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The impact of educational levels on formal and informal entrepreneurship



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Abstract This paper studies the impact of formal education on entrepreneurship rates. We propose that different levels of education not only vary between each other in terms of their impact, but also according to whether we analysis either formal or informal entrepreneurship. Our results show that tertiary education increases formal entrepreneurship as a consequence of the higher self-confidence, lower perceived risk and enhanced human capital. At the same time, tertiary education also has a negative effect on informal entrepreneurship as it increases awareness of and sensitivity to the possible negative repercussions of this kind of activities. In addition, we show that the impact of secondary education on formal entrepreneurship is positive as well, although in this case the effect on informal entrepreneurship is not significant. Even though secondary education also increases awareness of the potential negative repercussions of informal entrepreneurship, this effect is counteracted by a lack of management skills.

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Introduction

The concept of entrepreneurship, which encompasses the creation of ideas, companies, and patents as well as the thought process behind these creations, even in cases where they are not put into practice, has been identified by various authors as one of the key components of economic growth and development (Agarwal et al., 2007; Baumol, 2004; Baumol and Strom, 2007; Zacharakis et al., 2000). Entrepreneurship is intimately linked to innovation, growth

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in productivity, competitiveness, economic growth, the creation of employment, and even success at a personal level (Grilo and Thurik, 2005).

Along with the significant increase in rates of entrepreneurship over recent decades, with estimates even as high as 500 million people per year involved in the creation of new firms (Moya, 2008), scholarly interest has also increased notably. On the one hand, it seeks to examine our understanding of this phenomena in greater depth and, on the other, to offer advice and guidance for users and regulators (for a review, see Dimitratos and Jones, 2005; Szyliowicz and Galvin, 2010).

Entrepreneurship is a multidimensional subject, the study of which involves approaches at an individual, regional, sectoral, or, as in this case, at a national level (Wennekers and Thurik, 1999; Davidsson, 2004). Given that a large part of entrepreneurial activity at this level is not explained if only economic variables are considered (Freytag and Thurik, 2007; Uhlaner and Thurik, 2007), this study aims to broaden the analysis, by focusing on the impact of education on entrepreneurship rates. As Coduras et al. (2010) underline, individuals tend to acquire knowledge that can provide entrepreneurs with useful abilities and skills through (especially formal) education. Our study, therefore, contributes to the literature on Institutional Economy (North, 1990), by conducting an in-depth analysis of the impact of education, which is one of the factors that defines social, economic and political interactions within a country, and, by explaining how different educational levels can have very different repercussions for each form of entrepreneurship.

Supported by the results of numerous studies, the mainstream view has traditionally assumed that higher rates of education will lead to higher rates of entrepreneurship (see, for example, Bates, 1995; Reynolds, 1997; Delmar and Davidsson, 2000). However, to the best of our knowledge, there are no studies exploring the particular effect of different educational levels on entrepreneurship rates, distinguishing between formal and informal entrepreneurship. We propose that the effect of each educational level will vary according to whether its impact on either formal or informal entrepreneurship is investigated. This is not only because the determinants of each educational level often differ, but also because each one has its own peculiarities, methods, objectives and resources. Thus, we also contribute to the literature focused on entrepreneurship, by lending attention to the distinction between formal and informal entrepreneurship, and by providing theoretical arguments and empirical evidence that educational levels have different effects on each one of them. To do so, we use multi-country data on enrolment rates in secondary and tertiary education taken from the World Development Indicators of the World Bank and on formal and informal rates of entrepreneurship, taken from the World Bank Group Entrepreneurship Snapshots (WBGES) and the Informal Entrepreneurship Index or IEI, respectively (Dau and Cuervo-Cazurra, 2009).

