

# Why older workers become entrepreneurs? International evidence using fuzzy set methods\*

## Jorge Velilla

University of Zaragoza (Spain)

C. Gran Vía 2. 50005 Zaragoza, Spain Email: [jvelilla@unizar.es](mailto:jvelilla@unizar.es)

## José Alberto Molina

University of Zaragoza (Spain), BIFI (Spain) and IZA (Germany)

C. Gran Vía 2. 50005 Zaragoza, Spain. Email: [jamolina@unizar.es](mailto:jamolina@unizar.es)

## Raquel Ortega

University of Zaragoza (Spain)

C. Gran Vía 2. 50005 Zaragoza, Spain Email: [rortega@unizar.es](mailto:rortega@unizar.es)

## Abstract

In this paper, we empirically analyze the individual characteristics that drive older workers to become entrepreneurs, providing evidence of the differences between developed and developing countries. While OLS models provide limited conclusions, Qualitative Comparative Analysis and fuzzy set logic, at the country level, using GEM 2014 Adult Population Survey micro-data, show the importance of the various combinations of high and/or low presence of skills, opportunities, entrepreneurial perceptions, peer effects, and satisfaction with life and income. This indicates how entrepreneurship may be a potential source of income for older workers, in a range of contexts. Further, we find that all the possible combinations of higher proportions of individuals with the latter features are necessary conditions. Our results contribute by identifying certain aspects of the entrepreneurial behavior of older workers, highlighting certain causal patterns of the complex phenomenon that is entrepreneurship.

**Keywords:** Entrepreneurship, Older individuals, Fuzzy Set Qualitative Comparative Analysis, GEM data, Global Entrepreneurship Monitor, Development.

**Jel Codes:** L26, J14, M21, O57

---

\* This research was conducted at University of Zaragoza (Spain). This paper was partially written while Raquel Ortega was Visiting Scholar at the Carroll School of Management of Boston College (US), to which she would like to express her thanks for the hospitality and facilities provided. We are grateful to comments from Alicia Coduras. This work was supported by the “Cátedra Emprender” (Universidad de Zaragoza-Fundación Emprender en Aragón).

## 1. Introduction

Entrepreneurship is an activity traditionally associated with economic growth and development, and public policies and institutions have, consequently, devoted efforts to promote such activity (Chang and Kozul-Wright, 1994; Minniti, 2008; Shane, 2009). Furthermore, the recent economic crisis has increased the role of entrepreneurship as a driver of development and economic recovery (see, for example, Fuentelsaz et al., 2015). It is well-established in the literature that institutions and the environment play a major role in determining entrepreneurship (i.e., the institutional theory, North, 1990), and it has been recently noted that entrepreneurship exhibits hysteresis (Congregado, Golpe and Parker, 2012). However, Fuentelsaz et al. (2015) show that entrepreneurship by necessity does not benefit from the actions of institutions, even when tax rates affect the probability of being an entrepreneur (Fossen and Steiner, 2009). In this context, individual attributes may play an important role in determining what forces workers to become entrepreneurs (see Arbia et al., 2015, for the case of Italian small food business). For instance, although some authors have found that entrepreneurship is generally associated with younger individuals (Schott and Bagger, 2004; Kelley, 2009; Wennekers et al., 2010), third-age entrepreneurship cannot be considered to be a marginal activity (Kautonen, 2008; Kautonen et al., 2011).<sup>1</sup> Further, Kautonen (2008) reveals that the entrepreneurial activity of the elder population is an under-researched area and needs to be studied more deeply, and Schott et al. (2017) claim that “people may retire from jobs as employees or as self-employed, but may continue to pursue ventures”. Thus, the present paper bridges this gap, addressing the question of what are the individual characteristics that determine entrepreneurial behavior, by necessity, of older individuals, providing empirical evidence for both developed and developing countries.

We use the Global Entrepreneurship Monitor (GEM) 2014 Global Individual database, “the world’s foremost study of entrepreneurship” (<http://www.gemconsortium.org>). GEM experts provide to the scientific community high quality data and reports in order to analyze, promote, and understand entrepreneurial activity (see Singer, Amoros and Moska, 2015, for a recent report on GEM analyses). Regarding the methodology, because classical quantitative regression analyses may offer a limited range of results, and causal effects cannot be derived from them, we also develop a fuzzy set Qualitative Comparative Analysis (fsQCA), which is a qualitative technique designed to find causal relationships that offers a different perspective from regression analyses (Woodside, Ko and Huan, 2012; Ragin and Stand, 2014). These techniques complement classical analyses and help to find results that, otherwise, could not be captured. From the point of view of inference and economic policy, fsQCA represents a major advantage, since it allows us to analyze causality, which cannot be determined using cross-sectional quantitative models. Fuzzy set logic is an underused tool in economic and business issues, although it has recently gained in importance (see Roig-Tierno, Kun-Huang and Ribeiro-Soriano, 2016). In spite of that, few analyses have used this technique to study entrepreneurship (Beynon, Jones and Pickernell, 2016; Kuckertz, Berger and Mpeqa, 2016; Núñez-

---

<sup>1</sup> In this line, Block and Koellinger (2009) find that youth is associated with entrepreneurial satisfaction and, consequently, age is positively related to necessity in Germany.

Pomar et al., 2016; Gieure and Buendía-Martínez, 2016; Hernández-Perlines et al., 2016), with Coduras et al. (2015), Castaño et al. (2016), Devece et al. (2016), and Velilla and Ortega (2017) being among the first authors to apply this to GEM data.

We analyze the differences between developed and developing countries, in terms of entrepreneurial behavior of third-age workers, using the following variables of the GEM data: skills to be an entrepreneur, opportunities to become an entrepreneur, peer effects, entrepreneurial perception, income satisfaction, and life satisfaction, all aggregated at the country level. We find that, while regression analyses do not yield significant results, fsQCA offers a range of causal determinants of high levels of entrepreneurship by necessity among older individuals, for both developed and developing countries. Furthermore, we find that, in both developed and developing countries, high levels of all the possible combinations of the selected features are necessarily derived from high levels of entrepreneurship.

