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## DETERMINING FACTORS OF ENTREPRENEURSHIP IN COSTA RICA: AN ECONOMETRIC APPROACH

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# Determining factors of entrepreneurship in Costa Rica: An econometric approach\*

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## *Abstract*

This paper explores the triggers of the decision to start a new business in Costa Rica. The theoretical approaches explaining entrepreneurial behavior and its influence over the economy take inspiration, among others, from Schumpeter's (1934) work and his concept of the "creative destruction" of knowledge (1976). Recently, several authors have agreed that the creation of new businesses, started on the basis of rent seeking, is the driver of economic growth.

More specifically, this work seeks to isolate variables that exert a statistically significant influence (positive or negative) over the decision of starting a new venture. Variables traditionally considered as determining in that decision process, such as the levels of formal education, do not result in significant regressors. In contrast, less traditional factors (self-perception of job-relevant skills, fear of failure and the opportunities outlook) appear to be highly significant. This shows that psychological factors are the most important in Costa Rica, and therefore policies should be redirected towards those hotspots.

J.E.L.: L26, O5, O21, O170.

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Keywords: entrepreneurship, probit model, public policy.

## **I. Introduction & Background**

This paper explores the triggers of the decision of starting a new venture in Costa Rica. The theoretical approaches explaining entrepreneurial behavior and its influence over the economy are inspired on Schumpeter's (1934) work and his concept of the "creative destruction" of knowledge (1976). Recently, several authors have agreed that the creation of new businesses, that started on the basis of rent seeking, are the drivers of economic growth – e.g. Krauss (2008); Baron y Shane (2008), Ventakamaran (1997) – among others.

Opportunities to profit from entrepreneurship are always coupled with uncertainty, and therefore the risk element is always interacting with the expected income and costs (both economic and opportunity costs). Eckhardt & Shane (2003) argue that equilibrium models are deficient when explaining entrepreneurship, as far from explaining the differences between entrepreneurs, it is more important to explain the nature of the underlying opportunities, which are signs of market failures. However, Kirzner (1997) had previously raised a counterpoint, noting that such criticism of the neoclassical synthesis is not sufficient, since at all times, start-up opportunities and its associated rent seeking incentives set the tendency towards market equilibrium.

Previously Romer (1987) contributed with a neoclassical growth model that includes a market for Innovation and Development (I&D), where existent knowledge has the characteristics of a public good (non-rival and non-exclusive) and it generates constant productivities that lead to positive externalities, allowing as a result the creation of patents (a mechanism to internalize the externality). The produced knowledge is public, but patents make the technology private. Thus, knowledge as a whole (existent knowledge + patented technologies) is diffuse (unevenly distributed) among the agents, preventing entrepreneurial opportunities from being detected or inferred by anyone; that is consistent with the approach exposed by Hayek (1945). Arrow (1974) also explains that the opportunities of discovering or creating new goods and services (I+D) exist precisely because of the diffuse information and the differences between the agents, and knowledge brokers would encourage more people to get into the market.

Venkatamaran (1997) refers to a processes that has been ignored and focuses on the knowledge differences (both cognitive and behavioral), which are also associated with abilities. Risk assessment and exploration of the alternatives to exploit entrepreneurial opportunities as well as the knowledge creation process, strongly depend on the entrepreneurs' own characteristics.

The ease with which an individual makes the connection between specific knowledge and the market opportunity depends on a great range of abilities, aptitudes and circumstances that are not necessarily equally distributed amongst all individuals. These links were theorized by Hayek (1945) and Arrow (1974).

Uncertainty assessment is a relevant factor in the process of exploiting an opportunity. By definition, the entrepreneur takes actions in the present that involve time and effort investments, among others, without knowing what the final outcome will be. This is consistent with the issues raised since the 17th century by Richard Cantillon (1725), passing by Jean Baptiste Say (1803) and David McClelland (1961), among others. Vereshchagina and Hopenhayn (2009) use a neoclassical model with an indirect utility function that includes a non-concave region, allowing different levels of risk aversion, an idea originated from Friedman and Savage's work (1948). These non-concavities emerge from the presence of financial constraints and given job selections, so they do not emerge from assumptions about the individual's risk preference; and rather emerge endogenously. Both skills development and risk aversion processes contribute to build the individual's perception of market opportunities and chances.