In particular, our results show that secondary and tertiary education increase formal entrepreneurship as a consequence of the higher self-confidence, lower perceived risk and enhanced human capital (Schultz, 1959; Shane and Venkataraman, 2000; Davidsson and Honig, 2003; DeTienne and Chandler, 2004). By contrast, tertiary education has a

negative effect on informal entrepreneurship as it increases awareness of and sensitivity to the possible negative repercussions of this kind of activities (Gössling, 2003; Bitros and Karayiannis, 2010). However, secondary education does not influence informal entrepreneurship significantly. Even though secondary education also increases awareness of the potential negative repercussions of informal entrepreneurship, this effect is counteracted by a lack of organizational, planning, administrative, bureaucratic, leadership or human resource management skills (Lazear, 2005; Levie and Autio, 2008), forcing some entrepreneurs to join the informal sector as a last resort (Günther and Launov, 2012).

The remainder of this paper is structured as follows. The second section sets out a review of the literature and lays the groundwork for the hypothesis on the impact of different educational levels on formal and informal entrepreneurship rates. The third section describes the methodology used in the empirical section of this study, detailing the dependent, independent and control variables, as well as the multicollinearity diagnosis and the model. The fourth section presents the results and the robustness tests that were applied. Finally, in the fifth section, the principal conclusions are drawn, and the limitations and possible future lines of research are discussed.

Literature review and hypotheses

Formal and informal entrepreneurship

As previously stated, entrepreneurship is a complex concept encompassing the creation of ideas, companies, and patents as well as the thought process behind these creations. Literature has traditionally relied on quantifiable variables such as patents and rates of firm creation to measure entrepreneurship. We also adopt this approach and consider entrepreneurship in its functional form as the creation of new firms (Dau and Cuervo-Cazurra, 2009).

Different modalities of entrepreneurship can be distinguished. Formal entrepreneurship refers to the creation of legally registered new firms in a country (Klapper et al., 2007), whereas informal entrepreneurship focuses on those firms that are not legally registered and are largely unregulated (Nystrom, 2008).

Entrepreneurs from developed economies mainly create firms in the formal sector (Ahlstrom and Bruton, 2006; Bruton et al., 2008). Consequently, most studies focus on formal entrepreneurship (Dau and Cuervo-Cazurra, 2009). In addition, the data limitation and the problems to obtain reliable measures about the weight of the informal sector in a given economy, contribute to explain its marginal role in academic research. On the contrary, it must be acknowledged that the informal sector exists, to a greater or lesser extent, in every country (Webb et al., 2013). In fact, it represents more than half of the total economy in some countries, being informal entrepreneurship one of its main components (ILO, 2002; Fiess et al., 2010).

Formal and informal entrepreneurship have considerably divergent characteristics and, likewise, their determinants play a different role in each one (Dau and Cuervo-Cazurra, 2009). It therefore seems reasonable to think that the impact of each educational level on the creation of both formal and informal firms will differ.

The impact of education on formal entrepreneurship rates

The importance of education in occupational employment has been underlined on several occasions, both in pioneering studies (Blau and Duncan, 1967) and in more recent ones (Uhlener and Thurik, 2007). Despite the literature having often found a positive relation between education and formal entrepreneurship (see for example Bates, 1995; Reynolds, 1997; Delmar and Davidsson, 2000), the complexity of this relation should be acknowledged, because opportunity costs may intervene. In other words, those individuals with a higher level of education may also have a greater probability of achieving success and the fulfillment of their personal goals, not only as owners of firms, but also as employees (Campbell, 1992; Gimeno et al., 1997). This could explain the results from certain studies in which education does not appear as a significant determinant in the choice of becoming an entrepreneur (De Wit and Van Winden, 1989; Uhlener et al., 2002). Nevertheless, certain studies suggest that higher levels of education lead to better performance in entrepreneurial activities than when working as an employee (Evans and Leighton, 1989). Moreover, a higher level of education can create a set of possible entrepreneurs attracted by the non-material advantages of entrepreneurship such as greater autonomy (Van Gelderen and Jansen, 2006) and personal achievement (McClelland, 1975).

Traditionally, it has been argued that those individuals that have a better training, starting from secondary education, acquire specific knowledge and develop capabilities that facilitate personal development in certain professions and help them start entrepreneurial activities where they may be put into practice (WEF, 2009; Coduras et al., 2010). This even occurs regardless of whether the education aims to be of a vocational nature or is more generalist, as the objective of both is to develop many of the necessary qualities to conduct a professional activity, such as problem solving, initiative, creativity in the design of new processes and activities, the use of modern communication techniques and team work (UNESCO, 2005; Gauthier, 2006).