Contributions of the present research are threefold. First, we analyze entrepreneurship among the third-age population, using fuzzy set qualitative techniques that are underused in the literature. Second, we identify certain aspects of the entrepreneurial behavior of older workers that may have gone unnoticed in classical cross-sectional models. This is important from both academic and institutional points of view because it facilitates an understanding of the complex phenomenon that is entrepreneurship (Coduras et al, 2015). Finally, fsQCA results deal with causal relationships, which is especially important in developing efficient and effective policies (Naudé, 2016). In particular, the developed countries are characterized by the role of high levels of skill, fewer opportunities, and different combinations of high and low satisfaction. On the other hand, in the developing countries, more complex patterns emerge, indicating the importance and complexity of entrepreneurship, and how in this field, one size does not fit all. This sheds light on how entrepreneurial-related factors should be considered as inter-related determinants that interact, and can consequently affect entrepreneurship in different ways.

The rest of the paper is organized as follows. Section 2 establishes the theoretical background from the existing literature. Section 3 describes our data and the empirical specification, and Section 4 contains results and discussions. Finally, section 5 sets our main conclusions.

## **2. Theoretical background**

Prior literature has found that formation, entrepreneurial, and managerial skills are an important determinant of the entrepreneurial activity of workers (Kotsova, 1997; Ramachandran and Shah, 1999; Mengistae, 2006; Minniti, 2009; Levie and Autio, 2013; Rostam-Afschar, 2014; Brixiova et al., 2015; Kyrö, 2015). We expect to find that, for the particular case of older workers, the higher the managerial skills, the more prone are they to be entrepreneurs. We must note that in the most developed countries

the formal entrepreneurial education at school or University, or specific programs, are more established, making that relationship especially important.

Hypothesis 1: *Higher entrepreneurial and managerial skills are positively related to entrepreneurship of older workers.*

Several concepts of entrepreneurship have appeared in the literature, but - especially in the last decade - a classification from the perspective of different motivations for becoming an entrepreneur has generated much interest. This classification is consolidated in the work of Reynolds et al. (2003), who distinguish between opportunity-driven and necessity-driven entrepreneurs (that is, between those who take advantage of a business opportunity, and those who have no other alternative for work). We are interested in analyzing whether these two motivations are disjointed, or not, among the third-age workers in the developed and developing countries.

Hypothesis 2: *Necessity-driven third-age entrepreneurs do not consider opportunities as a motivation to be entrepreneurs.*

Peer effects are extremely important in the study of social behaviors, and some authors have found evidence for the particular case of entrepreneurial activity (Holcomb et al., 2009; Okumura and Usui, 2016; Gimenez-Nadal et al., 2017). In the same line, learning processes (e.g., 'learning by seeing') have been found to determine the entrepreneurial behavior of individuals (Goedhuys and Sleuwaegen, 2000; Blumberg and Pfann, 2015; Viinikainen et al., 2016). We are interested in studying whether peer effects are also present among older entrepreneurs; that is to say, older workers who need income and have helped or met other entrepreneurs may be encouraged to establish a start-up.

Hypothesis 3: *Third-age workers who need income are more prone to be entrepreneurs under the influence of peer effects.*

Entrepreneurial perception, culture, and social norms have been heavily analyzed in the entrepreneurial literature (Minniti, 2005; Terjesen and Szerb, 2008; Roskrugge et al., 2016). We claim that the effect of the social valuation of entrepreneurship (i.e., whether being an entrepreneur is seen as a desirable career) over entrepreneurial activity does not depend on age, and then third-age workers in societies where entrepreneurship is highly-valued would be more likely to be entrepreneurs.

Hypothesis 4: *In societies where entrepreneurship is more highly valued there will be higher values of entrepreneurship among the third-age population.*

The financial and, consequently, psychological status of individuals have been found to significantly determine the entrepreneurial activity of workers, with a good financial situation encouraging individuals to assume risks and become entrepreneurs, but with excessive optimism being negatively correlated with success and outcomes (Sobel, 2008; Dawson et al., 2015; Molina et al., 2016, Schott et al., 2017). We are interested in the relationship between wellbeing and entrepreneurship among older individuals. However, it is not clear whether good conditions of life may positively or negatively influence entrepreneurship, even among those workers who need income.

It may be that workers with the highest levels of wellbeing find it easier to become entrepreneurs due to optimism and psychological factors. However, it may also be that workers who are not satisfied with their life or jobs find in entrepreneurship a way to change their lifestyle (Schott et al., 2017, claim that elderly entrepreneurs report substantially higher degrees of wellbeing).

*Hypothesis 5: Individuals' wellbeing may be positive or negatively related to third age entrepreneurship.*

### **3. Data and variables**

#### **3.1. Data**

We use the GEM Adult Population Survey data for the year 2014 to analyze the relationship between entrepreneurship by necessity among older individuals, and a series of individual attributes related to individual entrepreneurial behavior. The database is produced annually by GEM and contains information on nine groups of variables of national, socio-economic characteristics related to the encouragement of entrepreneurship. This data is based on surveys filled out by respondents from a range of countries, using stylized questions (more information can be found at (<http://www.gemconsortium.org/wiki>)). The advantage of using this source is that GEM is the leading global entity analyzing entrepreneurship, and the data is elaborated and processed by experts in the field. Further, GEM's definition of entrepreneurs, and entrepreneurs by necessity, avoids sample selection.

