Spatial Drivers of New Firm Birth in Iran

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Abstract

Entrepreneurial decisions on location choice are determined by a wide range of regional factors. Given the importance of regional characteristics, this paper investigates the determinants of new firm birth in the 30 Iranian regions, considering four different sizes: Micro (1-10 employees), Small (11-49 employees), medium (50-99 employees) and Large (100 and more employees) over 2000-2013. The main innovation of the paper is to analyze regional differences in the decision to start a new firm on a size basis. Using a new and unique database, we estimate panel non-spatial random effect and panel spatial autoregressive models. We find that regional variations explain firm dynamics, but the kind of the impacts is not homogeneous across firms with different size. We also find that all types of the firms are influenced by the negative effect of economic sanctions during the sample period. Furthermore, direct government intervention seems to be a key driver of new firms' birth in the Iranian economy.

Keywords: firms' birth, labor market approach, ecological approach, spatial autoregressive, Iran.

JEL Classification: M13, O18, L26.

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1. Introduction

In recent decades there has been a quick expansion on the regional determinants of firm birth in the economic geography and growth literature. The importance of regional aspects of new firm birth arises from this fact that birth of new firms leads to create entrepreneurship capital that known as a key factor to prompt economic growth (see, for example, van Stel and Suddle, 2008; Dejardin, 2011). Therefore, national and regional policymakers in different countries try to motivate new firm birth to promote regional growth. New firm birth may have direct and indirect effects on job creation for three main reasons. Firstly, new firms represent an entry of new capacities into the market, create employment directly and then increase the stock of jobs (Van Stel and Storey, 2004). In this line, Birch (1979) for the case of U.S. and Reynolds et al. (1994); Gallagher and Miller (1991) for the case of U.K. argue that after a short period (2-3 years), new firms are the main source of new job opportunities. Although, this direct impact may be different in each region (Reynolds and Maki, 1990; Reynolds et al. 1994).[1] Secondly, new firms birth leads to competition improvement and constitute a competitive threat to existing establishments which encourage them to perform better than before (Disney et al. 2003). This indirect process may stimulate economic growth consequently (Fritsch and Mueller, 2004). Finally, new firm birth can be known as a driver for the introduction of the new ideas and innovation to an economy which leads to economic growth in long-run (Romer, 1986).

Due to the importance of new firm formation in the regional context, since the early 1990s, many studies have been focused on the effect of regional economic and environmental conditions on new firm birth by using of regional level data. The main goal of this paper is to extend the current empirical literature by presenting new empirical evidence of the impact of the regional determinants on newly founded firms' birth for the case of Iran. To get the results, we use data sample, over the period 2000-2013, identify the determinants of firms' birth across different Iranian provinces. By doing so, this paper is the first attempt to test the role of regional factors for new firm birth in the Iran. Thus, it contributes to the empirical literature on the role of regional factors for a new firm birth that has so far been dominated by studies in different countries. This paper adds some major contributions to the existing literature. First of all, this is one of the first studies to investigate the regional-level determinants of new firms' birth for the case of Iranian provinces. Iran as a developing country face to central regional differences in terms of wages, labor skills, growth rates and natural resources and firms and population is highly concentrated around the main cities. Therefore, this economy is considered unequal, and it has spatial behavior in the allocation of scarce resources over space and location of economic activity. Second, the most of the previous studies didn't take into account spatial differences in their analysis and mostly relied on the non-spatial

[1] For example, Van Stel and Storey (2004), for the case of U.K. regions found that the strongest job creation effect can be attributed to new firm activity that founded about 5 years earlier.

methods. The spatial stationary assumption might be over-simplifies and most likely to be a misspecification of reality in light of important spatial variations in geographic context. Our study aims to correct this limitation and to exam whether a spatially varying relationship exists among new firm birth and relevant regional factors. Furthermore, we categorize the firms into four types: micro, small, medium and large, and estimate the models for each group of the firms. This classification helps us to investigate the role of regional factors on the newly founded firms' birth according to their size and get the detailed and more comprehensive results.

The structure of the paper is as follows. As a starting point, Section 2 reviews the main regional determinants of firm birth in theory and evidence. In Section 3, the definition of the data used in the paper is presented. The methodology and results of dynamic spatial panel regression are conducted in the fourth section. Finally, Section 5 presented summary and conclusions.

2. Main Regional Determinants of New Firm Birth: Theory and Evidence

2.1. Review of Related Theories

Since the early 1980s, a vast body of studies discusses that in a variety of countries, a high portion of variation in firm birth explains by different characteristics of regions within each country. The current theories identify the regional factors in four major categories: 1) local demand factors, 2) supply-side factors, 3) agglomeration effects and 4) policy environment determinants.

Local demand factors, mainly include the population size growth- which reflects the home market potential for the entrepreneurial activities- and regional per capita income. As Keeble and Walker (1994), Reynolds et al. (1995), Kangasharju (2000) and Lee et al. (2004) indicate, regional differences in market demand conditions are likely to be important on demand for new firm birth. On the other hand, if firms try to locate in regions with more concentrated customers, this makes a 'self-reinforcing effect' and encourages other firms to entry in these areas, since the market size increases further and leads to more entrepreneurial activity. Thus, it concludes that changes in population growth have a key positive role in firm entry rates. Another factor that influences on demand for new firm birth is regional per capita income. Reynolds (1994) argues that increase in regional income level leads to higher market demand and provides access to capital as a potential need for firm entry into the market. It also indicates promising economic conditions that can be a driver for running an entrepreneurial activity (Audretsch and Keilbach, 2004). But a higher level of regional income may also prevent firm entry due to higher employee costs and increase the opportunity costs of self-employment for the business owners.[1] Therefore, the general effect of income on firm entry may be positive or negative.

Supply-side factors usually refer to personal incentives to start a new business. As a general point of view, supply factors categorized into four main headings. First of all, current literature indicates that unemployment rates can play two contrasting roles

[1] For more discussion, see Ashcroft et al. (1991)

(positive or negative) in the firm entry. In one side, in regions with a higher level of unemployment rates, there are rare job alternatives, and the people have less chance to get a paid work. In this situation, higher rates of unemployment lead to higher entry rate, since unemployed workers encourage to start their own business as an alternative to unemployment. Thus, this view suggests a positive role for unemployment rates in firm birth.[1] In another side, there may be a negative relationship between unemployment rates and new firm birth. As Reynolds et al. (1994); Audretsch and Fritsch (1994); Carree (2002); and Sutaria and Hicks (2004) indicate, a higher level of unemployment rates reflects weak regional economic conditions and hinders new firm birth consequently. Human capital is another important element of firm birth. Evans and Leighton (1990) argue that higher level of education may stimulate firm birth since they are expected to be more successful at discovering new entrepreneurial activities. Therefore, based on this view, there is a positive effect of human capital on new firm formation.[2] On the other hand, more skilled people can decide to choose a paid work as they face less risk of unemployment and low-income levels (Binet and Facchini, 2015). In this line, Delmar et al. (2005) argue that for most of the educated people, the decision to become an entrepreneur is a second choice option, because they usually prefer an ordinary work with relative higher personal income than being an entrepreneur. Knowledge capital such as R&D expenditures and innovation are also known as variables driving entrepreneurial activity, especially in technological base industries (Binet and Facchini 2015). As the results of Audretsch et al., (2006) study show, there is a positive link between regional R&D activities and opportunities for new knowledge-based business. However, it is true when there is not a lack of entrepreneurial capital in an economy, because occurring this situation may cancel the positive role of R&D activity on entrepreneurship. Thus, in general, the effect of R&D on firm birth is indeterminate. Access to finance is another important supply factor in explaining regional variation in startup (Reynolds et al. 1994; Sutaria and Hicks 2004). In fact, regions with more financial depth and easier access to financial resources encourage entrepreneurs to entry in the market.[3] Finally, some economists believe that the size structure of the local industry is a supply-side factor, insomuch the birth rate of new firms tends to be higher in regions with more small-scale firms ceteris paribus. It can explain by the fact that the labors in small-scale firms usually find market opportunities more easily and to be more familiar with how to operate in this type of business (Johnson and Parker, 1996; Nyström, 2007).