Shane and Venkataraman (2000) underline that entrepreneurship is composed of two interrelated processes: the discovery of opportunities and the exploitation of those opportunities. People with higher levels of education may be at an advantage in both processes. In the first place, a higher level of education can provide the necessary cognitive skills so that the individual can better evaluate the opportunities as they arise (Schultz, 1959), which leads to a greater potential for productivity and efficiency (Becker, 1964; Mincer, 1974). Moreover, once committed to a business activity, entrepreneurs with a higher level of education are better equipped to exploit those opportunities successfully (Davidsson and Honig, 2003). A higher level of education also increases levels of self-confidence, facilitating their exploration of entrepreneurial activity. Perceived risk may also be reduced, as those individuals usually consider that they will find employment more easily in the labor market, should their business fail (Shane and Venkataraman, 2000).

The advantages mentioned above suggest the existence of a relation with a positive sign between secondary

education and formal entrepreneurship, which leads us to formulate the following hypothesis:

H1. A higher rate of enrolment in secondary education will have a positive impact on the rate of formal entrepreneurship.

As secondary education, tertiary education does also provide individuals with skills to detect and assess business opportunities (DeTienne and Chandler, 2004) and plays a crucial role on the attitudes and behavioral dispositions (Peterman and Kennedy, 2003; Walter and Dohse, 2009) through similar mechanisms to those previously described. While the importance of education starts from the very beginning, all the educational stages play a significant role on entrepreneurship (WEF, 2009; Coduras et al., 2010). Moreover, some authors claim that tertiary education has the greatest one as it provides, in addition to technical expertise, a broad set of business management and leadership skills needed to access and mobilize the resources necessary for launching the new venture (Levie and Autio, 2008). Consequently, we also expect a positive relation between tertiary education and formal entrepreneurship and, therefore, formulate the following hypothesis:

H2. A higher rate of enrolment in tertiary education will have a positive impact on the rate of formal entrepreneurship.

The impact of education on informal rates of entrepreneurship

There are various arguments to support the existence of a relation with a negative sign between education and informal entrepreneurship. Individuals with a higher level of education are more aware of the possible sanctions and fines that may ensue from carrying out an informal professional activities and, furthermore, they are more aware of morality and the negative impact on their social status that society associates with activities that take place in the informal economy (Gössling, 2003; Bitros and Karayiannis, 2010).

However, in the case of secondary education, this negative effect of education on the creation of informal firms may be compensated by another positive impact, arising from the greater bureaucratic requirements and managerial complexities that the management of formal firms may entail (Webb et al., 2013). As Lazear (2005) highlights, entrepreneurs must be able to combine both domain-specific as well as generic management skills in order to be successful. In certain cases, and despite possessing the capabilities and technical knowledge needed for their occupation, some individuals may lack these other capabilities that are equally necessary and useful for business management, such as organizational, planning, administrative, bureaucratic, leadership or human resource management skills (Levie and Autio, 2008). In these cases, entrepreneurs may have no other choice but joining the informal sector as a last resort (Günther and Launov, 2012). As a consequence, greater levels of enrolment in secondary education may increase rates of creation of informal firms, such that entrepreneurs can dedicate more time to the exploitation of

their expert knowledge that is more directly related to their occupation, with less complex requirements and obligations (Honig, 1996).

Despite the existence of contrasting arguments, this positive impact of secondary education on informal entrepreneurship¹ as a feasible alternative to those who are unable to run a formal venture leads us to formulate the following hypothesis:

H3. A greater enrolment rate in secondary education will have a positive impact on the rate of informal entrepreneurship.

