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Send correspondence to:
Iman Cheratian
Tarbiat Modares University
cheratian@acecr.ac.ir

¹ Economics research group, Academic Center for Education, Culture, and Research (ACECR) on Tarbiat Modares University, Jalal Ale Ahmad Highway, P.O. Box:14115-111, Tehran, Iran. Tel: +98 2182884114. Fax: +98 2188220298.

² Economics research group, Academic Center for Education, Culture, and Research (ACECR) on Tarbiat Modares University, Iran.

³ Facultad de Ciencias Económicas y Sociales, Universidad Nacional de Mar del Plata, Funes 3250,7600, Mar del Plata, Argentina.

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Abstract

Given the importance of entry promotion to prompt economic growth and promote structural transformation, this paper investigates the regional determinants of firm entry in the 30 Iranian regions, considering four different sizes -micro, small, medium and large- over 2000-2015. Using a new and unique database, we estimate panel non-spatial and spatial lag and error dependence models. We find that regional factors explain firm entry, but the impact is not homogeneous across firms of different size. We also find that most types of firms are influenced by the negative effect of economic sanctions during the sample period.

Keywords: firm entry, ecological approach, spatial models, Iranian economy

JEL Classifications: M13, O18, L26

ملخص

نظراً لأهمية تشجيع دخول الشركات في إيران لتحفيز النمو الاقتصادي وتشجيع التحول الهيكلي ، تبحث هذه الورقة في المحددات الإقليمية لدخول الشركات في المناطق الإيرانية الثلاثين ، مع الأخذ بعين الاعتبار أربعة أحجامها المختلفة – المتناهية الصغر ، والصغيرة ، والمتوسطة والكبيرة خلال 2000-2015. باستخدام قاعدة بيانات جديدة وفريدة من نوعها ، فإننا نقوم بتقييم الفجوة الزمانية بين النماذج غير المكانية والمكانية وأخطاء نماذج الارتباط، فنجد أن العوامل الإقليمية تفسر دخول الشركات ، لكن تأثيره ليس متجانساً بين الشركات ذات الأحجام المختلفة. كما نجد أن معظم أنواع الشركات تتأثر بالآثار السلبية للعقوبات الاقتصادية خلال فترة العينة.

1. Introduction

In recent decades there has been a quick expansion on the study of regional determinants of firm creation in economic geography and growth literature. Since entrepreneurship capital is considered as a key factor to prompt economic growth, national and regional policymakers in different countries wonder how to boost firm birth, especially at the regional level ((Fritsch & Mueller, 2004, 2008); Van Stel and Suddle (2008); Von Graevenitz, Harhoff, and Weber (2010); Dejardin (2011); Fritsch (2013)).

Firm entry promotion is particularly relevant in developing countries, since startups not only enhance economic growth, but also promote structural transformation by absorbing labour from traditional sectors, provide innovative inputs, promote specialization, raise productivity (Gries & Naudé, 2010), and lead to gap-filling and input-completing activities (Acs & Amorós, 2008). Moreover, start-ups also allow to commercialize innovations (D. B. Audretsch, Keilbach, & Lehmann, 2006) and discover a country's competitive advantages (Hausmann & Rodrik, 2003).

Despite its relevance, firm formation in developing countries has been barely studied, in comparison to the attention that it has received in developed and industrialized economies. This paper aims to contribute to the empirical literature on the role of regional factors on firm dynamics in developing countries, by identifying the determinants of firm entry across Iranian provinces over the period 2000-2015. This is, to our knowledge, the first attempt to investigate regional-level determinants of firm entry for the Iranian provinces.

This paper also adds some other major contributions to the existing literature. Most of previous studies in developing countries do not take into account spatial differences and mostly rely on non-spatial methods, given the large size of the administrative units. However, the spatial stationary assumption might be over-simplifying and a misspecification, in light of the severe spatial heterogeneity in these countries (Scott & Storper, 2003). Thus, to overcome this limitation, we use different spatial econometric methods. Furthermore, we divide firms into four types, according to their size (micro, small, medium, and large) and we investigate the role of regional factors on firm entry in each group.

Iran has many features that are worthwhile noting. In terms of population, it is the second-largest country in the Middle East and it is a major regional and middle power. As many other developing countries, Iran has the challenge to diversify its oil-reliant economy and has to cope with short-term commodity and capital booms that have a limited effect on sustained growth. Another common feature with other developing countries is the acute regional differences in terms of wages, labor skills, growth rates and natural resources, as well as the high concentration of firms and population around the main cities. In fact, the uprooting of these regional imbalances has been included as one of the objectives of the constitution of the Islamic Republic after the 1979 Revolution (Farzanegan & Alaedini, 2016).

Entrepreneurship policies in Iran have been gradually included in the successive Economic and Social Development Programmes, both at the national and regional level. However, despite

this desirable focus on entrepreneurship in plans and policymaking, start-ups heavily depended on macroeconomic variations due to the economic and financial sanctions imposed by the European Union and the United States from 2006 to 2015, as the result of the political conflicts about the Iranian nuclear program. Thus, the relevance of entrepreneurship policies, along with the vulnerability of business environment to macroeconomic shocks, make Iran an interesting case to quantify the magnitude and significance of regional factors on firm entry. Our results show that regional variations explain firm dynamics, but the magnitude and significance of the impacts are not homogeneous across firms of different size. Econometric models also reveal that most types of firms are influenced by the negative impact of the economic sanctions during the sample period.

The structure of the paper is as follows. As a starting point, Section 2 reviews the main regional determinants of firm entry in theory and evidence. In Section 3, we describe the data as well as the period of interest. The method and the results of the non-spatial and the spatial lag and error dependence models are conducted in the fourth section. Finally, Section 5 summarizes the main conclusions.

2. Regional Determinants of Firm Entry: Theory and Evidence

2.1. Review of Related Theories and Empirical Evidence for Developed Countries

Since the early 1980s, a vast body of studies discusses that in a variety of countries, a high portion of firm entry variation may be explained by the socio economic characteristics of the regions within each country. Current theories classify these regional factors into four major categories: 1) local demand factors, 2) supply-side factors, 3) agglomeration effects and 4) policy environment.

Local demand factors mainly include regional differences in the population size or its growth (which reflects the home market potential for entrepreneurial activities) as well as the regional per capita income. According to Keeble and Walker (1994), P. D. Reynolds, Miller, and Maki (1995), Kangasharju (2000), and Lee, Florida, and Acs (2004) changes in population growth have a key positive role on firm entry rates. Regional per capita income also leads to new startups, since it is a proxy for higher market demand as well as better access to capital (P. Reynolds, Storey, and Westhead (1994); D. Audretsch and Keilbach (2004); Li, Goetz, Partridge, and Fleming (2016)). However, higher level of regional income may also prevent firm entry due to the higher labor costs and upper opportunity costs of self-employment for business owners (Ashcroft, Love, & Malloy, 1991). As the demand effect is usually more important than the cost effect, it is generally expected that increased levels of regional income induce more firms to enter (Nyström, 2007).

Supply-side factors usually refer to personal incentives to start new businesses. These factors may be classified into three main headings: unemployment rates, human capital and access to finance. Firstly, unemployment rates can play two contrasting roles on firm entry. On the one hand, there may be a positive effect if unemployed people, with scarce chances of getting a paid job, start their own business (Storey (1991); Evans and Leighton (1990); Johnson and Parker (1996)). On the other hand, there may be a negative effect since high unemployment weakens regional demand (P. Reynolds et al. (1994); D. B. Audretsch and Fritsch (1994a); M.