Agglomeration effect is another regional factor, which contributes to new firm birth via increasing local market opportunities in terms of customers and required inputs (Reynolds et al. 1994; Fritsch et al. 2006). When a firm located close to other firms, it can benefit from some advantages such as access to a broader labor market, knowledge spillovers, and sharing of research organizations. Therefore, densely

[1] See Storey (1991); Evans and Leighton (1990); and Johnson and Parker (1996).
[2] See Audretsch and Fritsch (1994); Fotopoulos and Spence (1999); Armington and ACS (2002); and Naud et al. (2008).
[3] For more debate, see Naude et al. (2008)

populated regions are more attractive for entrepreneurs to establish a new start-up. This positive relationship has been verified in some previous studies.[1] Nonetheless, there may be a negative agglomeration effect on firm birth. For example, in some regions with too located firms near each other, it might cause to increase in labor wages and input prices. In addition, homogeneous firms usually compete for same resources which may lead to barriers to new firm entry (Nyström 2005; Bosma et al. 2008). However, based on current evidence, the positive agglomeration effects outweigh the negative consequences.

Finally, *policy environment* which includes access to infrastructures (roads and airports), subsidies or tax policies refers to the direct and indirect role of government through linking policy to the other determinants of entrepreneurial activities. As mentioned by Verheul et al. (2002), the government can influence on entrepreneurship in five types: first of all, government intervention can impact on the demand side of the entrepreneurship and increase the accessibility of entrepreneurial opportunities. In fact, some policies such as technological developments, competition, and income policies help to create demand for entrepreneurship and reduce barriers to entry for small businesses. Type 2 refers to government intervention, which affects the supply of potential entrepreneurs at the aggregate level. Immigration or regional development policies are some of the government interventions that can influence the characteristics of the people within the region or country. Access to resources, knowledge, and skill for potential entrepreneurs is the third type of government intervention. Governments can focus on policies to overcome the financial and knowledge gap through increasing the accessibility of financial and informational resources and help to small-business owners to obtain basic requirements to start or expand a business. In type 4, governments can play a decisive role in forming entrepreneurial targets and values in the educational systems (as a whole) and the media and finally, government intervention can be linked to the decision-making process of potential entrepreneurs (type 5). Some policies such as tax reduction, social security improvement, and deregulation encourage people to give up their present state of (un)employment to become an entrepreneur.

2.2. Review of Related Evidence

In this section, we assess some of the related studies, which focus on the regional determinants of firm birth at the national and sub-national level data. Kangasharju (2000) in his study by using the panel and cross-sectional data estimates the effects of regional factors on firm formation in Finland over the period 1989-1993. Panel data evidence reveals that the average size of firms in the Finland sub-regions tends to explain firm formation most robustly. Furthermore, cross-sectional evidence for Finland and some other countries shows that demand growth can be known as an important factor explaining regional firm formation. Fotopoulos and Louri (2000) examine the determinants of hazard rates of new firms entering Greek manufacturing over the period 1982-1992. The results of their study reveal that firms

[1] i.e., Audretsch and Fritsch (1994); Keeble and Walker (1994); Reynolds et al. (1994); Armington and ACS (2002).

located in the country's largest urban environment, Athens, face better survival prospects and this finding appears to be particularly relevant for smaller firms located in Athens when compared with their counterparts elsewhere in Greece. Thus, they conclude that centripetal forces such as agglomeration economies and other market-pull factors in Greece remain strong in resisting extensive decentralization of manufacturing activities.

To re-examine the importance of new firm birth in new growth theories, Armington and Acs (2002) by using of U.S. longitudinal annual data on firm birth for 384 labor market areas, investigate the role of human capital, education, training and entrepreneurial environment on new firm formation over the period 1994-96. They find considerable differences in the new firm formation rates from industrial to the technologically progressive regions, but much less variation over time. The results show that difference in the new firm birth rates is explained by regional differences in population and income growth, industry intensity, and human capital. Johnson (2004) for the case of U.K. examines regional differences in business formation activity over the period 1994-2001. He considers the extent to which regional differences can be accounted for by 1) variations in industrial structure and 2) variations across regions in the formation rate in the same sector. The statistical evidence of this paper suggests that in some U.K. regions, a key challenge arises from an industrial structure that is biased against industries in which the formation rate tends to be high. In other areas, the results suggest that a dominant policy concern should be the inability of some industries to match the formation rates experienced in the same industries in other regions.

In order to analyze regional factors influencing new firm formation in U.S., Sutaria and Hicks (2004) use a unique set of localized micro-data on annual firm entry, exit and survival over the period 1970-1991. The results of fixed effects' regression show unemployment change rates, mean establishment size, prior firm entry and exit dynamics, and the availability of local financial capital variation can explain regional patterns of new firm formation. In addition, they find no evidence of influence attributable to population or income dynamics, unemployment level, or local government spending. Whereas a high level of firm birth significantly contributes to the regional growth and known as the main signal of economic dynamism, understanding the factors that stimulate or mitigate the new firm creation is vital to local economic efforts. In this line, Lee et al. (2004) in their study examines the connections between local characteristics (such as creativity and diversity), human capital and new firm formation by using U.S. longitudinal Establishment and Enterprise Microdata (LEEM) for 1994-96 and Labor Market Areas (LMAs) data for the period 1997-98. The results show that new firm birth has a positive relationship with creativity in the form of Diversity index, but not with the Melting Pot Index. Furthermore, new firm birth is associated with other explanatory variables such as income change, human capital, and population growth rates, which are consistent with current literature. The evidence reveals that regions with more openness and creativity attract more human capital, which leads to entrepreneurship dynamism.

To take a closer look at the spatial variation of and the relationship between regional entry and exit, Brixy and Grotz (2007) analyze the factors that influence regional birth and survival rates of new firms for 74 West German regions over the period 1983-1992. They use of IAB Establishment Register database, which covers the information of all establishments that employ at least one employee who is liable to social insurance. The results of the panel fixed effect regression show the positive relationship between entry and exit (the negative relationship between entry and survival) for business services, but not for the manufacturing industries. The results also show the positive impact of employment growth on both the formation of firm entry and their chance to survive. Furthermore, workforce qualification and R&D efforts put a substantial positive impact on firm creation, but a very high negative influence on survival rates. The authors suggest that regional structural policies should focus not only on encouraging new firm creation but also on ensuring the sustainability of the new firms.

Nyström (2007) investigates the regional determinants of entry and exit in Swedish industrial sector at the three levels of aggregation data during 1996-2001. The results indicate that at the aggregate regional level, local demand and supply factors have a small effect on entry and exit. Furthermore, the effects of mentioned factors are not important at all at the industrial level data. In addition, agglomeration (in terms of localization economies) has a positive effect on new firm birth rates for most of the industries. Naude et al. (2008) in their study identifies the determinants of start-up rates across different sub-national regions of South Africa as a developing country. They find that some regional variables such as profit rates, educational levels, agglomeration and access to formal bank finance play a magisterial role in start-up rates across the districts. Thus, they conclude that start-ups in South Africa are mainly opportunity-driven, as opposed to being necessity driven.

Bosma et al. (2008) in their study investigate the impact of two types of agglomeration effects, localization, and urbanization, on the rate of independent start-ups and the rate of new subsidiaries for the Netherland over the period 1988-2002. They find that localization economies are more important in the creation of independent new start-ups, while urbanization economies have a more important role in the creation of new subsidiaries. In addition, the effect of agglomeration variables is stronger for manufacturing industries compared to services industries. Cheng and Li (2011) examine spatially varying relationships between new firm formation and its determinants across US counties by using of geographically weighted regression (GWR) approach over the period 2001-2003. Results of their analysis support the existence of spatially varying relationships and show significant local variations of new business entry in all the sectors investigated..