Recently, the relevance of differences across individuals in terms of evaluation processes and cognitive abilities has been recognized. That recognition was not only conceptual; but it has promoted growing empirical research, especially using probabilistic models which have been used over the last decade in 45% of the studies on entrepreneurship (Alvarez and Urbano, 2011). For example the works of Arenius and De Clercq (2005), Arenius and Minniti (2005), De Clercq and Arenius (2006) and Koellinger (2008), all of them based on GEM's (Global Entrepreneurship Monitor) databases.

Arenius and De Clercq (2005) used data from the GEM (2005, Belgium and Finland). The authors set recognition of opportunities (opport) as the dependent variable and residential area, education, employment status, age and gender as explanatory variables in a series of binomial logistic regressions. They found that entrepreneurial activity is conditioned by the perception of opportunities, which in turn depends on the social networks (networking) of the entrepreneur. The same authors (2006) related the resulting knowledge from formal education and the knowledge of other entrepreneurs with the probability of creating a company.

Shapiro and Sokol (1982) emphasize the need and importance of access to financial resources since it increases the perception of the viability of a new business. In the same way the perception about the state of a country's economy at the time of the potential launch influences the decision to start a new business.

Lee et al. (2004), with information from the GEM's APS (2002 in Hong Kong, Taiwan and Singapore), examined the degree of entrepreneurial activity and its relationship with the factors previously considered in the existing literature. Their conclusions are in favor a positive relationship between entrepreneurship and the concepts of "self-efficacy", widely used in psychology to describe the capacity in which people deal with the stress of everyday life (Krueger, Reilly & Carsrud, 2000), and the perception of opportunities to start a business. They suggest that individuals with high levels of "self-efficacy" are most likely to start up a new business because of their high persistence and good performance in the market. Löfstrom (2009) found that those individuals whom do not found themselves as a person with the proper skills to make a venture will face difficulties starting up a new business.

Constant (2004) argues that self-employment ventures are dominated by men in Germany. From a multinomial logit estimation, concludes that women on the other hand are more likely to choose a paid position in that country. Berglann et al. (2009) also found in a study for Norway that men are more prevalent in entrepreneurship activities than women.

Despite the proliferation of this type of studies to identify determinants of entrepreneurship, in Costa Rica, due to a lack of information to this date, those studies have not been

performed yet. It was until 2010 and 2012 that the first survey database was provided by the GEM-Costa Rica consortium.

The purpose of this research is to contribute to the empirical determination of the factors affecting entrepreneurship (both positively and negatively) in Costa Rica. Starting with GEM databases (2012 and 2014) and contrasting between cognitive variables (skills, opportunities perception, uncertainty aversion, etc.) and more traditional variables (location, employment status and others).

According to Alvarez and Urbano (2011) research on entrepreneurship can be classified into three approaches: the economic (economic rationality, entrepreneurship is due to purely economic issues), psychological (individual factors or psychological traits that affect the response) and the sociological or institutional (environment socio-cultural conditioning decision). This paper considers aspects of the three approaches with special emphasis on the economic and psychological approach (individual's expectations in particular); the implementation of these will be explained in the methodology section.

## **II. Methodology**

The employed database comes from the GEM-Costa Rica Consortium surveys conducted in 2010 and 2012. The TEA is used as the dependent variable, it incorporates information from both affirmative and negative responses to the question of whether the observed individual was involved in some form of entrepreneurial initiative. This allows an estimation without the presence of a sample selection bias. In case of an affirmative answer, the response will be tested for the presence of links to both a set of classical economic variables and one composed of more cognitive variables. The TEA takes the value of 0 if the person is not involved such activities, and 1 in the event that he or she is. The estimation follows a probit model for the mentioned in Costa Rica.

The group of economic variables includes income and employment, the variables cognitive (which are not clearly separable) includes the perception of opportunities; the perception of own skills specifically relevant in the field of the intended venture, and the fear of failure (which is used as a proxy of risk perception by the entrepreneur). The remaining variables:

gender, age, location and education, are more sociological in type, and more traditional in this type of work.

The variables used in accordance with the nomenclature of the GEM are presented in Table 2.1. In order to make the estimates they were recoded.