A. Carree (2002); Sutaria and Hicks (2004)). Secondly, regarding human capital, Evans and Leighton (1990) argue that a higher level of education of the workforce may stimulate firm entry since these people are expected to be more successful at discovering new entrepreneurial activities. However, Delmar (2005) and Binet and Facchini (2015) argue that for most educated people the decision to become an entrepreneur is a second choice option, because they usually prefer to be full time employees. Access to finance is another supply factor which explains regional variation in startups (P. Reynolds et al. (1994); Sutaria and Hicks (2004)). Thus, an easier access to financial resources encourages entrepreneurs to entry in the market.*

Agglomeration effects, that is, the external economies driven by the geographical concentration of firms and individuals, enhance firm entry by increasing local market opportunities in terms of customers and required inputs (P. Reynolds et al. (1994); Fritsch, Brixey, and Falck (2006)). When a firm locates close to other ones, it can benefit from some advantages such as access to a broader labor market, knowledge spillovers, specialized suppliers and sharing of research organizations. Therefore, densely populated regions are more attractive for entrepreneurs (D. B. Audretsch and Fritsch (1994a); Keeble and Walker (1994); P. Reynolds et al. (1994); Armington and Acs (2002); Nyström (2007)). Nonetheless, there may be disagglomeration effects if the excessive concentration of firms leads to congestion effects, higher labor wages and raised input prices. In addition, a competition effect may also expel firms out of dense regions, since these firms may compete for the same resources or markets (Nyström (2005); Bosma, Van Stel, and Suddle (2008)).

Policy environment which includes access to infrastructures (roads and airports), subsidies or tax policies refers to the direct and indirect role of government in enhancing entrepreneurial activities. As mentioned by Verheul, Wennekers, Audretsch, and Thurik (2002), the government can influence on entrepreneurship by five channels: 1) it can promote the demand for entrepreneurship and reduce barriers to entry for small businesses, supporting technological developments, as well as promoting competition and income policies; 2) it can affect the supply of potential entrepreneurs at the aggregate level, through immigration or regional development policies; 3) it can facilitate access to resources, knowledge, and skills for potential entrepreneurs; 4) it can play a decisive role in forming entrepreneurial targets and values in the educational systems and the media and, at last, 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 Empirical Evidence on Firm Entry by Size

It has been recognized that determinants of entry are not independent of startup size. This is because not all types of firms perceive entry barriers in the same way, or they are not equally able to take advantage from the endowments of territories they locate in (José Mata, 1991). Rather, their perception of entry barriers is mediated by firm's characteristics (such as the size) and the exploitation of resources and opportunities depends on their internal capacities (which are usually more limited as the size decreases).

* For more debate, see Naudé, Gries, Wood, and Meintjies (2008).

Empirical literature on firm entry by size is referred exclusively to developed countries, for example Nurmi (2006) for Finland; Fotopoulos and Spence (1998) and Fotopoulos and Louri (2000) for Greece; Görg, Strobl, and Ruane (2000) and Görg and Strobl (2002) for Ireland; Colombo, Delmastro, and Grilli (2004) for Italy; Jose Mata (1996) and José Mata and Machado (1996) for Portugal; and Arauzo-Carod and Segarra-Blasco (2005) for Spain. They find that:

- The evidence about the relative importance of demand factors is ambiguous. While the former studies find that industry growth is more important for larger start-ups (entrants may choose to enter at a larger scale in growing markets), D. B. Audretsch (1995) shows that smaller and younger firms are more positively affected by high economic growth, and Mills and Schumann (1985) find that small firms account for greater share of economic activity during economic expansions and a reduced share during contractions.
- As for the supply-side factors, unemployment has a positive effect only on small-scale entry, since firms founded by unemployed people are smaller on average (Segura, Garrigosa, & Vergés, 2005).
- Agglomeration economies, as well as the local availability of skilled workforce, may be more important for small firms, as large entrants are able to provide by themselves the necessary suppliers or workforce or even bring them from other locations. This is consistent with the incubator hypothesis Hoover and Vernon (1959), which holds that small firms are more dependent on the environment.

2.3. Review of Empirical Evidence for Developing Countries

In contrast to the vast empirical evidence for developed countries, studies that analyze regional factors associated to firm entry in developing countries are very scarce (we are only aware of contributions about Argentina (Calá, Manjón-Antolín, and Arauzo-Carod (2016); Calá (2018)), India, Indonesia (Deichmann, Lall, Redding, and Venables (2008); Ghani, Kerr, and O'connell (2014)), South Africa (Naudé et al., 2008), Turkey (Karahasan, 2015) and Vietnam (Santarelli & Tran, 2012)). They usually take as a starting point the set of variables typically included in studies for developed countries (see section 2.1) and occasionally add some variables that proxy for the specificities of developing economies.

Interestingly, when the same study is performed in a developed country (USA) and replicated in a developing country (India), the same variables that explain over 80% of spatial variation in entry rates in USA, can only explain 30% of the same dependent variable in India (Ghani et al., 2014). This suggests that determinants of entry for developed economies can explain just a small part of regional firm dynamics in a developing country.

Demand variables are usually significant and show the expected sign. Profits and economic growth rate encourage entry, while wages (which can proxy demand as well as input prices) have either a positive or insignificant effect. As for the supply-side factors, the unemployment rate is not statistically significant in any case (Naudé et al. (2008); Santarelli and Tran (2012); Calá et al. (2016); Calá (2018)), probably because the unemployed start new firms in the informal sector, which is not reflected in official firm entry registers. On the contrary, the availability of skilled workers is relevant (Naudé et al. (2008); Santarelli and Tran (2012); Karahasan (2015)) and, in the case of India, it seems to be stronger than in comparable studies

for developed countries (Ghani et al., 2014). The access to credit is positively related to firm entry in India, South Africa and Turkey, while the remaining studies do not include this dimension, possibly due to the lack of information at the regional level.

Agglomeration economies are very important, not only because of the labor market externalities and the proximity to customers, but also because of the availability of small suppliers. However, disagglomeration economies are also significant, and in highly populated countries like India and Indonesia, new firms avoid the high costs of urban areas, and prefer locating by large population centers. Congestion effects are also significant in South Africa and Argentina.

Lastly, economic crisis exerts a negative effect on entries (Karahasan, 2015), and after it, the usage of the idle capacity of the existing firms may act as a substitute for firm entry (Calá et al. (2016); Calá (2018)). That is, incumbent firms increasing their number of employees satisfy great deal of the increasing demand, instead of new ventures. Regarding the variables typical for developing countries, the size of the informal sector and the level of poverty have considerable explanatory power in entry regressions for Argentina.

As macroeconomic instability is higher in developing countries (Stiglitz, 1999), it is particularly worthy to explore the impact of macroeconomic conditions on firms of different size -i.e. are small firms more vulnerable or are they more flexible and have consequently in a better position to afford demand fluctuations[†]? (Mills and Schumann (1985); Carlsson (1989)).

3. Data

3.1. Entry rates

To analyze the regional determinants of firm entry in Iran, we use an annual database consisting of 30 provinces over the period 2000-2015. Thus, the total number of observations in the dataset for the whole sample period is 480. Entry data comes from the Ministry of Industry, Mining and Trade (MIMT) unique database. The MIMT database provides geographical and sectoral information about the number of entries, exits and incumbents based on the International Standard Industrial Classification (ISIC Rev.3) system on all mining of coal and lignite (10), mining of metal ores (13), other mining and quarrying (14), manufacturing (15-37), electricity, gas, steam and hot water supply (40), supporting and auxiliary transport activities (63), computer and related activities (72), research and development (73), and other business activities (74) firms. The data collected by MIMT is at individual-level and covers all public and private single-establishment formal firms with one or more employees registered with social security. Therefore, it does not cover informal or multi-establishment firms. Furthermore, the MIMT database provides this information by firms according to their size: micro (1-10 employees), small (11-49 employees), medium (50-99 employees), and large (100 and more employees). Therefore, our dependent variable is the entry rate in each Iranian province between 2000 and 2015, for each firm size group.