Binet and Facchini (2015) examine the regional determinants of business start-ups in the 22 French regions and four different sectors (industry, real states, trade, and services) over 1995-2004. The results of spatial and dynamic panel data methods show that regional factors determining new firm start-ups differ between sectors. On the other hand, the results are consistent with the existence of spatial heterogeneity

and persistence in start-up rates has been observed and finally, Li et al. (2016) in their study analyzes the importance of local factors on 5000 high-growth enterprises in the U.S. metro and non-metro counties. They draw on the knowledge spillover theory of entrepreneurship to motivate their count data models (CDM) and enhance this theory with more regional variables that have been found to be important in the firm location literature. They indicate that local government policies can play a major role in fostering entrepreneurial activities and in helping firms succeed. Furthermore, labors with college educational degree are essential to the existence of high-growth enterprises. They also find that some regional factors such as population density and per capita income have a positive relationship to the existence of these enterprises. Some earlier studies on the influence of regional variations on the new firm formation have been listed in Table 1 by authors, year of study, country focus, methodology and main findings.

Table1. Review of related studies (during the 1980s and 1990s)

Reference	Country focus	Methodology	Main findings
Whittington (1984)	U.K	OLS	Social factors, especially the proportions of home ownership and manual workers, have the major influences on new firm formation rates.
Beesley and Hamilton (1986)	Scotland	Shift-Share analysis	The regional variation in birth and death rates is mainly due to the intra-industry variability from region to region.
Del Monte and De Luzenberger (1989)	Southern Italy	ARCH (2)	The regional policy affected the birth of new local firms indirectly through the positive impact of large branch plants moving into southern Italy and not by a direct effect on local firms themselves.
Audretsch and Fritsch (1994)	West Germany	Panel data	Birth rates are greater in regions exhibiting characteristics reflecting convexities in production.
Guesnier (1994)	France	Linear regression	Regional factors have a significant impact on birth rates, and different types of areas may be affected by different start-up processes.
Bramanti and Girardi (1994)	Italy	Static & dynamic model	Net births of new firms are equal to the equilibrium elasticity of observed births plus a disequilibrium term that can be split into two different components: a sectoral and a regional one.
Gerlach and Wagner (1994)	Germany	Panel OLS & Panel LMS	Small firm entry tends to be positively related to high overall economic growth and to be higher in regions where both the small firm employment share and the level of wealth are high while the wage rate is low.
Reynolds et al. (1994)	France, Germany, Italy, Ireland, U.K, and U.S, Sweden	Linear regression	First, the most plentiful regions have annual new firm birth rates that are two or four times higher than the least fertile regions. Second, the underlying processes affecting new firm entry at the regional level appear constant across countries.

Table1. Review of related studies (during the 1980s and 1990s)

Reference	Country focus	Methodology	Main findings
Keeble and Walker (1994)	U.K.	Multivariate regression	The previous local population growth, capital availability, occupational structures, managerial and non-manual expertise, firm size, and geographically-concentrated urban demand have key influences on new firm formation.
Reynolds et al. (1995)	U.S	Linear regression	Some regional factors such as population growth, personal wealth, mid-career adults, low unemployment and greater flexibility in employment relationship have the most impact on the business birth rate.
Spilling (1996)	Norway	Linear regression	The existing industrial structure (i.e., business density, the proportion of small firms and the level of sectoral concentration of industry) provides the most significant explanation of regional variations.
Fotopoulos and Spence (1999)	Greece	OLS & Box-Cox regression	The local supply of skilled labor, and wealth and labor productivity differentials across regions to be significant and positive influences on new firm formation.

3. Data

To analyze the regional determinants of new firm birth in Iran, we collected an annual database consisting of 30 provinces over the period of 2000-2013. We mainly use three sources of data. First, Statistical Center of Iran (SCI); second, Central Bank of Iran (CBI) and third, Ministry of Industry, Mining, and Trade (MIMT). From the MIMT database which provides geographical and sectoral establishment data by aggregating data from the business entry according to sector and employment size, we considered the birth rate of new firms in four groups, Micro (1-10 employees), Small (11-49 employees), Medium (50-99 employees), and Large (100 and more employees) as endogenous variables in the models. Furthermore, to get the detailed and more comprehensive results, the birth rates are measured in two different methods: Labour Market Approach (LMA) and Ecological Approach (EA). It should be noted that measuring the absolute number of new entrances and then comparing them across different regions would be more misleading than revealing. It is because the economic regions are not homogeneous with respect to size (Audretsch and Fritsch, 1994; Armington and Acs, 2002). The LMA approach standardizes the number of new entrance relative to the number of workers in the industry (per 1000 workers). This approach is based on the theory of entrepreneurial choice –people's decisions to start a new business or not- suggested by Evans and Jovanovic (1989). Instead, the EA approach standardizes the number of new entrance relative to the number of existed firms (per 100 firms). This approach considers start-up activity relative to the size of the existing population of business (Armington and ACS,

2002). The definitions of the variables that will be used in the empirical models are presented in Table 2.

Table 2. Data description, sources and expected sign

Variable	Definition	Source	Expected sign
Dependent			
Firm birth (LMA) ^{M,S,m,L}	Number of new firms (normalized by per 1000 workers).	a	
Firm birth (EA) ^{M,S,m,L}	Number of new firms (normalized by per 100 existing firms).	a	
Independent			
Firm birth rate $_{-1}$	New birth rate in each region with one lag	a	+
Economic size	Real regional GDP Per Capita.	b	+/-
Population change	Change in population in each region between the period *t* and *t-1*.	b	+/-
Unemployment	Annual unemployment rate in each region.	b	+/-
Schooling	Share of population with secondary school.	c	+/-
Human capital	Ratio of technical institution graduates to the number of institutions.	c	+/-
Financial depth	Average value of stock transactions in regions' stock market.	d	+
Agglomeration effect	Ratio of industry establishment to population in each region.	c	+/-
Economic sanction dummy	For the years 2006, 2007, …, 2013=1; for other years=0.		-
Ahmadinejad policy dummy	For the years 2006, 2007=1; for other years=0.		+

Note **1**: M: micro, S: small, m: medium, L: large. *Note* **2**: [a] authors' calculation base on MIMT database, [b] Statistical Center of Iran, [c] authors' calculation base on SCI database, [d] authors' calculation base on CBI database. *Note* **3**: All variables are used in the models in their natural logarithm form.

Summary statistics for all of the regional variables during the whole period are provided in Table 3. As the results show, we observe that the average number of firm birth based on LMA approach which reflects the propensity of inhabitants of a region to start a new firm is 5.51 for the case of micro firms. While, the mean value decreases to 2.16, -1.18 and -1.51 for small, medium and large firms respectively. Similarly, the mean values of birth rate based on EA approach are 5.08, 2.95, 2.60, and 1.66 for micro, small, medium and large firms respectively. The dispersion of firm birth rates indicates that there is an apparent variation across different groups of the firms in Iranian regions.

Table 3. Summary statistics for regional variables for regressions

Variable	Mean	Medium	Max.	Min.	Std. dev.
Micro firm birth (LMA)	5.51	5.38	7.68	3.12	0.52
Micro firm birth (EA)	5.08	4.95	7.17	2.50	0.50
Small firm birth (LMA)	2.16	2.13	4.09	-0.38	0.63
Small firm birth (EA)	2.95	2.93	4.97	0.35	0.66
Medium firm birth (LMA)	-1.18	-1.19	1.97	-3.67	0.97
Medium firm birth (EA)	2.60	2.53	6.59	-0.08	0.97
Large firm birth (LMA)	-1.51	-1.52	0.67	-4.76	0.95
Large firm birth (EA)	1.66	1.73	4.61	-1.19	0.97

Table 3. Summary statistics for regional variables for regressions

Variable	Mean	Medium	Max.	Min.	Std. dev.
Economic size	10.69	10.69	12.20	9.35	0.43
Population change	0.16	0.22	2.42	-2.58	0.54
Unemployment	2.44	2.45	3.56	1.41	0.30
Schooling	-4.57	-4.52	-3.44	-6.80	0.31
Human capital	6.56	6.59	8.52	4.17	0.59
Financial depth	4.47	7.56	9.80	0.00	4.03
Agglomeration effect	-8.67	-8.69	-6.38	-12.21	0.82

Note: All variables are in their natural logarithm form.