We transform the variables into dummies, and maintain the mean value of each, by country. That way, for each country, we define the mean value of the corresponding variables. We sample individuals over age 55, living in the following 28 developed countries: United States, Russia, Greece, the Netherlands, Belgium, France, Spain, Hungary, Switzerland, Sweden, Norway, Poland, Germany, Mexico, Chile, Japan, Korea, China, Canada, Portugal, Luxembourg, Ireland, Finland, Estonia, Slovenia, the Czech Republic, Slovakia, and Israel; and in the following 28 developing countries: South Africa, Romania, Peru, Argentina, Brazil, Colombia, Malaysia, Indonesia, the Philippines, Singapore, Thailand, Vietnam, India, Iran, Lithuania, Latvia, Croatia, Bosnia and Herzegovina, Macedonia, Guatemala, Panama, Ecuador, Surinam, Uruguay, Puerto Rico, Trinidad and Tobago, Jamaica, and Taiwan.

The variable of interest, which is usually called "output" in QCA, is the fact of being a necessity-driven entrepreneur or, in our country-level aggregated context, the probability of being a necessity-driven entrepreneur, conditioned on being over age 55. It is important to note that the GEM data directly characterizes those individuals (the GEM dummy variable "TEA14nec", labelled as being "involved in necessity early-stage entrepreneurial activity"). The fsQCA methodology requires a selection of a relatively small number of features, which are often called "conditions", due to the exponentially-increasing computational costs (given  $n$  conditions, fsQCA analyzes all the  $2^n$

combinations). The conditions selected for the analysis are the following, all representing individual-level attributes: 1) “Skills”, measuring the self-evaluation of individuals regarding their own entrepreneurial skills. 2) “Opport”, measuring whether individuals consider that there are opportunities for them to start a business in the short term. 3) “Peer”, measuring peer effects, i.e., whether knowing other entrepreneurs may determine the entrepreneurial behavior of workers. 4) “Perception”, representing the social valuation of entrepreneurship, i.e., it measures whether individuals consider starting a new business a desirable choice. 5) “Satinc”, and 6) “Satlife”, measuring individuals’ satisfaction with their income and their life, respectively (in line with Schott et al., 2017).

Table 1 shows summary statistics of the variables for both developed and developing countries. We find that, on average, only 1.8% of the older individuals in the sample are necessity-driven entrepreneurs, in the developed countries, vs. 3.8% in the developing countries. Further, 29.8% (51.8%) of individuals in the developed (developing) countries consider themselves to have the required skills to be entrepreneurs, 25.3% (29.3%) think that there will be opportunities to start a business in the short term, and 24.4% of individuals in the developed countries have contact with entrepreneurs, vs. 32.2% in the developing countries. These data show that, in the developing countries, there is greater confidence about entrepreneurship, in line with the higher levels of entrepreneurship. There is also a higher social perception in the developing countries (25.8% of older individuals think that there is a high social perception of entrepreneurs) than in the developed countries (16.9%). On the other hand, regarding the satisfaction features, Table 1 shows that individuals in the developed countries are more satisfied with their income (23.8%, vs 8.2% in the developing countries), and with their lives (74.1% vs. 61.7%, respectively).

### 3.2. Fuzzy sets

A fuzzy set is a type of variable that measures, in the range (0, 1), the degree of belonging to a group, or the fulfilment of a characteristic. The difference from a categorical variable is that a fuzzy set constitutes a continuum of scores, and is not restricted to a fixed number of categories. Because of that generalization, certain authors have used fuzzy sets rather than classical variables, due to their greater degree of precision as a modelling tool (Velilla and Ortega, 2017). It is important to define the middle point, 0.5, as the inflexion point in the fulfilment/belonging process, because this constitutes the point at which an observation is neutral for the corresponding characteristic.

Fuzzy sets are defined from the aggregated variables, following Ragin’s (2007) direct method (Coduras, Clemente and Ruiz, 2015; Velilla and Ortega, 2017). This methodology is based on three key measures for each variable: the inflexion point (the median value of the original variable, corresponding to the score 0.5 of the fuzzy set), and the upper and lower bounds of belonging, which

are defined as the first and ninth deciles of the original variable.<sup>2</sup> Deviations to the medians are calculated, and also a ratio, defined as a quotient, dependent on medians and percentiles and depending on which values are greater or lower than the median. The product of the latter ratios and the deviations from the median are defined as the log-odd ratios, which are then transformed into the fuzzy set scores by an exponential transformation. The particular schedule of this process, used to construct and calibrate the outcome and conditions of the fsQCA from the original variables of the GEM data, is shown in Figure 1. Table 1 shows summary statistics of the fuzzy sets, for both developed and developing countries. It is observed that the mean values are around 0.5, which comes from the definition of the fuzzy set scores.

#### 4. Empirical analysis

We now analyze, using econometric and statistical models, the entrepreneurial behavior of individuals motivated by necessity, providing evidence of the differences between developed and developing countries. Following Coduras, Clemente and Ruiz (2015) and Velilla and Ortega (2017), we first propose a classic quantitative regression analysis and then compare results with a fuzzy set Qualitative Comparative Analysis. We propose the following model:

$$TEA14nec\_old = f(\text{skills, opport, peer, perception, satinc, satlife}), \quad (1)$$

where TEA14nec\_old represents the percentage of the population aged 55-64 who are involved in necessity-driven early stage entrepreneurial activities. Then, the outcome of the analysis corresponds to high values of this variable. The variables skills, opport, peer, perception, satinc, and satlife correspond to the definitions presented in Subsection 3.1.

##### 4.1. Regression analysis

We first estimate a linear OLS model of (1), i.e., a model of the probability of being an entrepreneur by necessity, as a function of the selected variables, differentiating between developing and developed countries. Columns 1 and 2 in Table 2 show estimates of the model for the developed and developing countries, respectively. It is observed that, for the developed countries, only opportunities and perception are related to necessity entrepreneurship, and opportunities are negatively related. On the other hand, perception is found to be positively related to necessity entrepreneurship.