[†] In Turkey, for example, adverse macroeconomic conditions discourage small-scale entries, while large plants find it easier to enter (Güenalp & Cilasun, 2006).

Entry rates are computed according to the Ecological Approach (EA). This approach standardizes the number of new entrances relative to the number of existing firms (per 100 firms) and considers start-up activity relative to the size of the existing population of business (Armington & Acs, 2002).

Figures 1(A-D) show the mean geographical distribution of firm entry rates across the Iranian provinces, which ranges from a minimum of 0.0016 to a maximum of 0.1578. To provide a clearer picture of spatial patterns of new entries, we depict the map for each firm size group. We can see that the spread of firm entry rates varies largely among regions and it is not simply related to the size of each region. New entries are mostly concentrated in regions with higher level of industrialization and this finding is nearly constant for all firm size groups. In particular, the highest density of new entries is around the industrialized regions such as East Azerbaijan, Tehran, Ghazvin, Mazandaran, Razavi Khorasan, Isfahan, Fars, and Yazd. Meanwhile, entry rates in less industrialized regions (e.g. North Khorasan, Golestan, Kermanshah, Hamedan, Bushehr, South Khorasan, Kohkiluyeh, and Hormozgan) have much lower values.

Figure 1(A). Geographical distribution of micro firm entry rates (Average 2000-2015)

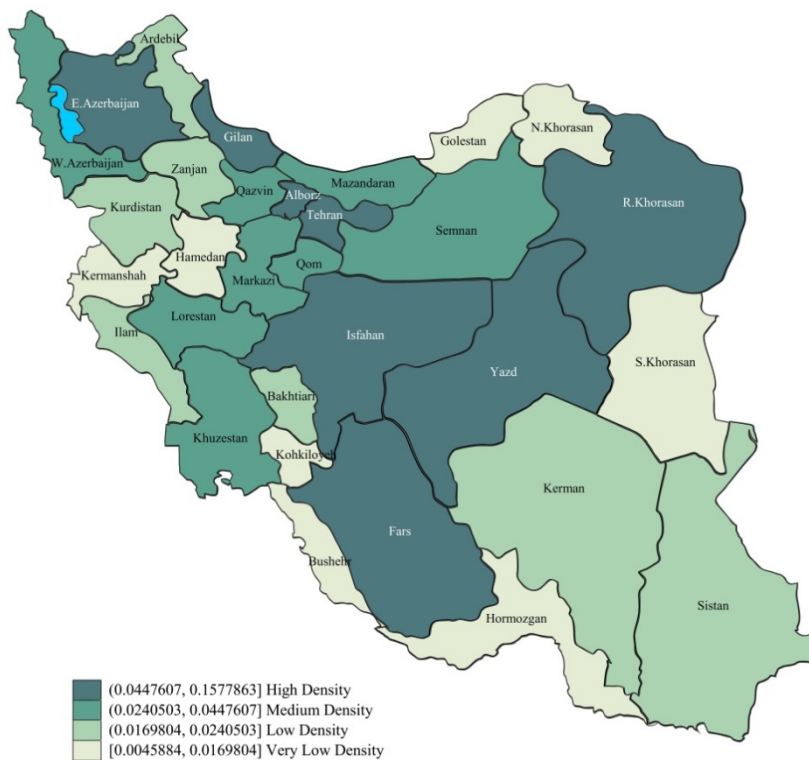


Figure 1(B). Geographical distribution of small firm entry rates (Average 2000-2015)

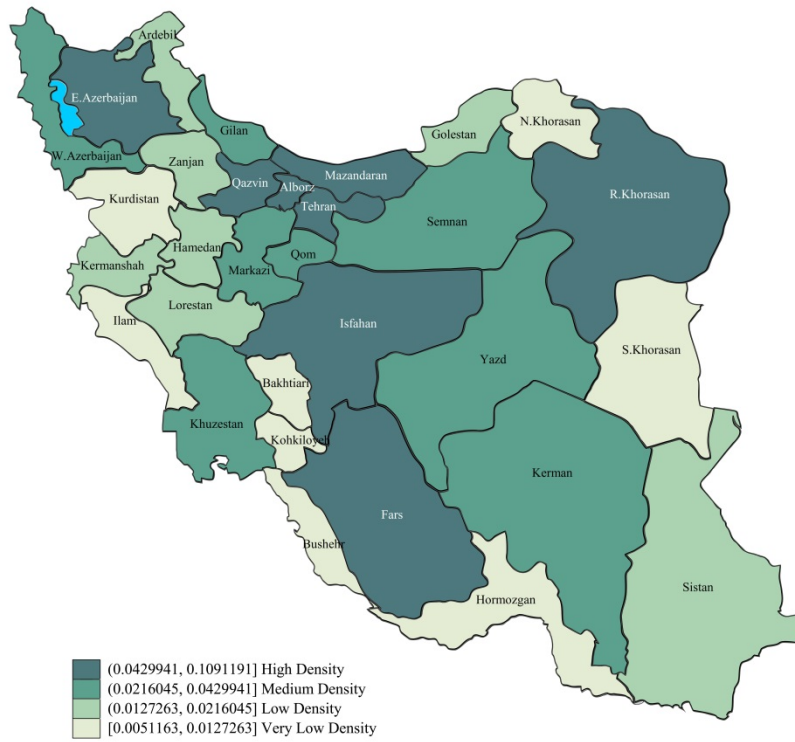


Figure 1(C). Geographical distribution of medium firm entry rates (Average 2000-2015)

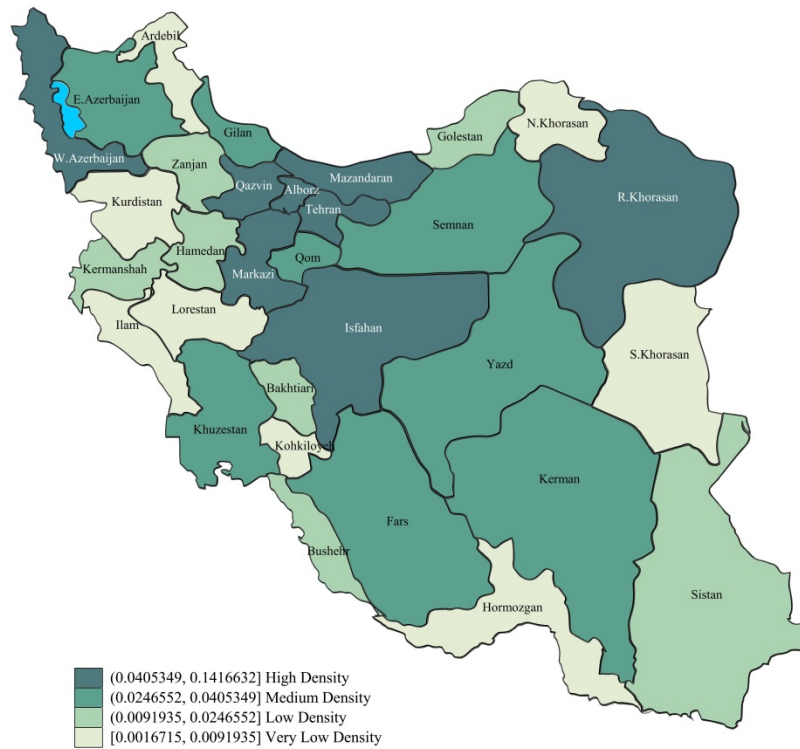
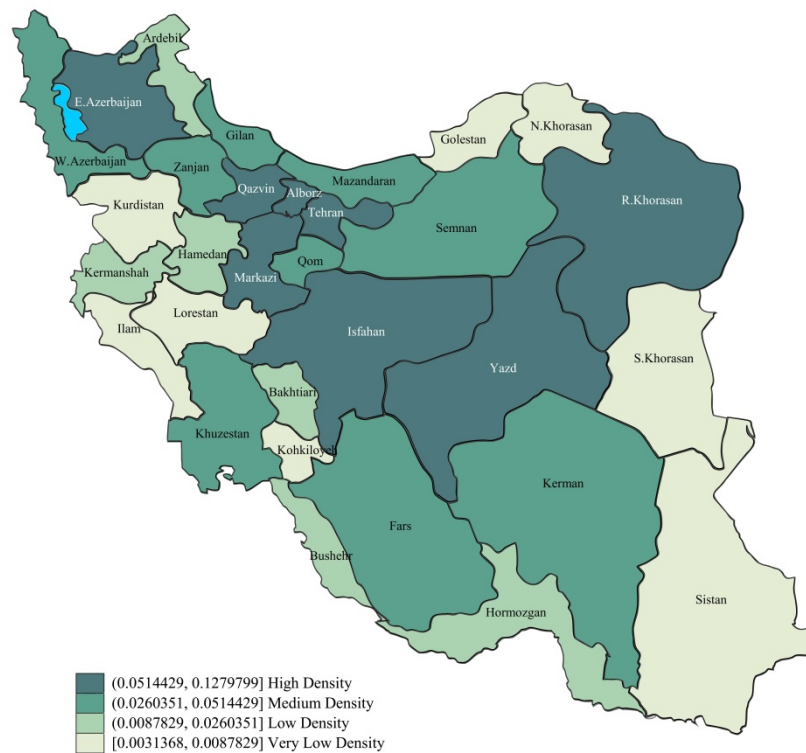