Figure A-D shows the average geographical distribution of firm birth across the Iranian provinces during the sample period. As the figures show, we divided the firms into four groups (micro, small, medium and large) and depicted the map for each group of the firms. In Figure A. it shows that most of the micro-firm birth are concentrated around the provinces such as East Azerbaijan, Tehran, Gilan, Razavi Khorasan, Isfahan, Fars and Yazd and spatial concentration in some provinces such as North Khorasan, Golestan, Kermanshah, Hamedan, Bushehr, South Khorasan, Kohkiloyeh, and Hormozgan is at the very low-level. Figure B. shows the geographical distribution of the small firm birth in Iranian provinces. As the results show, most of the small firms have been founded in provinces such as East Azerbaijan, Mazandaran, Tehran, Ghazvin, Razavi Khorasan, Isfahan, and Fars. While the concentration of the small firm birth in North Khorasan, Kordestan, Ilam, Bakhtiari, Kohkiloyeh, and South Khorasan is at the lowest level.

For the case of medium firm birth (Figure C), Razavi Khorasan, Mazandaran, Tehran, Ghazvin, Markazi, Isfahan and West Azerbaijan are included in the high-intensity regions and the birth intensity in North Khorasan, Kohkiloyeh, Hormozgan, Lorestan, Ilam, Kordestan, Ardebil, and South Khorasan is at the very low level. Finally, Figure D. Shows the regional distribution of Large firm birth in Iranian 30 provinces during the sample period. Based on our results, Razavi Khorasan, Yazd, Isfahan, Markazi, Tehran, Ghazvin, and East Azerbaijan are known as high-intensity provinces, and the concentration in some provinces such as North Khorasan, Sistan, Kohkiloyeh, Ilam, Golestan, Lorestan, Kordestan, and South Khorasan is at the lowest level.

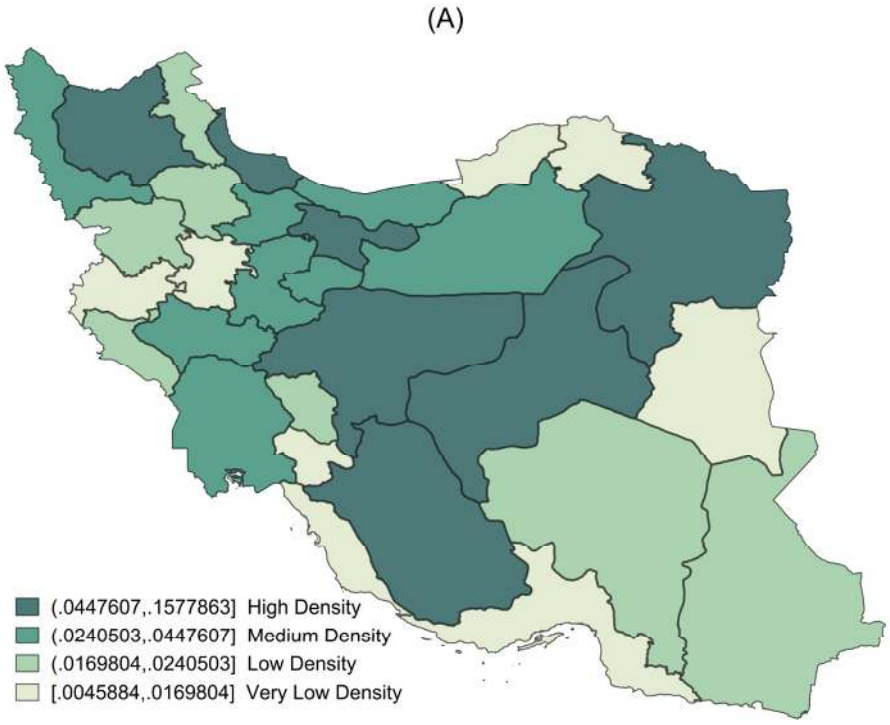

Figure A. Geographical distribution of micro firm birth (Average 2000-2013)

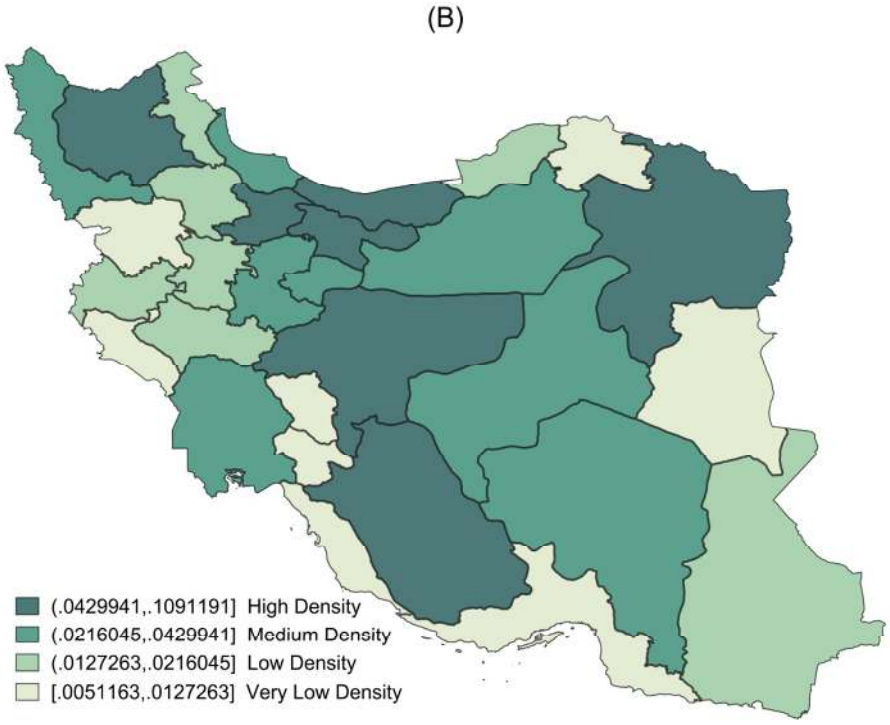

Figure B. Geographical distribution of small firm birth (Average 2000-2013)

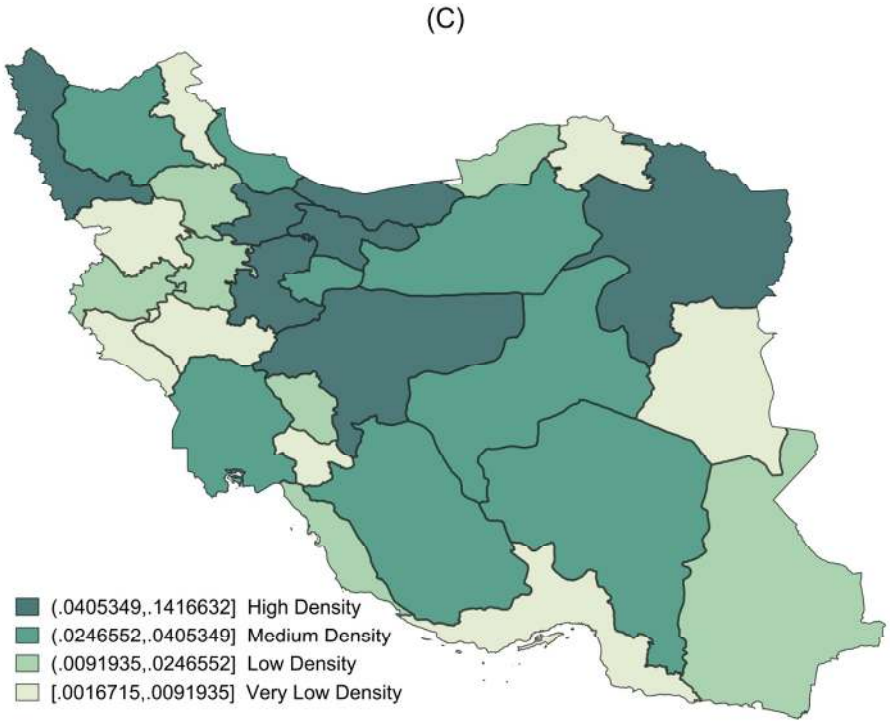

Figure C. Geographical distribution of medium firm birth (Average 2000-2013)