In contrast, the arguments supporting a positive relation between education and informal entrepreneurship are less likely to apply in the case of tertiary education, as this type of education provides to the individual with knowledge and skills both of technical and managerial nature (Lazear, 2005; Levie and Autio, 2008), which minimizes the cases of entrepreneurs being forced to conduct their activities informally (Günther and Launov, 2012). These individuals are also more aware of and sensitive to the possible negative outcomes that may arise from conducting business activities in an informal way, both at an economic level (fines and sanctions) and for their social status (Gössling, 2003; Bitros and Karayiannis, 2010). Moreover, at present, numerous countries are starting to lend greater attention to the inclusion of ethical and civic content in the design of their curricula, which also has a negative influence on the creation of informal firms (Jiménez-Eguizábal and Palmero-Cámara, 2007; UNESCO, 2009). A negative sign, therefore, between tertiary education and informal entrepreneurship may be expected. This leads us to formulate the following hypothesis:

H4. SA greater enrolment rate in tertiary education will have a negative impact on the rate of informal entrepreneurship.

Methodology

Dependent variables

First, to measure formal entrepreneurship, we use the World Bank Group Entrepreneurship Snapshots (WBGES) as our dependent variable, which obtain data through surveys of business registers, as well as other governmental sources from each country. These measures are explicitly designed to capture formal entrepreneurship, by recording “any unit from the formal sector incorporated as a legal entity in a public register” (Klapper et al., 2007, p. 4). In particular,

¹ Note that this positive effect of education on the rates of informal entrepreneurship is, at the same time, not incompatible with a simultaneous positive effect on the rates of formal entrepreneurship. For example, an increase in the educational level might facilitate, at the same time, the creation of both formal and informal firms (according to whether each individual possesses the knowledge, abilities and resources needed for it), by individuals in a segment of the population that had been unemployed or had worked as employees.

we use the entry density rate as a dependent variable. This measure is calculated as the number of newly registered firms as a percentage of the population of a working-age in thousands of people. We analyze data from 2000 to 2007 to avoid any distortion of the results, due to such decisions as abandoned or delayed entrepreneurial activities caused by the subsequent financial crisis (Jiménez et al., 2014). Moreover, the results obtained by using the entry rate per capita are also offered as a robustness test. This measure is calculated as the percentage of new firms registered among the population in thousands.

Second, and taking into account the difficulties involved in sourcing reliable data for informal entrepreneurship, we use the measures prepared by Dau and Cuervo-Cazurra (2009). These authors provide two estimates of the Informal Entrepreneurship Index (IEI) from 2003 to 2005. This calculation is done by either using a specific index on the size of the informal economy with secondary data in Klapper et al. (2007), from the Global Entrepreneurship Monitor or GEM (2008) or an Informal Economy Index prepared by the authors themselves.² The former estimates are used in the main models, whereas the latter are used for the robustness tests.

Annex 1 shows the descriptive statistics for the dependent, independent and control variables included in the model. Annex 2 offers the list of countries included in the sample. Regarding formal entrepreneurship, data about the dependent and independent variables is available for 84 countries when using the entry density rate as dependent variable. However, only 70 countries qualify when using the entry rate per capita. Regarding informal entrepreneurship, the sample includes 30 countries for which there is available data in both estimations.

Independent variables

In order to analyze the impact of the different educational levels on the rates of formal and informal entrepreneurship, the total enrolment rates in secondary and tertiary education are used as independent variables. These ratios are calculated as the total number of enrolled students divided by the total population in the corresponding age range. Enrolment in educational levels are frequently analyzed in research focused on aspects related to educational issues (Sopoaga et al., 2013; Hengsadeekul et al., 2014; McEwen and Trede, 2014) and it represents a good measure of the students' level of motivation through a two-fold mechanism, first because it provides access to the teaching-learning processes and, second, because it increases the learning expectations (Rinaudo et al., 2003; Valle et al., 2007; Zimmerman, 2008; Zimmerman and Schunk, 2008). Furthermore, enrolment rates are particularly useful for educational policy-makers as they exercise greater control over them by being able to modify the academic and economic access requirements. Performance and educational success, on the contrary, depend heavily on the individual

² See Dau and Cuervo-Cazurra (2009) for a more detailed description of the procedure to calculate these measures and their validation.

effort and other variables of different nature (González, 2004; Feito-Alonso, 2009). Finally, by following this procedure we are able to take into account the knowledge and skill acquisition and the motivational increase of those individuals who enroll but do not finish the educational level in which they have registered. This determines that just starting an educational degree entails positive repercussion even if it is not completed, as these processes take place in a progressive way throughout the development of the degrees (OCDE, 2008; Pozo and Pérez Echeverría, 2009).