Figure 1(D). Geographical distribution of large firm entry rates (Average 2000-2015)



Since the 2000s, promotion of entrepreneurship has been increasingly regarded in the subsequent Economic and Social Development Programmes (DP). In particular, in the 3rd DP (2000-2004) the concept of “Academic Entrepreneurship” was considered in macro policies and educational plans, and in the 4th DP (2006-2010), for the first time, “Improvement of Business Environment” was regarded in national and regional development strategies, and a proper budget was allocated in order to promote entrepreneurial activities and support SMEs.[‡] Finally, the 5th DP (2011-2015) emphasized the improvement of business environment and obligated government to support the private sector, clusters and SMEs in a broader scale. The Labor Law and Social Security regulations were modified as well, and other promoting policies were implemented, such as competitive market creation or unemployment insurance reinforcement (Moghadam, 2017).

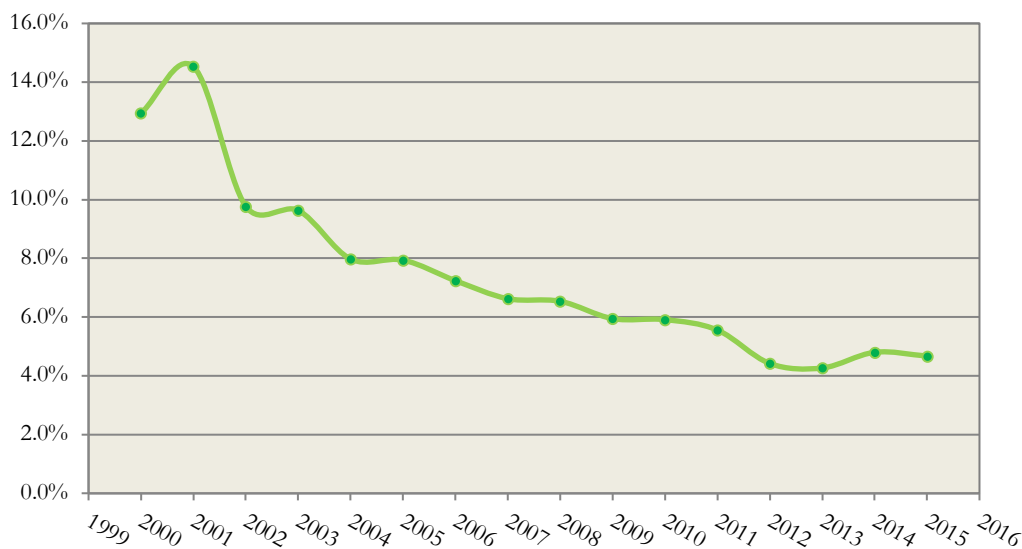
Anyway, despite the desirable focus on entrepreneurship in Iranian development plans and policymaking, in the last decade start-ups heavily depended on macroeconomic variations due to the external conflicts. By starting the Ahmadinejad’s administration and due to political conflicts about the Iranian nuclear program, the European Union and the U.S. imposed a set of economic and financial sanctions on Iran during 2006 to 2015 with the supposed goal of

[‡] During the Ahmadinejad's first administration (especially between 2007 and 2008), a high percentage of bank credits were allocated to the launch and development of SMEs in agriculture, industry, mining, service and training sectors. The main target of the policy was to encourage job seekers to start their own business (with focus of start-ups between 5-50 employees). Based on this policy, during the 4th DP, the banking system allocated between 20% and 50% of its financial resources to SMEs, while large firms benefited from the banking credits that exceeded SMEs requirements.

changing its government's political behavior. Harder sanctions to the import, purchase and transport of Iranian crude oil by the EU in 2012 were combined with international financial, banking and insurance sanctions. As a result, Iran's GDP growth decreased -7.44% in 2012 and the ease of doing business index reached its worst ranking (152 out of 190) (See Appendix 1).

Figure 2 displays the evolution of the entry rate over the whole period. As the figure shows, after a slight increasing between 2000 and 2001, it decreases in following years and then reaches its minimum values during 2012 and 2013, when the economic and financial sanctions were more severe. It is remarkable that, over the sample period, entry rate represents between 4% and 15% of total incumbents.

Figure 2. Total firm entry rate in Iran (2000-2015)



Source: Authors.

3.2. Explanatory variables

Data on regional explanatory variables such as local income, unemployment rate, human capital, agglomeration economies, and financial density were collected from the Statistical Center of Iran (SCI). The definition, sources and expected signs of the variables that are used in the empirical models are presented in Table 1. Year dummy variables are included in all specifications, which allows us to capture the effect of the economic sanctions (which were suffered –with different intensity- from 2006 to 2015), as well as the impact of the Ahmadinejad's policy in 2006 and 2007.

Table 1. Variables, sources and expected sign

Variable	Definition	Source	Expected sign
<i>Dependent</i>			
Firm entry (EA) ^{m,S,M,L}	Number of new firms (normalized by 100 existing firms)	a	
<i>Independent</i>			
Local income	Real regional GDP per capita in province <i>i</i> in period <i>t</i>	b	+

Variable	Definition	Source	Expected sign
Unemployment rate	Annual unemployment rate in province i in period t	b	+/-
Agglomeration effect	Population per Km ² in province i in period t	c	+
Disagglomeration effect	The squared of the agglomeration effect	c	-
Financial density	Ratio of the number of bank branches to existing firms in province i in period t	c	+
Human capital	Ratio of university graduates to population in province i in period t	c	+/-

Notes: m: micro, S: small, M: medium, L: large. a: authors' calculation based on MIMT database, b: Statistical Center of Iran, c: authors' calculation based on SCI database. All variables are used in the models in their natural logarithm form.

Summary statistics for all regional variables in their level form are provided in Table 2. We can see that entry rates decrease as the firm size increases. The dispersion of these entry rates suggests that there are important variations across the different firm size groups considered.