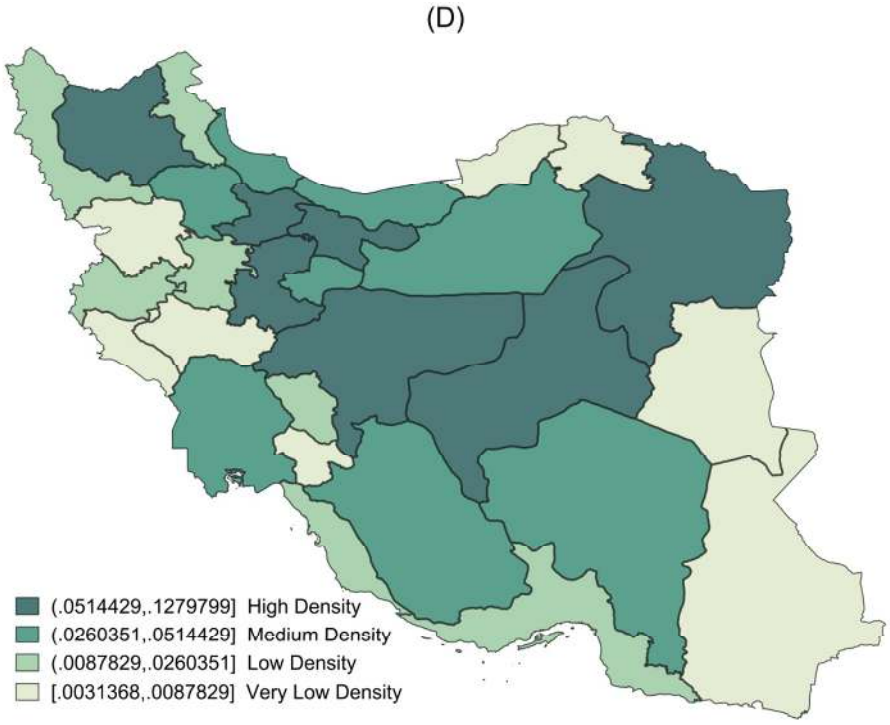

Figure D. Geographical distribution of large firm birth (Average 2000-2013)

4. Methodology and Results

This section presents the estimates of the effects of regional variables on the four groups of firm birth in Iranian provinces. To get the results, we used of two different estimators to provide initial evidence on the effect of various regional variables on the newly founded firms. In the first step, we eliminated spatial dependencies in the data and used the non-spatial panel random effect. This step constructed based on the assumption that the error terms are not spatially correlated. The results are reported in columns 1 and 4 in Tables 4 to 7. In the second step, regression results obtained from estimating the panel spatial autoregressive model (SAR) by adding spatial dependence in the form of spatial lag to panel data structure with random effects. The results of the panel SAR model reported in columns 2, 3, 5 and 6 in Tables 4 to 7.

A spatial autoregressive model in the form of a spatial lag to a panel data structure with random effects can be written in the following form:

$$y_{it} = \tau \sum_{i \neq j}^{N} W_{ij} y_{ij} + x'_{it}\beta + u_{it}, \qquad (1$$

In the equation (1), $u_{it} = \mu_i + \vartheta_{it}$ and $\vartheta_{it} = \rho\vartheta_{i,t-1} + e_{it}$ refer to structure of disturbances. In this equation, y_{it} known as dependent variable on the *i*th region at the period of *t* and x_{it} presents the $k \times 1$ vector of independent variables, and u_{it} is the unobserved error term. The parameter τ denotes the lag of dependent variable ($|\tau| < 1$) and provides a measure of the effect of the neighboring regions on the *i*th region. In equation (1), random effect component in the region *i* measures by $\mu_i \sim i.i.d.N(0, \sigma_\mu^2)$. Furthermore, $e_{it} \sim i.i.d.N(0, \sigma_e^2)$ is the i.i.d. random effect component and ϑ_{it} measures the serially correlated component in the *i*th region. Finally, $|\rho| < 1$ indicates the serial autocorrelation for each region. We can rewrite the equation (1) as a $nT \times 1$ vector form as follows:

$$y_{nT} = \tau(I_T \otimes W)y_{nT} + X_{nT}\beta + u_{nT}, \qquad (2$$

Where $y_{nT} = (y'_{n1}, y'_{n2}, \dots, y'_{nt})'$ is an $nT \times 1$ vector of dependent variable observation for the regions *i* (i= 1,…,N) and period *t* (t= 1,…,T). $X_{nT} = (X'_{n1}, X'_{n2}, \dots, X_*(\rho)')'$ is a $nT \times k$ matrix of *k* independent variables for the regions *i* and period *t*. In the equation (2), u_{nT} is the overall disturbance $nT \times 1$ vector and equals to $\left(\iota_T\iota'_T \otimes diag(\mu_1, \mu_2, \dots, \mu_N)\right)\iota_{NT} + (I_T \otimes I_N)\vartheta$. ι_T is a T-dimensional vector of ones, *I* is an identity matrix, *W* is the spatial matrix, $\otimes$ indicates the Kronecker matrix product and $W_\otimes = I_T \otimes W$. As Anselin and Bera (1998) argue, the covariance of *u* is equal to $B_\otimes(\tau)^{-1}\Omega(\sigma_e^2, \sigma_\mu^2, \rho)B_\otimes(\tau)^{-1\prime}$where $B(\tau) = I_N - \tau W$, $B_\otimes(\tau) = I_T \otimes B(\tau)$ and $\Omega(\sigma_e^2, \sigma_\mu^2, \rho)$ is the standard variance-covariance matrix of a panel data model with random effects and serial correlation. The fact that *Wy* is correlated with the error term *u* suggests that instrumental variables (IV) can be used

to solve for this endogeneity issue. In particular, spatially lag explanatory variables (WX, W^2X, …) can be used as IV (Montes-Rojas, 2010).

Now we turn to the results obtained from the empirical model regressions. As noted before, columns 1 and 4 in Tables 4 to 7 report results from the specification that contains variables without spatial dependencies and the parameters are assumed to be constant across regions. While columns 2,3,5 and 6 include variables with spatial dependencies across the regions. In order to check the robustness of our results to alternative specifications of the model, we proceed in the following way. First, we replaced the firm birth variable by using two different approaches; Labor market approach which reports in columns 1 to 3 and Ecological approach which reports in columns 4 to 6. The labor market approach rests upon the theory of entrepreneurial choice that each new firm is created by someone, as opposed to the ecological approach which implicitly assumes existing ventures create new business (Cheng and Li, 2011). Second, we considered two different time-invariant spatial weight matrixes in the model; a binary contiguity matrix (W) that reports in the columns 2 and 5 and inverse distance weight matrix (M) that reports in the columns 3 and 6. The W matrix assumes that spillovers only take place between bordering provinces, while the M matrix assumes that all the provinces contribute to the geographical spillovers proportionally to the distance so that the weights penalize the most distance provinces more heavily.

Table 4 presents the results of estimation where micro firm birth used as dependent variable. From the random effect estimation with non-spatial effect, we conclude that the significant factors are the economic size, agglomeration effect, financial depth, human capital, economic sanctions and the Ahmadinejad's policy (just in labor market approach and at the 10% level of significant). The model with including the spatial dependencies (SAR) between regions reported in columns 2,3,5 and 6 which present similar qualitative results for independent variables. The economic size has positive and significant impacts on micro new firm birth and a reasonable explanation for that is that increase in regional income level leads to increase in local market demand, and this phenomenon encourages new firms to enter the market. The next explanatory variable is agglomeration effect that measures by the ratio of the establishment to the population in each region at the period of *t*. According to the results, this variable has negative and significant impacts on dependent variable at the 1% significant level and refers to this fact that if the average industry size in the region is large, entry rates are low. The next variable is the average value of stock transactions in each region stock market and used as a proxy for financial depth indicator in our estimations. As can be seen in Table 4, the financial structure in Iranian regions suggests that more concentration in stock transactions is associated with a decrease in the start-up rate of micro firms and thus that financial structure in the form of stock transactions has a negative effect on micro start-ups in Iran. Unlike of previous variables, the coefficients for human capital, as measured by the ratio of technical institution graduates to the number of institutions, in all models (except Model 3) are positive and statistically significant. The positive impact of human capital on micro start-ups is consistent with other

findings in the literature –such as Mengistae (2006), Naude et al. (2008) and Evans and Leighton (1990)- suggesting that regions with a higher level of human capital will have higher micro start-up rates.