In the case of the developing countries, any feature is found to be significantly associated with entrepreneurship due to necessity. This may indicate that, in these countries, older individuals who need income may become entrepreneurs ‘no matter what’, in line with the conclusions of Velilla and Ortega (2017) regarding macro-level variables. These results may be considered biased by the limited

---

<sup>2</sup> An alternative to calibrate fuzzy sets using the direct method consists on select the three thresholds according to values subjectively chosen by researchers, according to representative values, or to previous research.

number of observations (only 28 countries for each of the OLS models). However, they demonstrate the necessity of using other empirical approaches, such as QCA, in the study of entrepreneurship. First, regression analyses rely on the estimation of linear relationships and, in the case of entrepreneurial activity, this hypothesis of linearity appears not to be true. Second, regression models lead to contradictory patterns among countries, perhaps because “one size does not fit all”, i.e., because not all countries display the same combinations and signs of conditions, or independent variables, concerning entrepreneurship. Hence, the absence of significant estimates in the regression analysis should not be thought, at least completely, to be only a matter of bias in statistical terms, but also of the complexity of the entrepreneurial phenomenon.

#### 4.2. Fuzzy set Qualitative Comparative Analysis

OLS models are characterized by certain restrictions, and can model only linear relationships, and it may be that different approaches would lead to different results. Using the fuzzy sets defined in the previous section, we propose an fsQCA model for developing and developed countries, to analyze the differences among both groups<sup>3</sup>. FsQCA is a qualitative technique that, using fuzzy set scores, aims to determine causal relationships between an outcome variable and the possible combinations of a series of conditions (Ragin and Stand, 2014). That is to say, fsQCA allows to study the different combinations of conditions that makes observations (e.g., countries) reach certain outcome. This kind of methodology is not better, nor worse than the classical quantitative approaches, but it does provide a different perspective that complements classical analyses and helps to find different results that, otherwise, could not be captured (Woodside, Ko and Huan 2012). In any case, from the point of view of inference and economic policy, fsQCA represents a major advantage since it allows us to analyze causality, which cannot be analyzed using cross-sectional quantitative models.

A complete description of fsQCA can be read in Ragin (2008). The sufficient conditions analysis is based on the identification of the causal relationships between the outcome variable and all the combinations of conditions, and the construction of a ‘Truth Table’ (Quine-McCluskey procedure). Then, each relationship is evaluated by its consistency, defined as follows:

$$\text{consistency}(X \Rightarrow Y) = \frac{\sum \min(X_i, Y_i)}{\sum X_i}, \quad (2)$$

where  $X_i$  represents the membership scores in a combination of conditions, and  $Y_i$  the membership scores of the outcome variable (see Kosko and Isaka, 1993; Ragin, 2006; Smithson and Verkuilen, 2006). On the other hand, the sufficient condition analysis is also based on the identification of consistencies, now defined as:

---

<sup>3</sup> We use the fsQCA 2.5 free software (Ragin and Stand, 2014).



$$\text{consistency}(Y \Rightarrow X) = \frac{\sum \min(X_i, Y_i)}{\sum Y_i}, \quad (3)$$

with  $X_i$  and  $Y_i$  as above. For both types of analysis, the cutoff consistency value that determines the relevant causal relationships is fixed at 0.75, with this value being dependent on the degree of stringency of solutions (generally between 0.7 and 0.8; Ragin, 2008).

Table 3 shows the different results of the sufficient conditions analysis, using the Quine-McCluskey algorithm, for the developed and developing countries. We show results concerning the complex (or detailed) solution (Ragin and Sonnett, 2005). In this context, the output variable is defined as high scores of the variable TEA14nec\_old, or, equivalently, percentages of population aged 55-64 involved in necessity-driven early-stage entrepreneurial activity higher than the average. It must be noted that the sign “~” represents the negation logic operator, and hence indicates a low percentage of individuals showing the characteristic represented by the corresponding fuzzy set. We find that, for the developed countries, four sufficient conditions emerge, i.e., countries reach the outcome (high percentages of individuals aged 55-64 years involved in necessity-driven entrepreneurial activity) through four sets of conditions:

- 1) Low percentages of individuals with entrepreneurial skills, individuals who consider themselves to have opportunities to be entrepreneurs, individuals who consider entrepreneurship a desirable career, individuals satisfied with their life, and individuals satisfied with their income. Countries that reach high levels of third-age necessity-driven entrepreneurship through the fulfilment of this set of conditions are: Hungary, South Korea, Portugal, Czech Republic, and Slovakia, all showing this pattern; further, these conditions show the second highest level of consistency among developed countries.
- 2) Low percentages of individuals who consider themselves to have opportunities to be entrepreneurs, and individuals satisfied with their life; but high percentages of individuals with entrepreneurial skills, individuals who consider entrepreneurship a desirable career, and individuals who are influenced by peer effects. These conditions lead the output in Poland and Slovenia.
- 3) Analogous to 2), but also with a high proportion of individuals who are satisfied with their life. China and Slovenia are the countries that reach the output because of these conditions.
- 4) High percentages of individuals with entrepreneurial skills, who consider themselves to have opportunities to be entrepreneurs, who are under the influence of peer effects, and who are satisfied with their income; but low percentages of individuals who consider entrepreneurship a desirable choice, and who are satisfied with their life. This sufficient set of conditions shows the highest consistency among the developed countries. Canada and Estonia show high values of the outcome thanks to these conditions.

For the case of the developing countries, countries reach the outcome through six sufficient sets of conditions:

- 1) High proportions of individuals with managerial skills, who are satisfied with their life; but low percentages of individuals who consider themselves to have entrepreneurial opportunities, who

consider entrepreneurship a desirable choice, and are satisfied with their income. These conditions are only shown in Vietnam, which reaches the outcome with a moderately high level of consistency.