Table 2. Summary statistics for regional variables

Variable	Mean	Medium	Max.	Min.	Std. dev.
Micro firm entry	22.05151	17.12627	157.5758	1.418853	18.07307
Small firm entry	14.33548	11.94196	78.94737	1.205053	9.922532
Medium firm entry	1.523364	1.159727	13.33333	0.117096	1.347781
Large firm entry	1.097817	0.82887	9.677419	0.076599	1.073164
Total firm entry	38.57081	30.89898	206.0606	2.896016	26.35309
Local income	50617.25	45794.28	281327.5	16543.58	25134.45
Unemployment rate	2.44	2.45	3.56	1.41	0.30
Agglomeration effect	83.97938	49.97329	960.945	3.941782	155.6365
Disagglomeration effect	31224.8	2497.334	923415.3	15.53764	144049.3
Financial density	1.743584	1.373137	10.9375	0.287675	1.326416
Human capital	0.006841	0.005757	0.030702	0.00028	0.004562

Note: All variables are in their level form.

4. Method and Results

In order to provide empirical evidence on the effect of various regional variables on newly founded firms, we perform four different estimations. In the first step, we do not consider spatial dependencies and so non-spatial panel models were estimated. This step is based on the assumption that the dependent variable and error terms are not spatially correlated. In the second step, we estimate the panel simultaneous autoregressive models (SAR) by adding spatial autocorrelation in the forms of spatial error model (SAR_{err}), spatial lagged-response model (SAR_{lag}), and spatial lagged-mixed model (SAR_{mix}).

SAR models assume that the dependent variable in region i is affected by the explanatory variables in the same region (i) and the neighboring regions (j) (Cressie (1992); Haining (2003)). In these models, the connection between the regions i and j is identified by a $n \times n$ spatial weight (W) matrix. Therefore, closer neighbors get higher weights and distant neighbors get lower weights. Some usual methods such as binary coding, row-standardization, and variance stabilization are used for coding the spatial weights matrix.

There are three different types of SAR models depending on the spatial autoregressive process considered (Anselin (2013); Haining (2003)). The first model is SAR lagged-response model (SARlag) that takes the form:

$$Y = \rho WY + X\beta + \varepsilon \quad (1)$$

where ρ is the spatial autoregression parameter, W is the spatial weights matrix, Y is the response variable, β is the coefficient of the predictors in the original predictor matrix (X) and ε is the error term. This model assumes that the spatial autocorrelation process (ρW) takes place only in the response variable (Y) and the standard term for the independent variables and errors ($X\beta + \varepsilon$) are the same as in ordinary least squares (OLS) regression.

The second model is the spatial error model (SARerr) that takes the form

$$Y = X\beta + \lambda Wu + e \quad (2)$$

where λ is the spatial autoregression parameter, e indicates the spatially independent errors, and the remaining terms are as above. This model assumes that spatial autocorrelation process takes place only in the error term, but not in the dependent or explanatory variables. In this model, the usual OLS model ($X\beta + e$) is complemented by a term (λWu) which represents the spatial structure (λW) in the spatially dependent error term (u).

Finally, spatial autocorrelation can affect both dependent and explanatory variables, which is considered in the lagged-mixed model (SARmix). In SARmix, a new term ($WX\gamma$) must additionally appear, and the model takes the following form:

$$Y = \rho WY + X\beta + WX\gamma + \varepsilon \quad (3)$$

where γ indicates the autoregression parameter of the spatially lagged explanatory variables (Kissling & Carl, 2008).

Now we turn to the results obtained from the econometric regressions. Column 1 in Tables 3 to 7 reports results from the specification that contains variables without spatial dependencies, where the parameters are assumed to be constant across regions, while columns 2 to 7 include variables with spatial dependencies. In order to check the robustness of the results to alternative specifications, we consider two different time-invariant spatial weight matrixes: a binary contiguity matrix (W) –estimations reported in columns 2, 4 and 6; and inverse distance weight matrix (M) –estimations reported in columns 3, 5 and 7. The W matrix assumes that spillovers only take place between bordering provinces, while the M matrix assumes that all provinces contribute to the geographical spillovers proportionally to the distance, so that the weights penalize more heavily the most distant provinces.

Table 3 reports the results for total firm entry as the dependent variable. Results are highly robust across different econometric specifications. In most models, variables are statistically significant and have the expected signs, in line with the findings of previous studies. The coefficient for the local income (real GDP per capita) is positive and weakly significant, but only in model 4. It shows that in higher income areas there are more business opportunities and that more demand from local consumers encourages entrepreneurs to start their business. This

finding is consistent with some related studies such as Fotopoulos and Spence (1999), M. Carree, Santarelli, and Verheul (2008), and Fritsch and Falck (2007) for Greece, Italy, and West Germany respectively.

Table 3. Entry determinants (dependent variable: Total firm entry)

Variable/Methods	Non-	SARerr model		SARlag model		SARmix model	
	Spatial dependence	Contiguity	Inverse distance	Contiguity	Inverse distance	Contiguity	Inverse distance
	Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)	Model (7)
$\ln(\text{Local income})_{i,t}$	0.053 (0.055)	0.053 (0.053)	0.036 (0.053)	0.097 * (0.057)	0.093 (0.069)	0.047 (0.060)	-0.021 (0.065)
$\ln(\text{Agglomeration effect})_{i,t}$	0.882 *** (0.267)	0.915 *** (0.258)	0.991 *** (0.256)	0.926 *** (0.260)	0.946 *** (0.276)	0.911 *** (0.259)	0.920 *** (0.254)
$\ln(\text{Disagglomeration effect})_{i,t}$	-0.105 *** (0.031)	-0.107 *** (0.031)	-0.113 *** (0.030)	-0.111 *** (0.310)	-0.112 *** (0.032)	-0.106 *** (0.031)	-0.104 *** (0.030)
$\ln(\text{Unemployment rate})_{i,t}$	0.131 ** (0.064)	0.125 ** (0.062)	0.116 * (0.062)	0.149 ** (0.064)	0.141 ** (0.064)	0.122 * (0.064)	0.099 (0.062)
$\ln(\text{Financial density})_{i,t}$	0.779 *** (0.053)	0.768 *** (0.053)	0.783 *** (0.052)	0.774 *** (0.052)	0.781 *** (0.053)	0.765 *** (0.054)	0.773 *** (0.053)
$\ln(\text{Human capital})_{i,t}$	-0.084 ** (0.041)	-0.074 * (0.040)	-0.076 * (0.040)	-0.091 ** (0.041)	-0.089 ** (0.041)	-0.072 * (0.041)	-0.068 * (0.041)
Spatial lag of dep. variable (ρ)				-0.165 ** (0.065)	-0.164 (0.164)	0.023 (0.116)	0.228 (0.156)
Spatial lag of error term (λ)		-0.238 *** (0.076)	-1.037 *** (0.255)			-0.263 ** (0.070)	-1.269 *** (0.309)
Wald χ^2 test	2582.67	3833.6	10214.7	2766.7	2580.6	3949.9	12889.7
<i>P</i> -value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wald test of spatial terms		9.83	16.48	6.48	1.00	9.80	17.46
<i>P</i> -value		(0.001)	(0.000)	(0.010)	(0.316)	(0.007)	(0.000)
<i>Pseudo</i> R ²	0.4212	0.4145	0.4011	0.4220	0.4121	0.4138	0.4094
Log likelihood	-129.22	-124.33	-120.09	-125.98	-128.70	-124.31	-119.14

Notes: Number of observations: 480. Number of groups: 30. Standard errors are reported in parentheses. Level of significance: * 10%; ** 5%; *** 1%. Year dummies are included in all the specifications. Estimations were carried out using the software STATA15.