**Table 2.1. Original variables used in the model**

<b>Variable code</b>	<b>Definition</b>	<b>Survey/basis of origin</b>
TEA10 / TEA12	Total people involved in entrepreneurship activities.	APS10 / APS12
suskil	Possession knowledge, skills and experience required to start a new business.	APS10 / APS12
opport	Perception of good opportunities to start a new businesses in the area in which you live (during the next 6 months).	APS10 / APS12
fearfail	In your case, would the fear of failure be an obstacle to start a business.	APS10 / APS12
gender	Gender.	APS10 / APS12
age	Age.	APS10 / APS12
occu	Which of the following best describes your current employment situation?	APS10 / APS12
crhhinc	Level of income.	APS10 / APS12
crregion	Region of residence.	APS10 / APS12
crreduc	Level of education.	APS10 / APS12

Source: Own elaboration with data from the APS survey. GEM-Costa Rica Consortium.



To validate the sample, those observations in which the individual does not know the answer ("Don't know"), cases where he/she refuses to give an answer ("Refused") as well as missing observations ("Missing Values") were excluded from the database. The final sample size is 1212 observations for 2010 and 1381 observations for 2012.

Binary variables "suskill", "opport", "fearfail", "gender", "crhhinc" and "crreduc" in addition to the continuous variable "age" are used without any modification, but the variables "occu" and "crregion" were transformed.

The variable "occu" takes values from 1 to 7. This was converted to 4 categories. Category 1 includes persons employed full-time or part-time; category 2 corresponds to self-employment; category 3 includes those unemployed. Finally, category 4 corresponds to housewives (7 in the original variable values). The variable is renamed as "cr\_occu". This transformation allows the analysis of the effects of condition and type of occupation on the TEA.

The categorical variable "crregion" which identifies 6 regions, was transformed to "cr\_reg", which collapses the regions into only 4: 1 for the Central Region; 2 the Chorotega Region, 3 the Brunca Region and finally 4 for other regions (North Huetar, Atlantic Huetar and Central Pacific).

Table 2.2 presents the variables used in the estimation after these transformations, their categories and the relative frequency in each sample.

**Table 2.2.** Variables used in the estimation.

<b>Variable</b>	<b>Tag</b>	<b>2010 Frequency</b>	<b>2012 Frequency</b>
Involved in the initial stages of new business (TEA10/TEA12)	No	960	1,180
	Yes	252	201
Possesses skills specifically suited for the venture (suskill)	No	387	424
	Yes	825	923
Sees opportunities to establish a business (oport)	No	651	674
	Yes	561	586
Fears failure (fearfail)	No	781	890
	Yes	431	464
Gender (gender)	Female	559	708
	Male	653	673
Occupation (cr_occu)	Employee	791	522
	Self-employed	75	268
	Unemployed	128	233
	Housewife	218	358
Income (crhhinc)	Less than ₡80. 000	96	35
	₡80. 001-₡158. 000	285	176
	₡158. 001-₡241. 000	317	290
	₡241. 001-₡362. 000	279	358
	₡362. 001-₡800. 000	159	334
	₡800. 001-₡920. 000	27	77
	₡920. 001-₡1. 200.000	29	60
Region of residence (cr_reg)	More than ₡1. 200.000	20	51
	Central	759	898
	Chorotega	121	147
	Brunca	98	86
Educational level (crreduc)	Another	234	250
	No formal schooling	15	13
	Incomplete Primary	147	96
	Completed Primary	351	354
	Incomplete Secondary	298	387
	Completed Secondary	194	253
	Incomplete University	95	127
	Completed University	79	119
	Incomplete Master/ Postgraduate	5	4
	Complete Master/ Postgraduate	13	9
Technical/paraprofessional	15	19	

Source: Own elaboration with data from the APS survey. GEM-Costa Rica Consortium.

The equation for the estimation of the models is presented below:

$$\text{Prob (TEA = 1)} = F(z)$$

$$\begin{aligned} = F & (\beta_0 + \beta_1(\text{suskill}) + \beta_2(\text{opport}) + \beta_3(\text{fearfail}) + \beta_4(\text{gender}) \\ & + \beta_5(\text{age}) + \beta_6(\text{cr\_occup}) + \beta_7(\text{crhhinc}) + \beta_8(\text{cr\_reg}) \\ & + \beta_9(\text{crreduc})) + \varepsilon \end{aligned}$$

$$\varepsilon \sim N(0,1)$$

### **III. Results**

The estimated coefficients according to the year of each variable and the levels of statistical significance (in parenthesis) are presented in Table 3.1. This section discusses the marginal effects of control and statistically significant variables. Appendix 1 shows more details for each variable category.