- 2) Low percentages of individuals with entrepreneurial skills, and individuals who are satisfied with their life; but high percentages of individuals who consider themselves to have entrepreneurial opportunities, who consider entrepreneurship a desirable labor choice, and who are under the influence of peer effects. These conditions make Argentina and Philippines reach the output with a moderate consistency.
- 3) Low proportions of individuals with entrepreneurial skills, who are under the influence of peer effects, and who have a good valuation of their income; but high percentages of individuals who consider themselves to have entrepreneurial opportunities, who consider entrepreneurship a desirable career, and who are satisfied with their life. This set of sufficient conditions shows the second highest level of consistency among developing countries, and Jamaica and Taiwan show high values of the output.
- 4) High percentages of individuals with entrepreneurial skills; who consider themselves to have opportunities to be entrepreneurs, who are under the influence of peer effects, who consider entrepreneurship a desirable career, and who are satisfied with their life, but not satisfied with their income. Only Brazil reaches the output because of this set of conditions.
- 5) Countries with high levels of individuals with entrepreneurial skills, but with a low proportion of individuals who consider themselves to have opportunities to be entrepreneurs, who are under the influence of peer effects, who consider entrepreneurship a desirable choice, and who are satisfied with their life. Iran, Bosnia, and Macedonia show high levels of third-age necessity-driven entrepreneurs because of this set of conditions, and show the lowest level of consistency (yet higher than the cutoff value of 0.75) among the developing countries.
- 6) Analogous to condition (5), but with low percentages of individuals who are satisfied with their income. This set of sufficient conditions shows both the highest consistency and coverage in the developing countries, and Vietnam, Iran, Bosnia, and Macedonia reach the output.

Finally, Table 4 shows the results of the necessary conditions analysis. That is to say, it shows, using all possible combinations of the conditions derived from the output, i.e., from high percentages of necessity-driven entrepreneurs among the population aged 55-64. Combinations of conditions are considered by groups of 4.<sup>4</sup> It is observed that some the combinations of the considered conditions are always fulfilled in countries that have reached the outcome, i.e., that show higher proportions of third-age necessity-driven entrepreneurs., for both developed and developing countries. This indicates that if a country shows high percentages of individuals aged 55-64 being necessity-driven entrepreneurs, it will show high percentages of individuals satisfying some combination of the considered conditions. This is an important result because, although these particular causal relationships do not allow us to

---

<sup>4</sup> Software restrictions do not allow us to develop a necessary conditions analysis with a higher number of fuzzy sets per group.

derive policy implications to promote entrepreneurship, it does shed light on the attributes that are expected to be found in countries with an intense entrepreneurial activity among older workers.

### 4.3. Discussion

OLS results appear to indicate that, for the developed countries, old workers generally become entrepreneurs because they consider that there are opportunities to start a new business, do not belong to the group of necessity-driven entrepreneurs. That is to say, opportunity and necessity may be disjointed motivations to become an entrepreneur, since opportunities are negatively related to entrepreneurship-by-necessity, as expected (Hypothesis 2). On the other hand, in developed countries where entrepreneurship is considered a desirable labor career, older individuals who cannot find an employer find entrepreneurship to be an alternative source of income, given the positive and significant parameter associated with this feature (Hypothesis 4). In the case of the developing countries, older individuals who need income may become entrepreneurs ‘no matter what’, in line with the conclusions of Velilla and Ortega (2017) regarding macro-level variables.

It is important to note that OLS estimates linear relationships, and results may depend on that linear-quantitative specification, given that there are different non-linear combinations of factors among the studied countries, which can lead to internal contradictions. However, this does not happen in the case of the Qualitative Comparative Analysis developed in 4.2, which captures and explains these contradictions, and sheds light on the importance of this type of qualitative technique in certain contexts, and allows us to obtain a broader range of results.

For instance, among the developed groups, according to the analyzed variables, countries attain high percentages of necessity-driven entrepreneurs among the elderly through four sets of conditions, and the condition of low proportions of older individuals who consider themselves to have opportunities to be entrepreneurs occurs in three of them. This result gives, then, empirical support to Hypothesis 2 for some developed countries. On the other hand, according to the remaining set of conditions, the output is reached, among others, through high levels of recognition of opportunities. Then, this last set of conditions indicates that, in some countries, necessity- and opportunity-driven entrepreneurship are not completely disjointed types of entrepreneurship, and highlights the idea that “one size does not fit all”. Hence, one cannot simply assume that necessity and opportunity are completely different motivations to be an entrepreneur: under certain circumstances, and in certain countries (e.g., the influence of peer effects, comfortable incomes, and an uncomfortable life), individuals may be entrepreneurs by necessity only if they consider they have the opportunity to do so.

For hypotheses 1, 3, 4, and 5, the explanation would be analogous, as according to the sets of sufficient conditions studied, some countries show high percentages of necessity-driven entrepreneurs, but others countries do not. This may indicate that, for example, individuals in countries with low

levels of wellbeing may become entrepreneurs even when entrepreneurship in those countries is not generally seen as a desirable career. It may also be that individuals with low incomes, in some countries, may establish a business in order to improve their income, while in other countries, they would be better-off searching for an employer, or benefiting from specific subsidies.

Thus, the empirical support for these hypotheses in the developed countries would be conditioned on specific countries, and on the interaction of the different conditions with the rest of the countries, highlighting the importance of the fsQCA approach, that does not consider entrepreneur-related features as single determinants, but as factors that may interact and consequently affect entrepreneurial activity in different ways. In the same way, hypotheses concerning entrepreneurship should not be considered individually, but as a net of circumstances that may interact one with another in complex ways.

For the case of the developing countries, a more complex net of conditions emerges from the analysis. That is to say, developing countries attain high levels of necessity-driven entrepreneurship among the elderly through a more complex set of interactions of the considered conditions. This result may be expected, given that developing economies show, in general, higher levels of entrepreneurship than developed economies. Nonetheless, with regard to the analyzed hypotheses, the same conclusions can be derived: their fulfillment or rejection depends on the specific cases studied, since in some countries the outcome may be reached according to a given hypothesis, or a set of hypotheses, but in other countries the outcome may be reached through the rejection of a specific hypothesis (perhaps because the interaction of some conditions overwhelms others that, for other countries, are crucial).