The variable of economic sanction notes to the new set of EU and U.S. sanctions imposed on Iranian economy during 2006 to 2013 with the supposed goal of changing its government's political behavior. Based on resolution 1929, the United Nations Security Council (UNSC) sent a strong signal that sanctions might be placed on Iranian oil (UNSC, 2010). After U.S. resolution 1929, in July 2012, the EU banned the import, purchase, and transport of Iranian crude oil. Oil sanctions were also combined with international financial, banking, and insurance sanctions consequently. As a result of economic sanctions, Iran's GDP decreased to -5.8 percent in 2013, and the economy faced to a 7 percent reduction in per capita income as a major driver of economic welfare (Farzanegan et al. 2016). But, what was the role of economic sanctions in firm dynamics in Iranian economy?. To answer this question, we included the economic sanction in our models as a dummy variable. The results are shown in Table 4 and reveal that there is a strong negative and significant effect of economic sanctions on micro start-ups during the sample period. The range of coefficients is between -29.3 percent to -57.1 percent depends on different models and scenarios.

During the Ahmadinejad's first government (especially between the years 2006 and 2007) and with the aim of job creation, a high percentage of bank credits is allocated to launch and development of small and medium enterprises (SMEs) in different economic activities. The main target of this populist policy was to encourage people to start their own business (with less than 50 employees) by using of government support in the way of banking credits. Based on this policy, during the Iranian fourth development planning (2005-2009), the banking system should allocate between 20 to 50 percent of its' financial sources to launch and promote the SMEs, and the large firms could benefit from the rest of the banking credits excess of SMEs requirement.[1] Regarding the importance of governments' direct intervention in new firm formation which argued in Section 2, we analyzed the effect of mentioned policy in new firms' start-up during the sample period. As the results show, the effect of Ahmadinejad's' policy on micro start-ups is insignificant and just non-spatial random effect model (Column 1) shows a positive and weak effect of policy at 10% level of significance.

According to the results in Table 4, we note that the coefficients for spatial lag for the dependent variable (λ) are statistically significant for all spatial autoregressive specifications. In fact, the positive and significant coefficient of the spatial lag of firm birth supports the idea that higher levels of birth rate in neighboring regions impact positively on birth rate in a given region.

[1] It should be noted that the policy banned the banking system to accept of support the projects with less than 5 employees. In fact, the policy focused mainly on the projects with less than 50 employees in some activities such as agriculture, industry, mining, service, and training.

Table (4). Estimation results of empirical models (dep. Variable: **Micro firm birth**)

Variable/Methods	*Labor market approach*			*Ecological approach*		
	Panel RE	Panel SAR		Panel RE	Panel SAR	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Ln (economic size)$_{i,t}$	**0.355 *****	**0.307 *****	**0.183 *****	**0.336 *****	**0.29 *****	**0.18 *****
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Ln (population change)$_{i,t}$	-0.0218	-0.029	-0.003	-0.053	-0.057	-0.033
	(0.889)	0.854	(0.982)	(0.726)	(0.702)	(0.824)
Ln (unemployment)$_{i,t}$	0.0126	0.0100	-0.035	-0.026	-0.029	-0.068
	(0.875)	(0.899)	(0.650)	(0.731)	(0.709)	(0.369)
Ln (agglomeration effect)$_{i,t}$	**-0.215 *****	**-0.19 *****	**-0.14 *****	**-0.197 *****	**-0.178 *****	**-0.137 *****
	(0.000)	(0.000)	(0.003)	(0.000)	(0.000)	(0.003)
Ln (financial depth)$_{i,t}$	**-0.019 *****	**-0.016 *****	-0.008	**-0.019 *****	**-0.017 *****	-0.009
	(0.006)	(0.024)	(0.259)	(0.003)	(0.014)	(0.149)
Ln (human capital)$_{i,t}$	**0.089 *****	**0.079 *****	0.0497	**0.089 *****	**0.081 *****	**0.056 ***
	(0.012)	(0.026)	(0.157)	(0.008)	(0.018)	(0.099)
Ln (schooling)$_{i,t}$	0.0825	0.0726	0.0632	0.0843	0.0717	0.063
	(0.311)	(0.370)	(0.419)	(0.281)	(0.357)	(0.406)
Dummy (economic sanction)	**-0.571 *****	**-0.504 *****	**-0.31 *****	**-0.527 *****	**-0.461 *****	**-0.293 *****
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Dummy (Ahmadinejad policy)	**0.0991 ***	0.0873	0.0496	0.0773	0.067	0.038
	(0.064)	(0.103)	(0.346)	(0.132)	(0.190)	(0.454)
Spatial lag for the dep. Variable (λ)		**0.122 ***	**0.463 *****		**0.128 ***	**0.443 *****
		(0.069)	(0.000)		(0.056)	(0.000)
Contiguity matrix (W)		YES			YES	
Inverse distance matrix (M)			YES			YES
Wald chi^2 test	**9140.92**	**9305.1**	**10140.9**	**8254.8**	**8567.8**	**9262.8**
P-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wald test of spatial terms		**3.30 ***	**26.34 *****		**3.64 ***	**21.87 *****
P-value		(0.069)	(0.000)		(0.056)	(0.000)
R^2 *adjusted*	0.233	0.246	0.270	0.221	0.235	0.259
Log likelihood	-190.78	-189.16	-179.84	-174.33	-172.55	-165.15

Note **1**: Number of observations: 420. *Note* **2**: Number of groups: 30. *Note* **3**: P-values are reported in parentheses. *Note* **4**: * significance at the 10%; ** significance at the 5%; *** significance at the 1%. *Note* **5**: The calculations were carried on using the software STATA15.

The results for random effects estimation- without and with spatial dependencies between regions- are shown in Table 5 by using of small firm birth as the dependent variable. In Table 5, the economic size coefficient is statistically significant for all specifications, indicating the positive effect of demand-side on new small start-ups in Iranian regions. Instead, the other demand-side factor (population change) put a strong negative and significant effect on small firms' birth surprisingly. Although the results of several studies have shown that population change is associated with birth rates positively[1], however, the effect is not apparently agreed upon. As Verheul et al. (2001) argue, a higher level of population can lead to the pursuit of economies of scale, which enables businesses to serve more efficient services to their customers and leaves fewer opportunities for small firms. In addition, population growth (if measured by the degree of urbanization) leads to excessive competition, wages level,

[1] For example see Reynolds et al. (1994); Armington and Acs (2002); Wennekers et al. (2005); Bosma et al. (2008).

and input prices, thus discouraging entry.[1] In the supply-side factors, the sign of unemployment rate is negative and strong in all of the specifications at the 1% level of significance. It means that higher level of unemployment in a region lowers small entry rates and refers to the fact that, a higher level of unemployment may reduce aggregate disposable income, effectively reducing local demand for goods and services, thereby putting downward pressure on the rate of new firms' birth (Reynolds et al. 1994). Furthermore, a higher level of unemployment indicates that the current labor market conditions face to higher risk levels. In this situation, the rate of new firms birth is likely to be lower because it would be more harder to survive, as compared to the situation when labor market conditions were judged to be more favorable (Sutaria and Hicks, 2004).

For the case of financial depth and human capital, the obtained results show the weak and negative effect of these variables on small firms' birth at the 1% and 10% levels of significance. Similar to the case of micro firms, the estimations show that the economic sanctions put negative, strong and significant effects on small start-ups that the range of coefficients varied between -15.9 to -43.2 percentage. But the result of the Ahmadinejad's policy is interesting. As can be seen in Table 5, the coefficients of Ahmadinejad's policy in all specifications are positive, significant and strong relatively. In fact, it shows that despite micro firms, the direct government intervention put a positive impact on the birth rate of small firms which were the key target of mentioned policy during the years 2006 to 2007. Finally, in all spatial dependence specifications, the coefficients for spatial dependence (λ) are positive and statistically significant. The positive spatial lag of firm birth means that one region located in a relatively rich neighborhood will tend to have a higher rate of firm birth if the other things being equal. The other diagnostic tests are shown in Table 5.