**Table 3.1. Probit model results (dependent variable: TEA. 2010-2012)**

<b>Variables</b>	<b>2010</b>	<b>2012</b>
<i>Constant</i>	-1.33 [*]**	-1.234 [*]**
<i>Suskill</i>	0.662 [*]**	0,580 [*]**
<i>Fearfail</i>	-0.202 [*]**	-0.39 [*]**
<i>Opport</i>	0.519 [*]**	0.267 [*]**
<i>Gender</i>	-0.366 [*]**	0.161 NS
<i>Age</i>	-0.006 [*]*	-0.007 NS
<i>Occupation</i>	Control: Part or full time	
<i>Self-employed</i>	0.676 [*]**	1.012 [*]**
<i>Unemployed</i>	-0.235 NS	-0.504 [*]**
<i>Housewife</i>	-0.418 [*]**	-0.396 [*]**
<i>Region</i>	Control: Central	
<i>Chorotega</i>	0.619 [*]**	-0.335 [*]**
<i>Brunca</i>	0.325 [*]*	-0.291 NS
<i>Another</i>	0.051 NS	-0.015 NS
<i>Income</i>	Control: Less than c80,000	
80,001 – 158,000	-0.484 [*]**	-0.06 NS
158,001-241,000	-0.328 [*]*	-0.221 NS
241,001-362,000	0.006 NS	-0.092 NS
362,001-800,000	0.456 [*]**	-0.009 NS
800,001-920,000	0.553 [*]*	0.307 NS
920,000-1,200,000	1.168 [*]**	0.029 NS
Over 1,200,000	1.092 [*]**	0.318 NS
<b>Variables</b>	<b>2010</b>	<b>2012</b>
<i>Education</i>	Control: Non formal education	
<i>Incomplete primary</i>	0.02 NS	-0.839 [*]*
<i>Complete Primary</i>	0.371 NS	-0.397 NS
<i>Incomplete Secondary</i>	0.2 NS	0.006 NS
<i>Complete Secondary</i>	0.249 NS	-0.169 NS
<i>Incomplete University</i>	0.112 NS	-0.274 NS
<i>Complete University</i>	-0.126 NS	-0.119 NS
<i>Master's degree /Incomplete graduate</i>	-0.473 NS	NA NA
<i>Master's degree /Full graduate</i>	-1.593 [*]**	-0.639 NS
<i>Technical /Paraprofessional</i>	-0.201 NS	0.312 NS
Pseudo R <sup>2</sup>	18.43%	27.59%

Note: [\*]\*\*] 5% significance, [\*.\*] 10% significance to, NS not significant, NA not available.

Source: Own elaboration with data from the APS survey. GEM-Costa Rica Consortium.

Skills variable (suskill) shows a positive influence over the TEA and with a statistical significance of 5% for both years. This provides empirical evidence supporting skills' self-perception as a relevant factor determining entrepreneurship in Costa Rica. This seems to indicate that the entrepreneur is more likely to proceed with the venture when he has already made an effort to acquire skills, empowering him to carry out the project. The marginal effect corresponds to 16 p. p. (percentage points) and 8.76 p.p. for those years.

Likewise the “fearfail” variable that measures fear of failure also resulted in a high level of statistical significance (5%), and negatively affects the probability of an individual starting a venture; the result is consistent for both years. Marginal effects are - 4.88 p.p. in year 2010 and - 5.89 p.p. for 2012.

The variable that captures the perception of favorable market opportunities ("opport") was in all cases (and for both years) significant (5%). The effect on the decision to start up a new business is 12.54 p.p. in year 2010 and 4.03 in 2012.

With respect to ("gender"), it is significant only in the estimate for 2010 (with a negative sign). The survey assigns 0 to females and 1 to males. For this year, being a male reduces the probability of being an entrepreneur (with respect to the control state: female) in - 8.84 p.p. For the year 2012 there is a change in sign, however the variable is no longer significant (even at a 10%). Table 3.2, evidences that there were changes in the composition of the variable from year to year, which helps to explain the lack of significance and change of sign in 2012.

**Table 3.2 Composition comparison for the variable gender (2010 and 2012)**

		Gender					
		2010			2012		
Involved in total entrepreneurial activity (initial stages) (TEA)	No	Woman	Man	Total	Woman	Man	Total
		435	525	960	702	611	1,313
	77.82%	80.40%	79.21%	89.09%	79.87%	84.55%	
	Yes	124	128	252	86	154	240
		22.18%	19,60%	20.79%	10.91%	20.13%	15.45%
Total	559	653	1,212	788	765	1,553	

Source: Own elaboration with data from the APS survey. GEM-Costa Rica Consortium.

