EXTENDED ABSTRACT

Title: The public sector role in developing entrepreneurial initiatives: An Economic Analysis of Law and Artificial Intelligence

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Abstract:

Creating new companies can be a potential driver of economic growth (Aparicio et al., 2016; Carree and Thurik, 2010; Estrin et al., 2013; Kiss et al., 2012; Martínez-Fierro et al., 2015; Minniti and Lévesque, 2010), although it can play a different role in different regions depending on the stage of development of the particular country (Galindo and Méndez, 2014; van Stel et al., 2005; Wennekers, et al., 2005). However, this driving effect is assured when innovation is introduced (Minniti, 2012; Pradhan, et al., 2016).

Entrepreneurship in any given region can be seen as a capacity or potential resource to promote its development, energising and reinforcing the region's own economic activity (Acs and Varga, 2005; Amorós et al., 2012; Anokhin and Wincent, 2012; Audretsch and Keilbach, 2004; Baptista et al., 2008; González-Pernia et al., 2012; Grilo and Thurik, 2008; Naude et al., 2008; Pike et al., 2016; Van Stel and Suddle, 2008). This is why entrepreneurship as a possible enabler of economic growth has become one of the key focuses of academic research (Acs and Storey, 2004; Carlsson et al., 2013; Ghio et al., 2015). It has also as well as sparked interest amongst political decision-makers with regards to which are the key factors behind the development of an Entrepreneurial Spirit (Acs and Szerb, 2007; Belitski et al., 2019; Braunerhjelm et al., 2019; Haltiwanger et al., 2013).

Scholars have demonstrated that the Entrepreneurial Spirit has connected to the environment and become a stimulation for the creation of new business organisations (Pennings, 1982; Osorio, 2018; Shwetzer et al., 2019). Researchers have specifically explored the influence of the different social and economic contexts (both effective and potential) in which entrepreneurs find themselves, and how it impacts the development at a regional level (Acs et al., 2014; Acs et. Al, 2018; Anokhin and Wincent, 2012; Audretsch and Peña, 2012).

From the institutional point of view, the context is seen as a set of factors (legal and socio-cultural) that the entrepreneur must take into consideration when deciding to launch a new business venture (Acs et al., 2018; Álvarez et al., 2011; Amorós et al., 2012; Aparicio et al., 2016; Brown and Mawson, 2019; Valliere and Peterson, 2009). Prior research has already considered which are the determinant environmental factors for entrepreneurship and analysed them using data from the Global Entrepreneurship Monitor (GEM) database (Faghih et al., 2019). Scholars have studied factors such as

financial support, education and training, new market creation, access to physical infrastructures, cultural and social norms and government policies and programmes (Arenius and De Clercq, 2005; Reynolds et al., 2005; Urbano et al., 2019). The positive relationship between entrepreneurial activity and economic development depends on the existence of ideal conditions in the region (Audretsch, 2019; Carrasco and Buendía-Martínez, 2013; Dennis, 2011; Minniti, 2012), as well as each country's ability to compete (Acs et al., 2008; Anokhin and Wincent, 2012; Amorós et al., 2012; Schillo et al., 2016). At the same time, the differences in the economic development of regions influences entrepreneurs' decisions regarding the types of initiatives they launch, thus becoming a *virtuous circle* between entrepreneurial activity and economic activity in the entrepreneurs' environments (Lamy, 2019; Minniti, 2012). In short, entrepreneurial activity depends on environmental factors such as market size and geographic location and the existence of productive and technological resources, amongst others (Cuervo, 2005; Stenholm et al., 2013).

According to North (1990) and Stenholm et al. (2013), institutions encompass the set of elements and restrictions created by humans to govern their interactions. These institutions can be informal or formal. Informal such as codes, norms, conventions, attitudes and values which regulate and influence individual behaviour and the respective society's culture or formal such as political and economic rules and regulations, contracts, laws, constitutions and rights. This institutional context (both formal and informal) influences economic and social development.

Álvarez et al. (2011) and Noguera et al. (2015) link the institutional theory to entrepreneurship in their case studies carried out at a regional level in Spain. Entrepreneurship can be analysed as the result of the existence of a complex interrelated network of institutions that favour or dissuade business creation and growth activities (Berger and Köhn, 2018; Spigel, 2011; Spigel and Harrison, 2018). It is worth noting that there are institutions that defend business culture and the legal norms that regulate markets (Cuervo, 2005; Dheer, 2017; Fritsch, 2019; Stenholm et al., 2013).