Table (5). Estimation results of empirical models (dep. Variable: **Small firm birth**)

Variable/Methods	*Labor market approach*			*Ecological approach*		
	Panel RE	Panel SAR		Panel RE	Panel SAR	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Ln (economic size)$_{i,t}$	**0.326 *****	**0.249 *****	**0.143 *****	**0.381 *****	**0.294 *****	**0.184 *****
	(0.000))	(0.000)	(0.012)	(0.000)	(0.000)	(0.003)
Ln (population change)$_{i,t}$	**-0.596 *****	**-0.598 *****	**-0.557 *****	**-0.628 *****	**-0.625 *****	**-0.575 *****
	(0.004)	(0.003)	(0.004)	(0.004)	(0.003)	(0.006)
Ln (unemployment)$_{i,t}$	**-0.241 *****	**-0.276 *****	**-0.309 *****	**-0.273 *****	**-0.309 *****	**-0.352 *****
	(0.021)	(0.007)	(0.002)	(0.015)	(0.005)	(0.001)
Ln (agglomeration effect)$_{i,t}$	-0.095	-0.075	-0.054	-0.104	-0.0822	-0.053
	(0.135)	(0.223)	(0.368)	(0.122)	(0.214)	(0.414)
Ln (financial depth)$_{i,t}$	**-0.016 ***	-0.015	-0.011	**-0.017 ***	**-0.016 ***	-0.012
	(0.081)	(0.1000)	(0.210)	(0.081)	(0.096)	(0.201)
Ln (human capital)$_{i,t}$	**-0.091 *****	-0.066	-0.039	-0.074	-0.056	-0.034
	(0.049)	(0.145)	(0.374)	(0.134)	(0.253)	(0.467)
Ln (schooling)$_{i,t}$	0.158	0.076	-0.0039	0.135	0.0638	-0.015
	(0.133)	(0.460)	(0.968)	(0.231)	(0.566)	(0.889)
Dummy (economic sanction)	**-0.418 *****	**-0.289 *****	**-0.159 *****	**-0.432 *****	**-0.318 *****	**-0.182 *****
	(0.000)	(0.000)	(0.027)	(0.000)	(0.000)	(0.019)
Dummy (Ahmadinejad policy)	**0.411 *****	**0.295 *****	**0.157 *****	**0.393 *****	**0.295 *****	**0.161 *****
	(0.000)	(0.000)	(0.032)	(0.000)	(0.000)	(0.040)

[1] For more discussion see Nyström (2007); Van Stel and Suddle (2008).

Table (5). Estimation results of empirical models (dep. Variable: **Small firm birth**)

Variable/Methods	*Labor market approach*			*Ecological approach*		
	Panel RE	Panel SAR		Panel RE	Panel SAR	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Spatial lag for the dep. Variable (λ)		**0.269 *****	**0.596 *****		**0.239 *****	**0.571 *****
		(0.000)	(0.000)		(0.000)	(0.000)
Contiguity matrix (W)		YES			YES	
Inverse distance matrix (M)			YES			YES
Wald chi² test	**881.3**	**986.6**	**1053.6**	**1413.2**	**1518.9**	**1608.0**
P-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wald test of spatial terms		**19.70**	**59.42**		**14.54**	**48.63**
P-value		(0.000)	(0.000)		(0.000)	(0.000)
R^2 *adjusted*	0.088	0.113	0.119	0.069	0.089	0.093
Log likelihood	-302.87	-293.72	-281.75	-331.13	-324.29	-313.34

Note **1**: Number of observations: 420. *Note* **2**: Number of groups: 30. *Note* **3**: P-values are reported in parentheses. *Note* **4**: * significance at the 10%; ** significance at the 5%; *** significance at the 1%. *Note* **5**: The calculations were carried on using the software STATA15.

Table 6 presents the results when the medium firm birth included in the model as the dependent variable. Based on the obtained results, economic size has a positive and significant impact on the entry of new firms' birth for the case of ecological approach and the range of coefficients is between 17.3 to 31.1 percentages. While the same effect in the case of labor market approach is insignificant. The results for the next explanatory variable (agglomeration effect) indicate that the variable put negative and significant effects (in Columns 4 and 5) on new firms start-ups in terms of higher rent, wage costs and potential competition from incumbent firms located in the area. Two other empirical results are statistically significant and negative for financial depth and human capital. In regions with a higher level of skilled people, we observe a lower rate of new firms' start-up (Columns 1 and 2). It is in line with Binet and Facchini (2015) suggesting that more skilled people usually prefer to choose a paid work as they face less risk of unemployment and low-income levels.

To measure the level of basic education in the economy, we include the measure of secondary educational attainment in each region. This variable is defined as the number of adults with secondary school degree in each year divided by the number of population in the region. The positive and statistically significant coefficients of schooling in Table 6 indicate that more population with basic educational degree encourages entrepreneurs to found their business which can rather be attributed to hire labor force with a lower level of educational degree and pay lower wages and benefit fringes to them. Results of the economic sanction dummy indicate that economic turmoil has heavily hit the medium firms' birth.. Indeed, for the case of medium start-ups, the negative impact of the economic sanction is observed between -36.1 to -70.5 percentage depends on different methods and scenarios. Similar to previous regressions, the results show positive and strong effects of Ahmadinejad's policy on medium firms' start-up with coefficients that are always significant at the 99% level of confidence and showing a magnitude ranging from 33.1 to 59.2 percentage. Finally, the coefficients for spatial dependence (λ) present positive signs and are statistically significant.

Table (6). Estimation results of empirical models (dep. Variable: **Medium firm birth**)

Variable/Methods	*Labor market approach*			*Ecological approach*		
	Panel RE	Panel SAR		Panel RE	Panel SAR	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Ln (economic size)$_{i,t}$	0.029	0.0152	-0.0113	**0.311 *****	**0.262 *****	**0.173 *****
	(0.700)	(0.840)	(0.880)	(0.000)	(0.001)	(0.033)
Ln (population change)$_{i,t}$	-0.159	-0.170	-0.159	-0.427	-0.427	-0.406
	(0.537)	(0.507)	(0.533)	(0.124)	(0.121)	(0.135)
Ln (unemployment)$_{i,t}$	0.0713	0.0615	0.053	0.096	0.073	0.044
	(0.596)	(0.645)	(0.688)	(0.501)	(0.607)	(0.756)
Ln (agglomeration effect)$_{i,t}$	-0.077	-0.077	-0.081	**-0.177 ****	**-0.161 ***	-0.134
	(0.411)	(0.404)	(0.377)	(0.050)	(0.074)	(0.135)
Ln (financial depth)$_{i,t}$	-0.010	-0.0094	-0.0092	**-0.029 *****	**-0.027 *****	**-0.025 *****
	(0.385)	(0.415)	(0.424)	(0.020)	(0.027)	(0.044)
Ln (human capital)$_{i,t}$	**-0.135 *****	**-0.115 ****	-0.0829	-0.088	-0.076	-0.052
	(0.022)	(0.050)	(0.165)	(0.161)	(0.225)	(0.401)
Ln (schooling)$_{i,t}$	**0.252 ***	0.216	0.154	**0.322 *****	**0.277 ***	0.202
	(0.064)	(0.116)	(0.258)	(0.024)	(0.054)	(0.161)
Dummy (economic sanction)	**-0.611 *****	**-0.512 *****	**-0.361 *****	**-0.705 *****	**-0.583 *****	**-0.391 *****
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.001)
Dummy (Ahmadinejad policy)	**0.592 *****	**0.506 *****	**0.368 *****	**0.567 *****	**0.483 *****	**0.331 *****
	(0.000)	(0.000)	(0.001)	(0.000)	(0.000)	(0.003)
Spatial lag for the dep. Variable (λ)		**0.141 *****	**0.377 *****		**0.143 *****	**0.403 *****
		(0.037)	(0.001)		(0.032)	(0.000)
Contiguity matrix (W)		YES			YES	
Inverse distance matrix (M)			YES			YES
Wald chi^2 test	**245.08**	**250.28**	**261.98**	**737.04**	**742.76**	**753.97**
P-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wald test of spatial terms		**4.36**	**11.78**		**4.62**	**15.40**
P-value		(0.037)	(0.000)		(0.032)	(0.000)
R^2 *adjusted*	0.186	0.191	0.201	0.238	0.241	0.240
Log likelihood	-408.89	-406.78	-403.81	-432.50	-430.25	-425.9

Note **1**: Number of observations: 420. *Note* **2**: Number of groups: 30. *Note* **3**: P-values are reported in parentheses. *Note* **4**: * significance at the 10%; ** significance at the 5%; *** significance at the 1%. *Note* **5**: The calculations were carried on using the software STATA15.

