the case of the death rate, the government factor, the industry factor and the habitat factor have significant effect in the LABOR model only. We can find that favorable habitat can reduce the failure rate of the firm through this analysis.

In the partitioned model regression analysis, we divide all 50 states in the U.S. into two groups according to the firm birth rate by the ecological approach. The group ‘HIGH’ includes top 26 states such as Washington, Nevada, Utah, Colorado and California, and has totally 130 samples. The group ‘LOW’ consists of bottom 24 states such as Illinois, Nebraska, Wisconsin, Ohio and Iowa. In the case of the group HIGH, the effects of the significant factors on the

firm birth rate are larger than those of the in the full model regression. In the region with high firm birth rate, the government and industrial R&D are more effective than the university R&D to enhance the firm birth rate, and tax deduction and reduction stimulate the firm creation. In addition, in the view of habitat, racial variety and high level of health care lead to high level of the firm birth rate, while high housing cost dispirits the latent entrepreneurs. In the partitioned factor regression analysis, there is a tendency that the industry factor promotes the entrepreneurial activity in the region with high firm birth rate, while the relatively supportive habitat leads the relatively high firm birth in the region with low firm birth rate.

Through the various regression analysis and factor regression analysis, we find that there is a regional difference of the firm birth rate at the state level in the U.S. and the role of government, industry and habitat are important than the role of university for entrepreneurial activity. In detail, the government can promote the firm creation through the R&D expenditure and the reduction or deduction of taxes. In the industry sector, the most important sphere, the enlargement of R&D investment and venture capital investment can contribute to the growth of firm birth rate as well as the reduction of firm failure rate. In addition, the racial variety can be crucial factor for entrepreneurial activity. Low housing cost and high quality of health care can also lubricate the firm creation. Finally, in the region with low firm birth rate, policy makers should first make regional supportive habitat to grow the firm birth rate, and then invite the industrial R&D and VC investment to raise the level of firm birth rate up after setting up fundamental habitat. Using a similar approach, future research might seek to collect regional triple helix and habitat data sets at the MSA or county level. In addition, we try to examine the interactions among the firm dynamics factors using the simultaneous equation method.

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