## **5. Conclusions**

While entrepreneurship is a complex (though heavily analyzed) phenomenon, generally associated with youth, older workers also constitute a meaningful segment of the entrepreneur community. Further, the behavior of older entrepreneurs has been barely analyzed in comparison with their younger peers. Prior evidence shows that third- and prime-age workers may see entrepreneurship from different perspectives, leading to different mechanisms underlying their respective entrepreneurial behaviors (Kautonen, 2008; Kautonen et al., 2011).

Under these circumstances, in this paper we empirically analyze, using the GEM 2014 Adult Population Survey database aggregated at country level, the necessity-driven entrepreneurial behavior of third-age workers (between 55 and 64 years old), showing empirical differences between the developed and developing countries. Using both OLS quantitative models, and fuzzy set Qualitative Comparative Analysis, we find that, while the former show no meaningful results, several conditions emerge from the latter, indicating the limitations of the linear specification of regression models in the study of entrepreneurship. In the developed countries, high levels of third age entrepreneurship motivated by necessity are reached following four formulas, in terms of high valuation of skills and

low perception of opportunities, combined with either high or low entrepreneurial perception, and income- and life-satisfaction. These formulas may help to identify the particular circumstances in which individuals become entrepreneurs in the studied countries, with the subsequent consequences at the institutional level. The sets of conditions that prevail in the developing countries to reach high percentages of necessity-driven entrepreneurs among the elderly are more complex, indicating that entrepreneurship among third-age workers may be a more common choice in those countries in which it is more difficult find an employer. Further, results do not point to the validation of hypotheses concerning entrepreneurship in general terms, and indicate the importance of not considering entrepreneurial-related factors individually, but rather as inter-related determinants that can affect entrepreneurship in different ways, depending on the studied country.

One limitation of our analysis may emerge from the fact that fsQCA is computationally and conceptually limited to small groups of conditions, or explanatory variables. Thus, unobserved factors may play an important role. Furthermore, these types of technique are limited to static analyses, preventing us from developing a longitudinal or dynamic study. Another limitation may arise from the limited number of observations, although the fsQCA does not suffer from this issue.

## References

- Arbia G, Cella P, Espa G, Giuliani D (2015) A micro spatial analysis of firm demography: the case of food stores in the area of Trento (Italy). *Empirical Economics* 48: 923-937.
- Beynon MJ, Jones P, Pickernell D (2016) Country-Based Comparison Analysis Using fsQCA Investigating Entrepreneurial Attitudes and Activity. *Journal of Business Research* 69: 1271–1276.
- Block J, Koellinger P (2009) I can't get no satisfaction – Necessity entrepreneurship and procedural utility. *Kyklos* 62: 191-209.
- Blumberg B, Pfann G (2015) Roads leading to self-employment: comparing transgenerational entrepreneurs and self-made starts-ups. *IZA DP* 9155.
- Brixiova Z, Ncube M, Bicaba Z (2015) Skills and youth entrepreneurship in Africa: Analysis with evidence from Swaziland. *World Development* 67: 11-26.
- Castaño MS, Méndez MT, Galindo MA (2016) The effect of public policies on entrepreneurial activity and economic growth. *Journal of Business Research* 69: 5280-5285.
- Chang H, Kozul-Wright R (1994) Organising development: Comparing the national systems of entrepreneurship in Sweden and South Jorea. *Journal of Development Studies* 30: 859-891.
- Coduras A, Clemente J, Ruiz J (2015) A Novel Application of Fuzzy-Set Qualitative Comparative Analysis to GEM Data. *Journal of Business Research* 69: 1265–1270.
- Congregado, E., Golpe, A. and S.C. Parker (2012). "The dynamics of entrepreneurship: hysteresis, business cycles and government policy", *Empirical Economics* 43(3), 1239-1261.
- Dawson, C., de Meza, D., Henley, A. and G.R. Arabsheibani (2015). "The power of (non) positive thinking: self-employed pessimists earn more than optimists". IZA Discussion Paper 9242.
- Devece C, Peris-Ortiz M, Rueda-Armengot C (2016) Entrepreneurship during economic crisis: Success factors and paths to failure. *Journal of Business Research* 69: 5366-5370.
- Fossen FM, Steiner V (2009) Income taxes and entrepreneurial choice: empirical evidence from two