Obviously, the contents at each educational level vary from country to country. Nevertheless, the source consulted, the World Development Indicators database (World Bank), describes secondary education as that which completes the basic education offered at primary level, the purpose of which is to establish the fundamentals for life-long learning and human development through training that is more oriented toward abilities and a more specialized teaching staff. Moreover, tertiary education is also described as that which requires a minimum admission condition of having successfully passed secondary level education, regardless of whether or not it is intended to provide an advanced qualification in research. Although there is no official definition for these terms, the definitions used by the World Bank appear to be in harmony with those of UNESCO, for which secondary education is the stage at which the future worker, citizen and person should be trained, whereas tertiary education centers on transmitting more advanced and specialized knowledge (Gauthier, 2006).

Control variables

The logarithm of per capita GDP and the growth of GDP are included in the model as control variables, given that the greater quantity of available resources favors the creation of firms, and higher growth rates offer more investment opportunities.

The logarithm of inward foreign direct investment (FDI) is also included, although its impact *ex ante* may not be foreseen. On the one hand, higher rates of foreign investment can provoke lower firm creation rates by increasing levels of market competition. However, on the other hand, the arrival of foreign firms in a sector can imply a revitalization of their associated sectors, increasing the rate of firm creation connected to the inputs and outputs (suppliers and clients) of the foreign firms.

According to Djankov et al. (2002) and Dau and Cuervo-Cazurra (2009), it is necessary to incorporate the impact of institutions and structural reforms on entrepreneurship rates, taking into account that its effects are very different in formal and in informal entrepreneurship. Therefore, following the recommendation of these authors, a measure for economic liberalization and another on the quality of national governance, are included in the model as control variables. The measure of economic liberalization is the score on the Index of Economic Freedom, prepared by the Heritage Foundation. This index, made up of 10 sub-indices, measures the independence of the judicial system, the ability of firms and individuals to ensure that the contracts are fulfilled, corruption that exists in the judicial system, the degree to which the government protects

property rights, and the degree of freedom that exists for business, commerce and investment. The scores fluctuate between 0 and 100 (Fernández and González, 2005).

The measure of national governance is the average score of each country assigned by the World Governance Indicators (Kaufmann et al., 2007), which are in turn made up of six indices.³ These measure the quality of the regulations which apply to economic transactions, as well as the way those regulations are put into practice and their application.

Finally, as is commonly done in the literature, a series of temporal “dummies” are included to control for the impact of historic events. We control for unobserved country-specific factors by using panel models that take these factors into account.

The sources consulted to obtain the data included the World Bank, UNCTAD and the Heritage Foundation. When the sources offered no data on the explanatory variables for certain years, the values were estimated as the average of the adjacent years.

Model

The statistical technique of panel data was chosen, which allows us to carry out a longitudinal study by incorporating the temporal dimension. In particular, and following the recommendation of Greene (2000) and Dau and Cuervo-Cazurra (2009), Generalized Least Squares (GLS) estimates were performed with heteroskedasticity and autocorrelation AR(1). The decision between the use of a fixed effects (FE) or a random effects (RE) model requires to perform a Hausman test, in order to determine whether the specific common effects are correlated with the explanatory variables, in which case a fixed-effects model should be chosen. However, in our model, the Hausman test did not reject the null hypothesis of no correlation between the specific common effects and the regressors, so the random effects model is more appropriate.

With regard to the causality of the model, following standard practice in the literature, one-year delays were applied to all the explanatory variables – both the independent and the control variables – in the model, with the aim of analyzing their impact on the dependent variable in the following year.