Finally, Table 7 presents the estimation results when using large firm birth as the dependent variable. According to the results, economic size, agglomeration effect, financial depth, human capital, schooling, economic sanction and Ahmadinejad's policy are the variables that are significant. First of all, it should be noted that for the case of labor market approach (columns 2 and 3), the coefficients for spatial dependence (λ) are not statistically significant and indicate that, the use of spatial econometrics might not be necessary because the spatial dependence not appears in the specifications. Turning our attention to the main result, it shows that the size of the economy has a weak and positive effect on new firms' birth (Column 4) and the coefficients are insignificant in the most cases. Thus, the general outcomes suggest that in the Iranian economy, the regional GDP per capita has larger positive effects on firms with the smaller size. While our regional variables for the agglomeration effect, financial depth, and human capital have negative and significant effects on large start-ups, the share of the population with secondary education degree has positive and relative strong effects on the dependent variable. This result is similar to the model estimation in Table 6 and reveals that the share of the population with a low level of education seems to be a driver for entrepreneurs to launch their own

business. On the other hand, similar to previous regressions, economic sanction deters entry, which suggests that macroeconomic instability hampers new firm formation and the rate of entry reflects negative expectations about the harsh economic conditions. From the obtained results, we conclude that large entries are positively affected by the government direct intervention.

Table (7). Estimation results of empirical models (dep. Variable: **Large firm birth**)

Variable/Methods	*Labor market approach*			*Ecological approach*		
	Panel RE	Panel SAR		Panel RE	Panel SAR	
	(1)	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**
Ln (economic size)$_{i,t}$	0.043	0.034	0.032	**0.132 ***	0.107	0.075
	(0.556)	(0.636)	(0.660)	(0.057)	(0.127)	(0.287)
Ln (population change)$_{i,t}$	-0.224	-0.218	-0.215	-0.209	-0.198	-0.184
	(0.382)	(0.392)	(0.399)	(0.435)	(0.457)	(0.483)
Ln (unemployment)$_{i,t}$	0.064	0.067	0.057	0.188	0.169	0.113
	(0.633)	(0.612)	(0.666)	(0.171)	(0.214)	(0.405)
Ln (agglomeration effect)$_{i,t}$	-0.126	-0.134	-0.131	**-0.281 *** **	**-0.271 *** **	**-0.237 *** **
	(0.145)	(0.122)	(0.130)	(0.001)	(0.001)	(0.004)
Ln (financial depth)$_{i,t}$	-0.008	-0.008	-0.0077	**-0.044 *** **	**-0.038 *** **	**-0.029 *** **
	(0.463)	(0.497)	(0.507)	(0.000)	(0.002)	(0.016)
Ln (human capital)$_{i,t}$	**-0.265 *** **	**-0.254 *** **	**-0.24 *** **	**-0.113 ***	**-0.114 ***	**-0.116 ** **
	(0.000)	(0.000)	(0.000)	(0.061)	(0.057)	(0.050)
Ln (schooling)$_{i,t}$	**0.283 *** **	**0.269 *** **	**0.250 ***	**0.306 *** **	**0.282 *** **	0.218
	(0.035)	(0.044)	(0.067)	(0.026)	(0.039)	(0.112)
Dummy (economic sanction)	**-0.431 *** **	**-0.372 *** **	**-0.35 *** **	**-0.716 *** **	**-0.589 *** **	**-0.408 *** **
	(0.000)	(0.000)	(0.002)	(0.000)	(0.000)	(0.001)
Dummy (Ahmadinejad policy)	**0.601 *** **	**0.545 *** **	**0.513 *** **	**0.520 *** **	**0.449 *** **	**0.341 *** **
	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.001)
Spatial lag for the dep. Variable (λ)		0.094	0.154		**0.137 *** **	**0.362 *** **
		(0.164)	(0.233)		(0.036)	(0.000)
Contiguity matrix (W)		YES			YES	
Inverse distance matrix (M)			YES			YES
Wald chi^2 test	**268.23**	**272.44**	**271.25**	**570.81**	**590.12**	**592.73**
P-value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wald test of spatial terms		1.94	1.42		**4.38**	**12.63**
P-value		(0.164)	(0.233)		(0.036)	(0.0004)
R^2 *adjusted*	0.141	0.145	0.148	0.335	0.337	0.341
Log likelihood	-405.17	-404.21	-404.49	-414.95	-412.81	-409.34

Note **1**: Number of observations: 420. *Note* **2**: Number of groups: 30. *Note* **3**: P-values are reported in parentheses. *Note* **4**: * significance at the 10%; ** significance at the 5%; *** significance at the 1%. *Note* **5**: The calculations were carried on using the software STATA15.

6. Summary and Conclusions

Entrepreneurial decisions on location choice are affected by a wide range of regional variations. Thus, due to the importance of regional characteristics, this paper analyses the regional determinants of new firms' birth in the 30 Iranian regions, considering four different sizes: Micro, Small, medium and large over the period 2000-2013. We estimate non-spatial panel random effect and panel spatial autoregressive models to explain the role of regional variations in new firms' birth in Iranian regions. This is a novelty in the context of an empirical study that largely previous studies focus on evidence from developed and industrialized economies. First of all, the results show that firms' birth rate in a given region is affected positively by the birth rate in the previous year and its' growth in neighboring

regions. This finding reveals persistence in entrepreneurship rates and suggests that policies to favor entrepreneurial activities should be implemented in the long run. We also find that agglomeration effect in terms of the ratio of industry establishment to population put a negative and significant effect on new firms' birth in the most cases and scenarios. The similar results were found for some other regional variables such as financial depth (in all cases), human capital (in the cases of small, medium and large firms' birth), and population change and the unemployment rate (in the case of small firms' birth). On the reverse, our results suggest that economic size has a positive and significant effect on new firms' birth, although this effect is less important when the firms with bigger size included in the models. Our findings highlight the positive role played by human capital in micro firms' birth and schooling in medium and large firms' birth respectively. Another important finding in the paper is that all types of the firms are influenced by the negative effect of economic sanctions, and the rate of new firms' entry actually reflects negative expectations about the harsh economic conditions. Furthermore, government direct intervention seems to be a key driver of new firms' birth in the Iranian economy.[1]

In terms of policy implications, our results suggest that for the case of Iran –as a developing country- policymakers should take into account regional conditions when designing birth-promoting policies. Furthermore, the spatial interactions of new firms' birth should be taken into account and it would be more desirable for birth-promoting policies to be coordinated with a broader regional focus in order to benefit from spatial externalities. This paper has provided the first empirical analysis of the regional determinants of new firm birth in Iran, considering spatial dependence in a panel data setup. Although this paper provides impressive results, the regional issues on exit across firm size are not analyzed in this research, and this subject is an important avenue for future studies about Iranian economy.

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[1] Appendix 1 provides summary of obtained results in terms of significant signs.

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Appendix 1. Summary of obtained results (in terms of significant signs)

	Dependent variables			
	Micro firm birth	**Small firm birth**	**Medium firm birth**	**Large firm birth**
Economic size	+	+	+	+
Population change		-		
Unemployment		-		
Agglomeration effect	-		-	-
Financial depth	-	-	-	-
Human capital	+	-	-	-
Schooling			+	+
Economic sanction	-	-	-	-
Ahmadinejad policy	+	+	+	+
Spatial lag for the dep. variable	+	+	+	+