Our model also shows significant agglomeration and disagglomeration effects, in line with previous findings for developed and developing countries. The coefficient of the unemployment rate is positive and significant in most specifications. This result supports the recession-push hypothesis, that is, an increase in unemployment rate decreases the paid-employment opportunities and pushes job-seekers to start their own business as a viable alternative.

The strong effect of financial density on total firm entry clearly reveals that start-ups in Iranian provinces rely upon on banks as a major source of external finance. This finding is consistent with Garofoli (1994); Fotopoulos and Spence (1999) and Sutaria and Hicks (2004) for Greece, Italy, and the United States respectively. Likewise, human capital is negatively associated with firm entry. This contrasts with other findings for developed countries such as Sweden (Davidsson, Lindmark, & Olofsson, 1994); Greece (Fotopoulos & Spence, 1999); United Kingdom (Keeble & Walker, 1994) and Norway (Spilling, 1996). However, as Calá, Arauzo-Carod, and Manjón-Antolín (2015) argue, in developing countries, where firms usually operate

in their early life-cycle stages and tend to specialize in natural resource-intensive goods and scale-intensive industrial commodities, firm entry may show no relationship with higher education levels of the workforce. Finally, the negative value of the coefficient associated with the spatial lag (ρ) in Model 4 reveals that provinces are expected to have higher entry rates if, on average, their neighbors have lower entry rates and vice versa.

Table 4 shows the results for micro firms, which are also highly consistent across different specifications. According to our models, micro firm entry rate in the Iranian regions is driven by supply factors rather than demand factors. There is a strong, positive and significant effect of unemployment rate on micro start-ups, which means that unemployment pushes potential entrepreneurs to start their own business as a viable substitution of paid-employment (as in D. B. Audretsch and Fritsch (1994b)). Local income, on the other hand, has a negative and significant impact (only at 10%) and a reasonable explanation for that is that the increase in local income benefits mainly larger or incumbent firms, implying further competition for new micro start-ups, which are less prone to enter the market. Financial density (bank branches per existing firms) exerts a positive and significant effect, while the negative impact of human capital suggests that people with higher level of graduation prefer to be employed in paid jobs rather than create their own business. This is in line with other findings in the literature, such as Binet and Facchini (2015).

We also find strong and significant agglomeration and disagglomeration effects. Interestingly, these effects are only relevant for micro and small firms (see Table 5), in line with the incubator hypothesis (section 2.2). Besides, the coefficients are higher for micro firms, suggesting that the smaller the firm size, the more dependent it is from the environmental conditions. Coefficients for the spatial lag for the dependent variable (ρ) are statistically significant for SARlag specifications using both W and M matrices. The negative value supports the idea that higher levels of entry rate in neighboring regions impact negatively on birth rate in a given region.

Table 4. Entry determinants (dependent variable: Micro firm entry)

Variable/Methods	Non-Spatial dependence	SARerr model		SARlag model		SARmix model	
		Contiguity	Inverse distance	Contiguity	Inverse distance	Contiguity	Inverse distance
		Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
$\ln(\text{Local income})_{i,t}$	-0.093 (0.070)	-0.100 (0.068)	-0.129 * (0.068)	-0.059 (0.071)	-0.009 (0.081)	-0.091 (0.074)	-0.134 * (0.078)
$\ln(\text{Agglomeration effect})_{i,t}$	1.167 *** (0.336)	1.275 *** (0.326)	1.442 *** (0.329)	1.255 *** (0.335)	1.367 *** (0.361)	1.281 *** (0.330)	1.434 *** (0.333)
$\ln(\text{Disagglomeration effect})_{i,t}$	-0.142 *** (0.039)	-0.153 *** (0.038)	-0.170 *** (0.039)	-0.153 *** (0.039)	-0.164 *** (0.041)	-0.155 *** (0.039)	-0.169 *** (0.039)
$\ln(\text{Unemployment rate})_{i,t}$	0.207 * (0.083)	0.167 ** (0.082)	0.141 * (0.082)	0.211 ** (0.083)	0.218 *** (0.083)	0.178 ** (0.088)	0.138 * (0.084)
$\ln(\text{Financial density})_{i,t}$	0.652 *** (0.066)	0.632 *** (0.066)	0.642 *** (0.065)	0.647 *** (0.065)	0.655 *** (0.065)	0.637 *** (0.067)	0.641 *** (0.066)
$\ln(\text{Human capital})_{i,t}$	-0.113 ** (0.054)	-0.107 ** (0.052)	-0.109 ** (0.053)	-0.120 ** (0.053)	-0.125 ** (0.053)	-0.111 ** (0.053)	-0.109 ** (0.053)
Spatial lag of dep. variable (ρ)				-0.193 *** (0.069)	-0.467 ** (0.201)	-0.051 (0.146)	0.026 (0.207)
Spatial lag of error term (λ)		-0.227 *** (0.077)	-1.097 *** (0.264)			-0.176 (0.165)	-1.122 *** (0.333)

Wald chi ² test	1142.09	1694.87	4791.81	1193.86	1122.26	1566.67	4923.59
<i>P</i> -value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wald test of spatial terms		8.69	17.18	7.64	5.41	8.92	17.07
<i>P</i> -value		(0.003)	(0.000)	(0.005)	(0.020)	(0.011)	(0.000)
Pseudo R ²	0.3090	0.2994	0.2837	0.2934	0.2756	0.2973	0.2850
Log likelihood	-255.02	-250.68	-245.41	-251.21	-252.09	-250.62	-245.40

Notes: Number of observations: 480. Number of groups: 30. Standard errors are reported in parentheses. Level of significance: * 10%; ** 5%; *** 1%. Year dummies are included in all the specifications. Estimations were carried on using the software STATA15.

The entry of small firms is mainly affected by the agglomeration economies and diseconomies and the financial density (Table 5). According to our results, to enter the market small firms are more dependent on financial conditions than their micro counterparts: a 1% increase in financial density rises micro firm entry rate between 0.63% and 0.65% (Table 4), while the impact is between 0.88% and 0.94% for small firms (Table 5).

There is also a positive (but weak) effect of demand conditions. Unlike micro firms, we do not find significant effects of the unemployment rate or the human capital level on small firm entry. Finally, the coefficients for spatial dependence (ρ) are negative but statistically insignificant.

Table 5. Entry determinants (dependent variable: Small firm entry)

Variable/Methods	Non-Spatial dependence	SARerr model		SARlag model		SARmix model	
		Contiguity	Inverse distance	Contiguity	Inverse distance	Contiguity	Inverse distance
		Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
$\ln(\text{Local income})_{i,t}$	0.066 (0.059)	0.065 (0.059)	0.068 (0.058)	0.069 (0.060)	0.095 (0.068)	0.116 * (0.063)	0.058 (0.070)
$\ln(\text{Agglomeration effect})_{i,t}$	0.507 * (0.282)	0.512 * (0.282)	0.498 * (0.282)	0.507 * (0.281)	0.531 * (0.281)	0.599 ** (0.248)	0.489 * (0.285)
$\ln(\text{Disagglomeration effect})_{i,t}$	-0.060 * (0.034)	-0.062 * (0.034)	-0.057 * (0.034)	-0.061 * (0.034)	-0.064 * (0.034)	-0.081 ** (0.031)	-0.056 (0.035)
$\ln(\text{Unemployment rate})_{i,t}$	0.049 (0.079)	0.047 (0.079)	0.048 (0.078)	0.050 (0.079)	0.057 (0.079)	0.073 (0.079)	0.046 (0.079)
$\ln(\text{Financial density})_{i,t}$	0.942 *** (0.071)	0.942 *** (0.070)	0.948 *** (0.071)	0.941 *** (0.071)	0.940 *** (0.071)	0.888 *** (0.083)	0.948 *** (0.071)
$\ln(\text{Human capital})_{i,t}$	-0.049 (0.051)	-0.051 (0.051)	-0.044 (0.051)	-0.050 (0.051)	-0.052 (0.051)	-0.081 (0.053)	-0.043 (0.051)
Spatial lag of dep. variable (ρ)				-0.012 (0.063)	-0.138 (0.170)	-0.289 (0.184)	0.046 (0.191)
Spatial lag of error term (λ)		0.020 (0.072)	-0.374 (0.216)			0.298 * (0.169)	-0.412 (0.269)
Wald chi ² test	1653.51	1603.61	2879.88	1661.56	1677.69	1221.40	3013.87
<i>P</i> -value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wald test of spatial terms		0.08	3.00	0.04	0.66	3.13	2.98
<i>P</i> -value		(0.780)	(0.082)	(0.846)	(0.415)	(0.209)	(0.225)
Pseudo R ²	0.4399	0.4410	0.4312	0.4414	0.4411	0.4967	0.4301
Log likelihood	-226.20	-226.16	-224.57	-226.18	-225.86	-225.12	-224.54