Therefore, our empirical analysis is based on the estimation of the following balanced panel model:

$$\begin{aligned} \text{ENTREPRENEURSHIP (formal or informal)}_t &= \gamma_0 + \gamma_1 \text{SECONDARYEDUCATION}_{t-1} \\ &+ \gamma_2 \text{TERTIARYEDUCATION}_{t-1} + \gamma_3 \text{GDPperCÁPITA}_{t-1} \\ &+ \gamma_4 \text{GDPGROWTH}_{t-1} + \gamma_5 \text{INWARDFDI}_{t-1} \\ &+ \gamma_6 \text{ECONOMICFREEDOM}_{t-1} \\ &+ \gamma_7 \text{WORLDGOVERNANCEINDICATORS}_{t-1} + \varepsilon_{ij} \end{aligned}$$

³ The titles of these indices are: voice and accountability, political stability and absence of violence, government effectiveness, regulatory quality, rule of law and control of corruption.

Diagnosis of multicollinearity

Annex 3 shows the correlation and covariates matrix and the Variance Inflation Factor (VIFs) for the independent variables as an additional variable of collinearity. VIFs measure how much a variable contributes to the standard error of the regression. Given that all the correlation coefficients are under the limit of 10 recommended by [Neter et al. \(1985\)](#), [Kennedy \(1992\)](#) and [Studenmund \(1992\)](#), and also under the strictest limit of 5.3 proposed by [Hair et al. \(1999\)](#), we are confident that no serious multicollinearity problems exist in our data.

Results and discussion

Annex 4 shows the results when the entry density rate for formal entrepreneurship ("a" models) and the first estimation of the IEI suggested by [Dau and Cuervo-Cazurra \(2009\)](#) for informal entrepreneurship ("b" models) are taken as the dependent variables in the models. In the first place, the model includes only the control variables. In second place, each independent variable (secondary education and tertiary) is separately introduced. Finally, both independent variables are included in the same model at the same time.

Regarding formal entrepreneurship, the results of models 2a and 4a demonstrate that higher secondary education rates significantly favor the creation of formal firms, verifying hypothesis H1. Moreover, models 3a and 4a show that tertiary education rates are also significant and positive, supporting hypothesis H2.

In addition, models 3b and 4b show that higher tertiary education rates significantly reduce informal entrepreneurship, verifying hypothesis H4. On the contrary, in models 2b and 4b, it may be seen that secondary education rates are not significant for the creation of informal firms. Therefore, hypothesis H3 is not supported.

In accordance with these results, the tertiary education rate is revealed to be a factor that not only favors the creation of formal firms, but also works against the creation of informal firms. The positive impact on formal entrepreneurship is due to this type of education providing the necessary capabilities to detect, evaluate and exploit business opportunities better, increase self-confidence and reduce perceived risk, as it fosters a broader awareness of employment possibilities, should the business venture fail. This result suggests that those individuals that attain a higher level of education, motivated by non-material advantages such as greater autonomy ([Van Gelderen and Jansen, 2006](#)) or self-fulfillment ([McClelland, 1975](#)), consider themselves better trained to start a formal entrepreneurial activity.

Besides, in addition to this positive impact on formal entrepreneurship, tertiary education also exercises a negative effect on informal entrepreneurship. This is owing to the ethical and civic content provided in the curricula, which increase the awareness of the potential negative repercussion, both economic and related to the social status of the individual.

The secondary education rate was only significant for the creation of formal firms, but not for informal entrepreneurship. Those individuals that reach this educational level

enjoy, in comparison with those with less training, the same advantages as in the case of tertiary education (although to a lesser extent), with regard to the identification and valuation of business opportunities, knowledge acquisition and skills, increased self-confidence and reduction of risk. However, although such individuals also perceive the possible negative repercussions of informal activities, they are unable, on occasions, to cope with all the obligations and complexities involved in formal firms due to the lack of management skills. Some individuals will therefore have no other alternative than to dedicate themselves to the informal sector, in order to put their knowledge and technical skills into practice.

In consequence, these results show the relevance of an appropriate training of the population, at both the secondary and tertiary level, in order to improve rates of national entrepreneurship. Tertiary education, in addition to its clear positive impact on the creation of formal firms, can also help counter the creation of informal firms. Besides, a policy of quality secondary education can be highlighted as a necessary condition, not only because it increases the chances to succeed in tertiary education, but also because it has a positive direct impact on formal entrepreneurship. However, given that its relation with informal entrepreneurship is not significant, it also appears advisable to underline, at this level of education, the negative repercussions of informal activities, as well as to reinforce and emphasize curricular content of an ethical and civic nature.