- German natural experiments. *Empirical Economics* 36: 487-513.
- Fuentelsaz L, González C, Maicas JP, Montero J (2015) How different formal institutions affect opportunity and necessity entrepreneurship. *Business Research Quarterly* 18: 246-258.
- Gieure C, Buendía-Martínez I (2016) Determinants of translation-firm survival: A fuzzy set analysis. *Journal of Business Research* 69: 5377-5382.
- Gimenez-Nadal JI, Lafuente M, Molina JA, Velilla J (2016) Resampling and Bootstrap to Assess the Relevance of Variables: A New Algorithmic Approach with Applications to Entrepreneurship Data. *Empirical Economics* (forthcoming).
- Goedhuys M, Sleuwaegen L (2000) Entrepreneurship and growth of entrepreneurial firms in cote d'Ivoire. *Journal of Development Studies* 36: 123-145.
- Hernandez-Perlines F, Moreno-García J, Yañez-Araque B (2016) The mediating role of competitive strategy in international entrepreneurial orientation. *Journal of Business Research* 69: 5383-5389.
- Holcomb TR, Ireland RD, Holmes RM, Hitt MA (2009) Architecture of entrepreneurial learning: exploring the link among heuristics, knowledge, and action. *Entrepreneurship Theory and Practice* 33: 167-192.
- Kautonen T (2008) Understanding the older entrepreneur: Comparing third age and prime age entrepreneurs in Finland. *International Journal of Business Science and Applied Management* 3: 3-13.
- Kautonen T, Tornikoski ET, Kibler E (2011) Entrepreneurial intentions in the third age: the impact of perceived age norms. *Small business economics* 37: 219-234.
- Kelley D. (2009). "Growth aspirations as a function of entrepreneurial motivations and perceptions. *Babson Faculty Research Working Papers* no. 49.
- Kosko B, Isaka S (1993) Fuzzy-Logic. *Scientific American*: 76-81. Available at: <http://sipi.usc.edu/~kosko/Scientific American.pdf>.
- Kotsova T (1997) Country institutional profiles concept and measurement. *Academy of Management Proceedings* 97: 180-184.
- Kuckertz A, Berger ES, Mpega A (2016). The More the Merrier? Economic Freedom and Entrepreneurial Activity. *Journal of Business Research* 69: 1288-1293.
- Kyrö P (2015) The conceptual contribution of education to research on entrepreneurship education. *Entrepreneurship and Regional Development* 27: 599-618.
- Levie J, Autio E (2013) Growth and growth intentions: A meta-analysis of existing evidence. ERC White Papers No. 1.
- Mengistae T (2006) Competition and entrepreneurs' human capital in small business longevity and growth. *Journal of Development Studies* 42: 812-836.
- Minniti M (2005) Entrepreneurship and network externalities. *Journal of Economic Behaviour & Organization* 57: 1-27.
- Minniti M (2008) The role of government policy on entrepreneurial activity: productive, unproductive, or destructive? *Entrepreneurship Theory and Practice* 32: 779-790.
- Minniti M (2009) Gender issues in entrepreneurship. *Foundations and Trends in Entrepreneurship* 5: 497-621.
- Molina JA, Velilla J, Ortega R (2016) The decision to become an entrepreneur in Spain: the role of household finances. *International Journal of Entrepreneurship* 20: 57-73.
- Naudé W (2016) Is European Entrepreneurship in Crisis? *IZA DP* 9817.
- North DC (1986) The new institutional economics". *Journal of Institutional and Theoretical Economics* 142: 230-237.

- Núñez-Pomar J, Prado-Gascó V, Añó V, Crespo J, Calabuig F (2016) Does size matter? Entrepreneurial orientation and performance in Spanish sports firms. *Journal of Business Research* 69: 5336-5341.
- Okumura T, Usui E (2016) Intergenerational Transmission of Skills and Differences in Labor Market Outcomes for Blacks and Whites. *IZA DP* 9662.
- Ragin CC (2006) "Set relations in social research: Evaluating their consistency and coverage", *Political Analysis*, 14(3), pp. 291–310. doi: 10.1093/pan/mpj019.
- Ragin CC (2007) Fuzzy Sets: Calibration versus Measurement. *Oxford Handbooks of Political Science* 2.
- Ragin CC (2008) Qualitative Comparative Analysis Using Fuzzy Sets (fsQCA). *Configurational Comparative Analysis*: 87–121.
- Ragin CC, Sonnett J. (2005) *Between Complexity and Parsimony: Limited Diversity, Counterfactual Cases, and Comparative Analysis*. In: Kropp S., Minkenberg M. (eds) *Vergleichen in der Politikwissenschaft*. VS Verlag für Sozialwissenschaften.
- Ragin CC, Stand D (2014) fs/QCA [Computer Software] Version 2.5. P. Irvine, CA: University of California.
- Ramachandran V, Shah MK (1999) Minority entrepreneurs and firm performance in sub-Saharan Africa. *Journal of Development Studies* 36: 71-87.
- Reynolds P, Bygrave WD, Autio E, Cox LW, Hay M (2003) Global Entrepreneurship Monitor 2002 exclusive report. Wellesley, MA: Babson College.
- Rostam-Afschar D (2014) Entry regulation and entrepreneurship: a natural experiment in German craftsmanship. *Empirical Economics* 47: 1067-1101.
- Roig-Tierno N, Kun-Huang H, Ribeiro-Soriano D (2016) Qualitative Comparative Analysis: Crisp and Fuzzy Sets in Business and Management. *Journal of Business Research* 69: 1261–1264.
- Roskrug MJ, Poot J, King L (2016) Social capital, entrepreneurship and living standards: differences between immigrants and the native born. *IZA DP* 9874.
- Schott T, Bager T (2004) Growth expectations by entrepreneurs in nascent firms, baby business and mature firms. In T. Bager and M. Hancock (eds.) *The growth of Danish firms (Part 2 of the Global Entrepreneurship Monitor)*. Copenhagen, DK, Børsens Forlag, pp. 219-230.
- Schott T, Rogoff E, Herrington M, Kew P (2017) GEM Special Report on Senior Entrepreneurship.
- Shane S (2009) Why encouraging more people to become entrepreneurs is bad public policy. *Small Business Economics* 33: 141-149.
- Singer S, Amoros JE, Moska D (2015). GEM 2014 Global Report.
- Smithson M, Verkuilen J (2006) Fuzzy set theory: Applications in the social sciences. (No. 147). Sage.
- Sobel RS (2008) Testing Baumol: Institutional quality and the productivity of entrepreneurship. *Journal of Business Venturing* 23: 641-655.
- Terjesen S, Szerb L (2008) Dice thrown from the beginning? An empirical investigation of firm level growth expectations. *Estudios de Economía* 35: 157-178.
- Velilla J, Ortega R (2017) Determinants of entrepreneurship using fuzzy set methods: Europe vs. non-Europe. *Applied Economics Letters*. doi: 10.1080/13504851.2016.1276262.
- Wennekers S, Van Stel A, Carree M, Thurik R (2010). *The Relationship between Entrepreneurship and Economic Development: is it U-shaped?*. Now Publishers Inc.
- Viinikainen J, Heineck G, Bockerman P, Hintsanen M, Raitakar O (2016) Born entrepreneur? Adolescents' personality characteristics and self-employment in adulthood. *IZA DP* 9805.
- Woodside AG, Ko E, Huan TC (2012) The New Logic in Building Isomorphic Theory of Management Decision Realities. *Management Decision* 50: 765–777.