Note that in 2010 the number of women claiming they were not entrepreneurs was 77.82% of the total women total sample, and 89.09% for 2012. This represent an increase in the amount of not entrepreneurial women in the sample of 11.27 total percentage points from one year to another. The results suggest a clearly established pattern in the type of influence gender has on Costa Rican entrepreneurs. This is a relevant result for policymakers, and promotes further investigation on this issue, particularly when governments are devoting resources to enhance entrepreneurial activities led by women.

The "age" variable was significant (10%) for the year 2010, with a negative sign and a marginal effect of - 0.15 p.p. With respect to the type of occupation, "cr\_occu" is significant at the 5% level for the self-employed category (and both years), with a positive sign and an associated marginal effect of 22.18 p.p (2010) and 26.72 p.p. (2012). The "unemployed" category is significant only for the year 2012 (using a 5% significance) with negative sign and a marginal effect of - 5.2 p.p. regarding the category "housewife", it appears to be significant for both years (at the 5%) with negative sign and marginal effects of - 8.61 p .p. and - 4.42 p .p., respectively.

Regarding the region, "cr\_reg" is significant (5%) for both years and for the Chorotega area but changes the sign: in 2010 is positive and in 2012 it has a negative marginal effect (17.97 p.p and - 4.34 p.p respectively). In addition, in the estimation for 2010 the Brunca region is also significant (at 10%) with a positive sign and a marginal effect of 8.36 p.p.

For 2010, the relatively lower income, contained in the variable "crhhinc" was significant but with a negative influence, 5% for the range of "c80,000 to c158,000" with a marginal effect of - 9.88 p.p, and with a 10% significance for the range "c158, 001 to c241,000" with a marginal effect of - 7.28 p.p. At the same time, the following levels of income show significance at the 10% level: "c362, 001 to c800, 000" with a marginal effect of 14.25 p. p, "c920, 001 to c1, 200, 000" with a marginal effect of 41.91 p.p and "above c1, 200, 000" with a marginal effect of 38.95 p.p, p and "of c800, 001 to c920, 000" with a marginal effect of 17.8 p.p. However, for the 2012 estimation, no income range was significant.

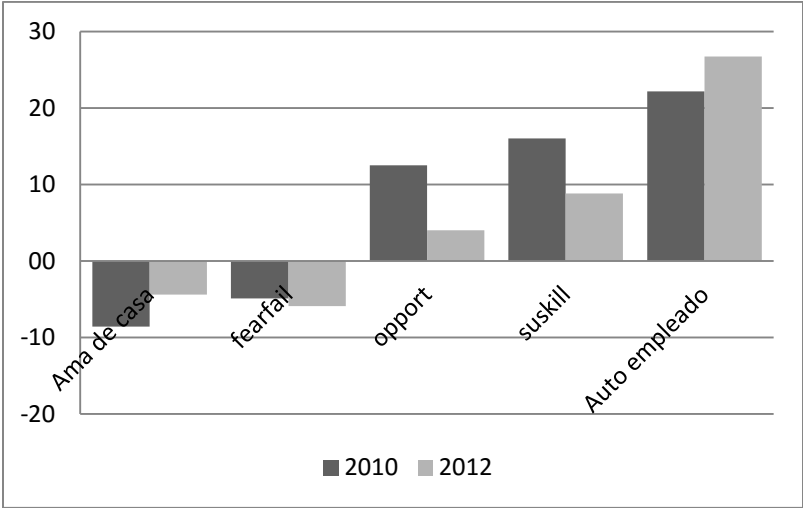
The estimate suggests that the level of education, which is measured through "crreduc", exerts a statistically significant influence for the year 2010 in the category "Full

master/graduate" (at the 5% level) with a marginal effect of - 11.63 p.p. For the estimation of 2012, the category "Incomplete elementary" is significant at 5% with a marginal effect of - 9.9 p.p.

If all the variables are set to their means, the probability of being an entrepreneur for 2010 was 15.83% and 8.17% in 2012. The pseudo R<sup>2</sup> is 18.43% for 2010 and 27.59% for 2012.

Appendix 1 presents the marginal effects results for all the variables. The summary of the significant marginal effects that are consistent (year-over-year) in the direction of their influence (sign) is presented in chart 3.1.