Notes: Number of observations: 480. Number of groups: 30. Standard errors are reported in parentheses. Level of significance: * 10%; ** 5%; *** 1%. Year dummies are included in all the specifications. Estimations were carried on using the software STATA15.

Variables that explain the entry of medium firms are related to both supply and demand factors (Table 6). In particular, local income shows a positive and robust effect (medium firms are the only ones that are consistently enhanced by local income conditions). Besides, financial density promotes firm entry, which may be related to more access to bank credits and facilities. Human capital is positive and significant in all specifications: regions with a higher level of skilled labor force, show a higher rate of medium firm start-ups, *ceteris paribus*. This suggests that skilled workforce prefer to work in bigger firms as they face less risk of death or bankruptcy. As the ρ coefficient shows, medium firm entry in each province is negatively related to the entry of firms of the same size in neighboring provinces. Finally, unlike previous models, we cannot find evidence on agglomeration and disagglomeration effects.

Table 6. Entry determinants (dependent variable: Medium firm entry)

Variable/Methods	Non-Spatial dependence	SARerr model		SARlag model		SARmix model	
		Contiguity	Inverse distance	Contiguity	Inverse distance	Contiguity	Inverse distance
		Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
$\ln(\text{Local income})_{i,t}$	0.084 (0.057)	0.101 * (0.053)	0.097 * (0.052)	0.099 * (0.054)	0.131 ** (0.053)	0.087 * (0.052)	0.123 ** (0.053)
$\ln(\text{Agglomeration effect})_{i,t}$	0.289 (0.253)	0.202 (0.241)	0.149 (0.244)	0.267 (0.234)	0.244 (0.228)	0.356 (0.221)	0.201 (0.236)
$\ln(\text{Disagglomeration effect})_{i,t}$	-0.048 (0.031)	-0.036 (0.030)	-0.027 (0.031)	-0.047 (0.029)	-0.045 (0.028)	-0.061 ** (0.027)	-0.038 (0.029)
$\ln(\text{Unemployment rate})_{i,t}$	-0.065 (0.118)	-0.054 (0.115)	-0.028 (0.114)	-0.055 (0.115)	-0.029 (0.112)	-0.052 (0.110)	-0.026 (0.113)
$\ln(\text{Financial density})_{i,t}$	0.586 *** (0.089)	0.549 *** (0.087)	0.558 *** (0.087)	0.571 *** (0.084)	0.566 *** (0.083)	0.576 *** (0.079)	0.566 *** (0.085)
$\ln(\text{Human capital})_{i,t}$	0.153 ** (0.073)	0.161 ** (0.071)	0.156 ** (0.072)	0.149 *** (0.071)	0.133 * (0.070)	0.121 * (0.070)	0.142 ** (0.071)
Spatial lag of dep. variable (ρ)				-0.247 *** (0.070)	-1.091 *** (0.238)	-0.555 *** (0.149)	-0.744 ** (0.337)
Spatial lag of error term (λ)		-0.217 *** (0.074)	-1.053 *** (0.255)			0.307 ** (0.131)	-0.426 (0.328)
Wald chi ² test	308.47	447.25	1146.23	335.71	359.76	225.73	582.36
<i>P</i> -value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wald test of spatial terms		8.48	16.99	12.49	20.85	17.77	24.38
<i>P</i> -value		(0.003)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
<i>Pseudo</i> R ²	0.3687	0.3688	0.3601	0.3879	0.3865	0.4100	0.3770
Log likelihood	-418.89	-414.67	-409.43	-412.70	-407.58	-411.09	-406.57

Notes: Number of observations: 480. Number of groups: 30. Standard errors are reported in parentheses. Level of significance: * 10%; ** 5%; *** 1%. Year dummies are included in all the specifications. Estimations were carried on using the software STATA15.

Results are similar for large firms, although in this case, demand factors have no significant impact (Table 7). In other words, only the financial density and the share of population with higher level of education have positive effects on this kind of firms. Once again, the ρ coefficient is negative and statistically significant, as well as the spatial lag of error term (λ). This means that the use of spatial econometrics is necessary in order to explain firm entry in the Iranian provinces across most of the firm size groups considered. Table A in Appendix 2 summarizes the main econometric results by size group.

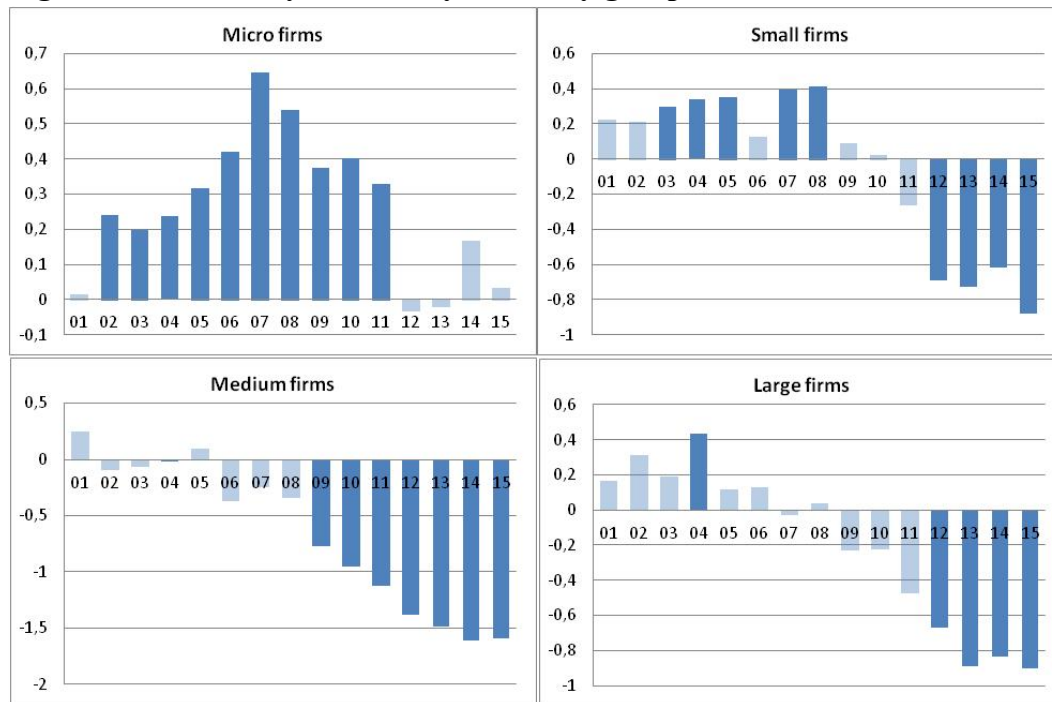
Table 7. Entry determinants (dependent variable: Large firm entry)