Consequently, all the above highlights the increasingly legitimate role of governments in defining public policies aimed at accelerating the set-up of new enterprises (Dubini, 1989; Spigel and Harrison, 2018) and, at the same time, creating formal institutions with legal frameworks which can, in turn, generate competitive environments to

incentivise entrepreneurial behaviour (Amin and Thrift, 1994; Cécora, 2019; Gertler, 1995; Ransome, 2019; Spigel, 2011).

Consolidated business environments in a given local area are the addition, overlap and interconnection of different variables. The optimal combination of these generates the so-called *virtuous circles* which strengthen entrepreneurship in the region (Julien, 2007; Lamy, 2019; Malecki, 2009; Minniti, 2012; Sahut et al., 2019; Volkmann et al., 2019). At the same time, the entrepreneurs' success in these communities represents a resource in itself, fomenting and strengthening entrepreneurial initiatives and making the latter one more variable in the local ecosystem. This success can also transform the structures of the region's institutions, converting them into examples for others and incentivising new entrepreneurs and affecting their perception of risk, as well as attracting financing sources (Audretsch, 2015; Berger and Köhn, 2018; Patton and Kenny, 2005; Pradhan et. al., 2016; Spigel and Harrison, 2018). The types of industries established in a given geographic area also explain the existing differences regarding the exploitation of business opportunities and the types of entrepreneurship that arise. This is due to the entrepreneurs' prior training and experience in other companies within the same region (Cécora, 2019; Cuervo, 2005; Dheer, 2017; Grilo and Thurik, 2008). Consequently, there is a relation between experience in previous jobs and entrepreneurial initiatives, potentially dissuading entrepreneurs if they do not have this prior experience (Brown and Mawson 2019; Ransome, 2019; Schillo et al., 2016).

Research on business initiatives from an ecological perspective (observing the process from a collective point of view more than an individual one) is obtaining data on business demographic patterns over time and how the success of innovation depends on the development of the industrial community's infrastructure (Baptista et al., 2008; Van de Ven, 1993). This infrastructure is the result of past decisions and events in which the entrepreneurs themselves have been involved, creating and modifying that infrastructure. The empirical evidence demonstrates that clusters favour the creation of an Entrepreneurial Spirit in society (Audretsch and Peña-Legazcue, 2012; Audretsch and Belitski, 2017; Chatterji et al., 2014; Delgado et al., 2010; Wiklund et al., 2019).

In this context, a relation between the Economic Analysis of Law (EAL) and entrepreneurship can be established, studying the above-mentioned institutions and their relation with business initiatives. There are numerous examples of studies of this relation between business initiatives and institutions: Baumol (1996), Boettke and

Coyne (2003), Bylund and McCaffrey (2017), Dai and Si (2018), Kuchař (2016), Licht (2010), Pacheco et al. (2010) and Sautet (2005).

In this respect, academic studies have underscored the need to analyse this Entrepreneurial Spirit in a more contextualised setting, referring here to the regional, temporal and social context. In the previous studies mentioned, the business ecosystem concept serves to analyse the link between regional development, regional industrial clusters and innovation ecosystems (Arıkan and Schilling, 2011; Cavallo et al. 2018; Delgado et al., 2010; Brown and Mawson, 2019; Gans et al., 2019; Godley et. al., 2019). In terms of Spain, some prior studies have also examined the influence these ecosystems have had on business initiatives at the regional level (Álvarez et al, 2011; Driga, 2009; Lafuente et al., 2007).

In this context, Big Data and Artificial Intelligence (AI) represent a profound revolution in social science research, impacting the different disciplines (Prüfer and Prüfer, 2019; Einav and Levin, 2014). The ability to analyse massive amounts of data enables better economic results and encourages developing new hypotheses as well as carrying out new research (Einav and Levin, 2014). While traditional econometrics is founded on theory, AI is based on data, providing economists with new empirical research tools (Einav and Levin, 2014), as well as offering enormous possibilities to those in charge of formulating public policies (Hansen, 2018). AI and, more specifically, Machine-Learning represent a powerful tool to underline more clearly than ever before to what data has to show (Mullainathan and Spiess, 2017), highlighting their greater ability to identify trends and patterns compared to econometric methods (Liu and Xie, 2019).