With regard to the control variables, both GDP per capita as well as the quality of national governance and economic freedom had a positive and significant effect on formal entrepreneurship. These results demonstrate that a higher quantity of available resources, better quality regulations, the reduction of transaction costs with institutions and economic liberalization act as incentives for the creation of formal firms.

GDP per capita also has a significant and negative coefficient in the informal entrepreneurship model, suggesting that fewer available resources lead entrepreneurs to decide on the creation of informal firms, to benefit from the less stringent requirements that are associated with them. The GDP growth rate is also negative in this model, showing that worse macroeconomic conditions are an incentive for the population to embark on informal entrepreneurial activities due to the absence of other alternatives. In addition, larger inflows of foreign direct investment do have a positive impact on the creation of entrepreneurial activities, although the greater competitiveness of foreign firms can force entrepreneurs to run informal business activities.

However, economic freedom exercises a negative effect on informal entrepreneurship. When the public sector strictly controls an activity, it can offer the goods at a price that is higher than the equilibrium price in a perfectly competitive market, as it can restrict the formal access of individuals that wish to operate in the market. This may force entrepreneurs to perform their business under clandestine conditions in the informal economy. On the contrary, when the sector is privatized, the entry of new agents into the market is allowed and the price is determined by the forces of supply and demand, which leads to a fall in the price, in comparison with the previous situation of a public monopoly. This can mean that some previously established

informal firms fail to perform in the more competitive market and are obliged to adjust to its new conditions or to abandon it. Finally, national governance quality has a positive but hardly significant effect, which even disappeared in the robustness tests.

Annex 5 shows the results for other alternative dependent variables, such as the per capita entry rate for formal entrepreneurship ('c' models) and the second estimation suggested by Dau and Cuervo-Cazurra (2009) of informal entrepreneurship ('d' models). These robustness models yield very similar results to those described earlier, supporting the same hypotheses. As regards formal entrepreneurship, a higher rate of secondary (models 2c and 4c) and tertiary education (models 3c and 4c) once again significantly favor the creation of formal firms. Likewise, a higher rate of tertiary education, significantly reduces the creation of informal firms (models 3d and 4d), whereas secondary education rates are not significant (models 2d and 4d). The control variables also obtained similar results to those described earlier, although now GDP growth shows a negative and significant relation with formal entrepreneurship. This may be due to existing firms that contract large numbers of workers and offer better conditions at times of economic expansion, in order to respond to greater demand or to enter new markets, making the option of becoming an entrepreneur relatively less attractive.

Finally, as an additional robustness test, we controlled whether the results might be due to an effect arising from the region in which the country is located. To do so, mutually exclusive dichotomous variables were introduced into the models to control for the effect of forming part of the European Union, North America, Latin America, Asia, Africa and the Middle East (the other countries in the world serving as a reference category). The results show, however, that these additional variables are not significant while the other variables remain unchanged.⁴ Finally, we confirmed that the results from the formal entrepreneurship models remain unchained when using as a sample the countries for which informal entrepreneurship data is available.⁵

Conclusions

This study has analyzed the role of education enrolment on entrepreneurship rates. The results confirm the proposed hypotheses and suggest that both secondary education and tertiary education have a very different effect, according to whether formal or informal entrepreneurship is investigated. In particular, formal entrepreneurship is positively associated to secondary and tertiary education, whereas informal entrepreneurship is only negatively affected by tertiary education.

The result, consistent with previous literature (Levie and Autio, 2008), points to the fundamental role of educational levels as the stages in which entrepreneurs are trained and an adequate mindset toward entrepreneurship is created (WEF, 2009; Coduras et al., 2010). In addition, they also

underline the importance of other institutional factors such as economic liberalization and national governance quality in the creation of formal enterprises (Djankov et al., 2002; Dau and Cuervo-Cazurra, 2009). Finally, the results also show a negative relation between macroeconomic magnitudes and the creation of informal firms, consistent with the counter-cyclical character of informal entrepreneurship (Loayza and Rigolini, 2006; Fiess et al., 2010).