**Figure 1. Ragin's direct method pseudo-code**

```
For each variable  $X_i$  {  
  Median $_i$ =median( $X_i$ )  
  P1 $_i$ =percentile( $X_i$ , 1)  
  P9 $_i$ =percentile( $X_i$ , 9)  
  For each observation  $j$  {  
    Deviation $_{ij}$ = $X_{ij}$  - Median $_i$   
    Ratio $_{ij}$ =3/( P9 $_i$  - Median $_i$ ) if Deviation $_{ij}$ >0  
    Ratio $_{ij}$ =3/( Median $_i$  - P1 $_i$ ) if Deviation $_{ij}$ <0  
    Logodd $_{ij}$ =Deviation $_{ij}$ *Ratio $_{ij}$   
    Fuzzy-set score $_{ij}$ =exp(Logodd $_{ij}$ )/(1 + exp(Logodd $_{ij}$ ))  
  }  
}
```

*Note:* this scheme is a particular case of Ragin's (2007) direct method to define fuzzy sets.



**Table 1. Summary Statistics**

<b>Variables</b>	<b>Variables - Mean (S.D.)</b>		<b>Fuzzy sets - Mean (S.D.)</b>	
	<b>Developed</b>	<b>Developing</b>	<b>Developed</b>	<b>Developing</b>
Entrepreneur	0.018 (0.012)	0.038 (0.023)	0.461 (0.320)	0.501 (0.339)
Skills	0.298 (0.348)	0.518 (0.421)	0.488 (0.334)	0.479 (0.415)
Opport	0.253 (0.350)	0.293 (0.394)	0.456 (0.357)	0.480 (0.342)
Peer	0.244 (0.344)	0.320 (0.404)	0.453 (0.334)	0.468 (0.369)
Perception	0.169 (0.283)	0.258 (0.377)	0.411 (0.327)	0.452 (0.339)
Satinc	0.238 (0.360)	0.082 (0.210)	0.473 (0.323)	0.499 (0.330)
Satlife	0.741 (0.344)	0.617 (0.428)	0.557 (0.342)	0.501 (0.393)
Observations	28	28	28	28

**Table 2. Regression model estimates**

<b>Variables</b>	<b>(1) Developed</b>	<b>(2) Developing</b>
Skills	0.001 (0.009)	0.002 (0.011)
Opport	-0.020*** (0.007)	0.041 (0.030)
Peer	0.004 (0.008)	-0.011 (0.012)
Perception	0.026** (0.011)	-0.023 (0.032)
Satinc	-0.005 (0.006)	-0.002 (0.009)
Satlif	0.004 (0.006)	-0.013 (0.010)
Constant	0.015*** (0.004)	0.043*** (0.009)
Observations	28	28
R-squared	0.333	0.252

*Note:* Robust standard errors in parentheses.  
Significance levels: \*\*\* p<0.01, \*\* p<0.05, \* p<0.1.

**Table 3. FsQCA: sufficient conditions of entrepreneurship**

<b>Conditions</b>	<b>Consistency</b>	<b>Coverage</b>
<b>A) Developed countries</b>	Overall: 0.736	
~Skills + ~opport + ~perception + ~satinc + ~satlife (Hungary, South Korea, Portugal, Czech R., Slovakia)	0.889	0.410
Skills + ~opport + peer + perception + ~satinc (Poland, Slovenia)	0.818	0.227
Skills + ~opport + peer + perception + satlife (China, Slovenia)	0.773	0.292
Skills + opport + peer + ~perception + satinc + ~satlife (Canada, Estonia)	0.932	0.205
<b>B) Developing countries</b>	Overall: 0.761	
Skills + ~opport + ~perception + ~satinc + satlife (Vietnam)	0.817	0.157
~Skills + opport + peer + perception + ~satlife (Argentina, Philippines)	0.818	0.248
~Skills + opport + ~peer + perception + ~satinc + satlife (Jamaica, Taiwan)	0.822	0.188
Skills + opport + peer + perception + ~satinc + satlife (Brazil)	0.797	0.172
Skills + ~opport + ~peer + ~perception + ~satlife (Iran, Bosnia, Macedonia)	0.777	0.248
Skills + ~opport + ~peer + ~perception + ~satinc (Vietnam, Iran, Bosnia, Macedonia)	0.859	0.268

*Note:* Quine-McCluskey algorithm. Results correspond to the complex solution. Cutoff consistency: 0.75. “~” represents lower levels of belonging to the correspondent feature group.

**Table 4. FsQCA: necessary conditions of entrepreneurship**

<b>Conditions</b>	<b>A) Developed countries</b>		<b>B) Developing countries</b>	
	<b>Consistency</b>	<b>Coverage</b>	<b>Consistency</b>	<b>Coverage</b>
Peer + satinc + satlife + perception	0.816	0.484	0.802	0.533
Opport + peer + perception + satinc	0.775	0.499	0.802	0.596
Opport + peer + perception + satlife	0.772	0.505	0.788	0.564
Opport + perception + satinc + satlife	0.792	0.483	0.822	0.539
Opport + peer + satinc + satlife	0.815	0.484	0.829	0.545
Opport + peer + perceptionn	0.918	0.528	0.866	0.588
Skills + opport + peer + satinc	0.824	0.514	0.861	0.562
Skills + opport + peer + satlife	0.826	0.512	0.903	0.551
Skills + opport + perception + satinc	0.800	0.516	0.862	0.636
Skills + opport + perception + satlife	0.814	0.515	0.905	0.599
Skills + opport + satinc + satlife	0.852	0.501	0.881	0.568
Skills + peer + perception + satinc	0.825	0.535	0.912	0.604
Skills + peer + perception + satlife	0.827	0.512	0.885	0.572
Skills + peer + satinc + satlife	0.865	0.498	0.917	0.555
Skills + perception + satinc + satlife	0.853	0.502	0.890	0.545