Previous studies have successfully applied Artificial Neural Networks in the entrepreneurship field, basing them on several factors such as the entrepreneurs' psychological and demographic traits (Tan and Koh, 1996), the demand for business skills according to the type of profession (Prüfer and Prüfer, 2019) and the survival of companies according to their behavioural traits and characteristics (Rutherford et al., 2001). Other examples include their application in analyses linked to institutions (Prüfer and Prüfer, 2018), as well as those related to business management (George et al., 2018; Wang et al., 2017).

In this study, the EAL and AI connect to the socioeconomic, technological and legal areas. This combination is both novel and differential in terms of its analysis of the efficiency of normative decisions in the local governance context and in terms of the

impact regional public policies have on the area's development and cohesion. Specifically, this study applies EAL and AI to analyse policies designed to foment the figure of the entrepreneur and regional differences. It studies the importance of the regional ecosystem factors in the creation of new ventures, observing the number of initiatives that arise as a result of public policies and examining the existence of differential factors: demographic, socioeconomic and public.

The database used for this study stems from different sources and takes into account a series of social, economic and legal factors:

1. Geographic sources: The empirical component focuses on the Autonomous Community of Aragon (Spain), with a surface area of 47,720.30 km^2, representing 9.4% of Spain and 1% of the European Union. Aragon comprises three provinces (Teruel, Zaragoza and Huesca) and had a population of 1,308,728 inhabitants in 2018 (Gobierno de Aragón, 2019).
2. *Programa de Atención al Emprendedor en su Domicilio* - PAED[1] ("Entrepreneur Home Assistance Programme"): The Government of Aragon created PAED to help companies (micro-companies and individual entrepreneurs) with their established businesses or to launch new ventures should they need to expand, modernise or consolidate themselves. This initiative focuses on the rural setting, in particular, to create, improve, expand or refocus companies in the autonomous community, especially, companies facing fewer business risks and with greater survival rates.

   PAED is financed by the Government of Aragon's Department of Economics, Industry and Employment (Departamento de Economía, Industria y Empleo del Gobierno de Aragón). The Chambers of Commerce, Industry and Services in Zaragoza, Huesca and Teruel are in charge of implementing all the actions stemming from this programme. The different Chambers of Commerce work together through the framework of "Autonomous Community Chamber of Commerce Plans" (Planes Camerales Autonómicos) foreseen in Law 3/2015, dated 25th March, of Official Chambers of Commerce, Industry and Services (Gobierno de Aragón, Spain).

[1] Gobierno de Aragón (13/06/2019) Programa de Apoyo Empresarial Directo. Recuperado de 'https://www.aragon.es/-/programa-de-apoyo-empresarial-directo'

Using this study's database, this research considers the number of projects serviced in all three provinces, including those launched in the various counties participating in PAED from 2010 to 2017.

3. Economic activity: To define the economic activities taking place in the respective companies within the timeframe detailed above, data was obtained from the Aragon Statistical Institute (Instituto Aragonés de Estadística). The data by county was as follows:
    a) *Clasificación Nacional de Actividades Económicas*, CNAE (National Classification of Economic Activities)[2]: The number of companies registered from 2010 to 2017 is detailed and classified at four levels (section, division, group and class). CNAE's classification was approved by the Royal Decree 475/2007, dated 13th April, entering into effect January 1st, 2009, and providing information about the respective firms (BOE 2007). The CNAE-2009 classification has a hierarchical structure with up to 6 levels of numerical aggregation (digits). It can be considered a good indicator.
    b) Population, average age of men and women
    c) Ageing index for men and women
    d) Unemployment and active population indexes for men and women.

The study uses Artificial Neural Networks to examine the impact as well as the importance of each of these variables for business ventures within the framework of regional initiatives to support entrepreneurship in collaboration with private regional agents.

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[2] BOE (2007). Real Decreto 475/2007, de 13 de abril, por el que se aprueba la Clasificación Nacional de Actividades Económicas 2009 (CNAE-2009). .Recuperado de http://www.boe.es/diario_boe/txt.php?id=BOE-A-2007-8824

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