Variable/Methods	Non-Spatial dependence	SARerr model		SARlag model		SARmix model	
		Contiguity	Inverse distance	Contiguity	Inverse distance	Contiguity	Inverse distance
		Model (1)	Model (2)	Model (3)	Model (4)	Model (5)	Model (6)
$\ln(\text{Local income})_{i,t}$	0.003 (0.064)	0.000 (0.061)	-0.007 (0.059)	-0.001 (0.061)	0.001 (0.059)	-0.000 (0.069)	-0.003 (0.059)
$\ln(\text{Agglomeration effect})_{i,t}$	0.180 (0.287)	0.186 (0.276)	0.160 (0.270)	0.192 (0.273)	0.172 (0.262)	0.185 (0.272)	0.168 (0.264)
$\ln(\text{Disagglomeration effect})_{i,t}$	-0.031 (0.035)	-0.030 (0.034)	-0.025 (0.034)	-0.034 (0.126)	-0.033 (0.032)	-0.036 (0.033)	-0.030 (0.033)
$\ln(\text{Unemployment rate})_{i,t}$	0.025 (0.127)	0.032 (0.126)	0.088 (0.124)	0.037 (0.126)	0.068 (0.123)	0.036 (0.125)	0.086 (0.124)
$\ln(\text{Financial density})_{i,t}$	0.754 *** (0.096)	0.728 *** (0.096)	0.716 *** (0.095)	0.744 *** (0.093)	0.729 *** (0.090)	0.755 *** (0.091)	0.725 *** (0.092)
$\ln(\text{Human capital})_{i,t}$	0.131 (0.081)	0.132 * (0.080)	0.141 * (0.080)	0.126 (0.080)	0.128 * (0.077)	0.116 (0.080)	0.136 * (0.079)
Spatial lag of dep. variable (ρ)				-0.175 ** (0.071)	-1.003 *** (0.242)	-0.303 ** (0.142)	-0.680 ** (0.307)
Spatial lag of error term (λ)		-0.128 * (0.075)	-0.960 *** (0.257)			0.143 (0.135)	-0.449 (0.305)
Wald chi ² test	240.79	294.14	781.59	255.97	282.38	214.69	472.37
<i>P</i> -value	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)	(0.000)
Wald test of spatial terms		2.86	13.87	6.1	17.11	6.85	20.90
<i>P</i> -value		(0.090)	(0.000)	(0.014)	(0.000)	(0.032)	(0.000)
<i>Pseudo</i> R ²	0.3322	0.3321	0.3258	0.3434	0.3458	0.3505	0.3384
Log likelihood	-445.68	-444.25	-437.88	-442.67	-436.28	-442.17	-435.00

Notes: Number of observations: 480. Number of groups: 30. Standard errors are reported in parentheses. Level of significance: * 10%; ** 5%; *** 1%. Year dummies are included in all the specifications. Estimations were carried on using the software STATA15.

As we have previously mentioned, all models include year dummy variables in order to take into account the effect of the economic sanctions, as well as the Ahmadinejad's Administration policies (see footnote 3). As Figure 3 shows, year dummies for 2007 and 2008 (the policy of Ahmadinejad's Administration) have positive and significant effects on micro and small entry rates, but not on medium and large ones. Conversely, economic sanctions (which were more severe between 2012 and 2015) have no significant effects on micro entries, but show negative and significant effects on small, medium, and large ones. These findings indicate the positive role of public policies on micro startups and the negative role of international restrictions on small, medium, and large startups in Iran.

Figure 3. Estimated year dummy effects by groups of firms



Note: estimated coefficients correspond to the SAR model (with contiguity matrix), which provides the highest pseudo R² in most specifications. Nevertheless, results are robust to alternative models. light blue bars indicate non significant effects.

Source: Authors

5. Summary and Conclusions

New firm formation is considered a key factor to enhance economic growth, so that national and regional policymakers try to understand which are the main drivers behind this process, especially at the regional level. In this paper, we analyze the regional determinants of firm entry in the 30 Iranian provinces over the period 2000-2015, considering four different sizes: micro, small, medium and large. We estimate non-spatial and panel spatial models, which is a novelty since empirical evidence is mainly centered on developed economies.

Our results show that the impact of regional variations is not homogeneous across firms of different size. In particular, the entry of micro firms is enhanced by higher unemployment rates, so that people with scarce chances of getting a paid job start their own business. This has been reinforced by Ahmadinejad's policies which encouraged job seekers to start their own firm through credit facilities. In terms of policy, we can wonder about the survival and growth perspectives of this kind of ventures.

We also show that the impact of regional factors on firm entry is not homogeneous across firms of different size. On the one hand, micro and small firms are more dependent on the environmental conditions, as they are positively influenced by the agglomeration of firms in a given territory, but they also negatively affected by the congestion effects of excessive agglomeration. Medium and large firms, on the other hand, are mainly affected by the availability of skilled workforce and demand conditions (only for medium firms). There are also some results that hold for all firms: financial density encourages startups regardless the size, and firm entry in a given region is negatively affected by entry rates in neighboring

regions. Another important finding is that most groups of firms (except for micro firms) are influenced by the negative effect of economic and financial sanctions.

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

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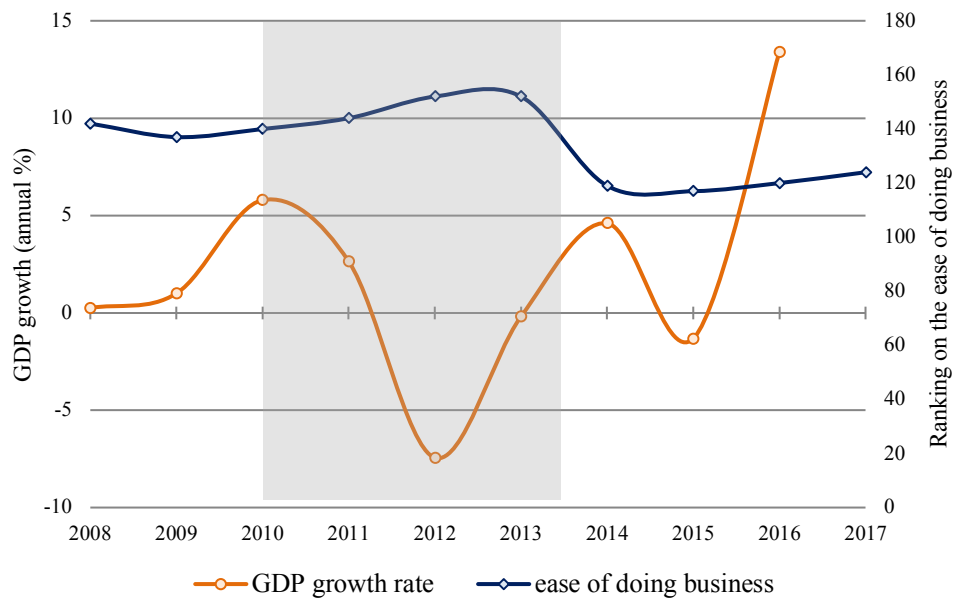
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Appendix 1

Trend of Iranian annual GDP growth rate and ease of doing business (2008-2017)



Source: *World Bank dataset.*

Appendix 2

Table A. Summary of the main results (in terms of significant signs)

	Total firms	Micro firms	Small firms	Medium firms	Large firms
<i>Local income</i>	+	-	+	+	
<i>Agglomeration effect</i>	+	+	+		
<i>Disagglomeration effect</i>	-	-	-		
<i>Unemployment rate</i>	+	+			
<i>Financial density</i>	+	+	+	+	+
<i>Human capital</i>	-	-	-	+	+
<i>Spatial lag for the dep. variable</i>	-	-		-	-
<i>Spatial lag for the error term</i>	-	-	+	-	-