We believe that these results have some relevant academic and practical implications for scholars, policy-makers and entrepreneurs. First, given that education is one of the factors that defines social, economic and political interactions with a country, we contribute to the literature on the impact of institutions (North, 1990) on entrepreneurship, by demonstrating that different educational levels do not affect all the modalities of firm creation equally. It does so by showing the different impact of educational levels not only on formal entrepreneurship, which is more relevant in developed countries and has traditionally received most attention from researchers, but also on informal entrepreneurship, which plays a key role in developing countries (Honig, 1996).

In addition, the evidence obtained of the positive impact of secondary and tertiary education on formal entrepreneurship as well as of the negative relationship between tertiary education and informal entrepreneurship contributes to the growing literature devoted to the study of entrepreneurship in general and to the role of education as one of its main determinants (Bécharde and Grégoire, 2005; Coduras et al., 2010) in particular. In particular, this paper highlights the mechanisms through which secondary and tertiary education encourage the creation of formal firms. Education provides entrepreneurs with cognitive skills to better evaluate and exploit entrepreneurial opportunities, increases the level of self-confidence and reduces perceived risk. Moreover, and perhaps more relevant as contributions given the relatively more scarce study that informal entrepreneurship has received to date, tertiary education provides ethical and civic values and a higher awareness of the potential negative repercussions of informal activities in terms of fines, sanctions and social status. Consequently, tertiary education exercises a negative influence on informal entrepreneurship. However, in the case of secondary education, the effect of the negative repercussion of informal activities is offset by the lack of a range of necessary skills to deal with the administrative and management complexities attached to formal activities, forcing some entrepreneurs to opt for the creation of informal enterprises as the only viable alternative. As a further contribution, rather than constraining the specific reality of one particular country, this study includes a wide range of different countries, avoiding the problem of extrapolating the conclusions that would otherwise apply.

Second, as practical implications for those in charge of the design and execution of national policies, these results underline the need for educational policies directed at improvements in the educational level of the population at secondary and tertiary level as an incentive for the creation of formal firms. However, they also signal that secondary education in itself is not sufficient to diminish the creation of informal firms. Therefore, it would be advisable to stress the relevance of an adequately designed secondary education

⁴ Results available on request from the authors.

⁵ We are grateful to an anonymous reviewer for this suggestion. Results available on request from the authors.

policy, not only to increase the chances of success in higher education, but also to reinforce and emphasize curricular content of an ethical and civic nature at this level, as is currently done in several countries at the tertiary level. By following this procedure, it may be possible to better endow individuals to increase their opportunities and, at the same time, increase the attractiveness of formalization of entrepreneurial activities (Günther and Launov, 2012).

Third, as practical implications at the individual level, this work highlights the relevance for potential entrepreneurs of providing themselves the best education, given the key role of secondary and tertiary education in the creation of firms. Despite the cases occasionally reported in the media of successful entrepreneurs that abandoned their studies at an early stage, our results show that a higher level of education can help entrepreneurs, by enhancing their capabilities to detect and evaluate business opportunities, increasing their knowledge and capabilities, improving their level of self-confidence and reducing risk.

In summary, the present study contributes to a better understanding of the impact of different levels of education on the rate of formal and informal firm creation in different countries. It is subject to limitation nonetheless. For instance, we are only able to analyze a sample of three years in the case of informal entrepreneurship, due to data unavailability. In addition, and despite the definitions used in the data source being convergent with those used by other international institutions, it is not possible to ensure that the educational levels are completely homogeneous across countries. Future research could continue along these lines by analyzing such questions as the impact of educational levels, not only enrolment rates but also attainment or educational success, on survival rates and the profitability of created firms, thereby deepening our understanding of the entrepreneurial phenomenon.

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Appendix A. Supplementary data

Supplementary data associated with this article can be found, in the online version, at [doi:10.1016/j.brq.2015.02.002](https://doi.org/10.1016/j.brq.2015.02.002).

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