**Graph 3.1. Marginal effects of the significant and consistent (year-over-year) regressors (at least to 10%) (in percentage points)**



Source: Own elaboration with data from the APS survey. GEM-Costa Rica Consortium.

Case analysis also shows interesting results. When estimating the values for the individual with the highest chances to become an entrepreneur, this individual has a favorable perception of skills and market opportunities, does not fear failure, is a male close to 37 years old, self-employed, and who started a venture in the Central Region. He has a monthly income greater than ₡1,200,000 (approximately US\$ 2,400); and has technical education. The model indicates that he has a 87.75% of being a entrepreneur.

At the same time, an individual with a favorable perception of skills and market opportunities, without fear of failure, female, close to 37 years old, self-employed, which lives in the Central Pacific-Brunca region, with an income between  $\text{C}\$80,001$  and  $\text{C}\$920,000$ , and with a master's degree, will have a chance to be an entrepreneur of 70.67%. This probability is relatively high if compared to the average.

An individual with favorable perception of skills and market opportunities, without fear of failure, of feminine gender, close to 37 years old, self-employed, who lives outside the Central, Brunca or Chorotega regions, with income between  $\text{C}\$241,001$  and  $\text{C}\$362,000$ , and with the degree of secondary education complete has a probability of being an entrepreneur of 41.13%.

Results show that if the individual does not have favorable perception of skills and market opportunities, has fear of failure, is a female, close to 37 years old, self-employed, lives outside the Central region, with an income between  $\text{C}\$920,000$  and  $\text{C}\$1,200,000$ , and with the degree of complete secondary education. This individual will have a chance of being an entrepreneur of just 15.74%.

The above evidence indicates that in Costa Rica, the individuals will have high to medium probabilities of being an entrepreneur if they have a favorable reading of market opportunities, required specific skills and they have no fear of failure. At the same time, if the response to all these questions is the opposite, his/her probability of becoming an entrepreneur it is relatively low.

#### **IV. Discussion and conclusions**

The fact that the variable "suskill" was statistically significant supports the argument that self-perception of the person's own skills (acquired previously and needed to start a given business) is a highly relevant factor driving entrepreneurship. Empirical evidence suggests that the individual will have a relatively high probability of starting an entrepreneurial activity if she perceives herself as being above a given confidence threshold in terms of her skills. That is, not only individual thinks she has the capabilities but she relies on them, which is very consistent with the issues raised by Ventakatamaran (1997), and the argument



of knowledge brokers from Hayek (1945) and Arrow (1974). These results are also consistent with the ones proposed by Löfstrom (2009).

In Costa Rica, programs to promote entrepreneurial culture rely on teachers' initiatives in the formal education system and the mainstreaming of entrepreneurship in the different curricula. However, given the high statistical significance and consistency the variable *suskill*, that promotion of "entrepreneurial culture" could be more effective if it considered aspects that enhance the specific skills and technical capabilities of enterprises according to each sector.

Similarly, fear of failure reduces the probability of an individual starting a venture. This is consistent with the theory proposed by authors like Cantillon (1725) and Say (1803), and projects a difficult scenario given that risk aversion varies from one individual to another. However, state institutions could advertise a positive image of the Costa Rican entrepreneur, where "success" is not perceived as an immediate result and associated with his first entrepreneurial venture; but rather a process of effort and learning, involving adjustments which may eventually allow your product to reach the market. The high statistical significance of this variable is related to the issues raised by Vereshchagina & Hopenhayn (2009) about the importance of uncertainty on the entrepreneur's decision making.

It would be useful in future versions of the APS to include a measurement of the intensity of fear instead of keeping it as dummy variable (as "fearfail"). This can be done for example, using a scale from 1 to a 100% for example. It is unlikely for an individual to be only either not preoccupied at all or with a maximum fear level. Similarly, it would be important to characterize this risk. That is, to indicate whether it is fear of the associated financial failure; fear of what others say / think of the entrepreneur in case businesses do not thrive, among others.

The consistently high statistical significance and marginal effects of the perception by the entrepreneur of a favorable market environment, indicates that replacing negative perceptions of market opportunities with a positive one would result in a significant increase in the number of entrepreneurs. This shows that in Costa Rica individuals rely on

their reading of opportunities. In that sense, policies can seek to provide useful and easily accessible information to complement the process of assessing market potentials. The result provides empirical evidence in favor of the self-efficacy hypothesis raised by Krueger, Reilly and Carsrud (2000): high levels of perceived opportunities will result in more entrepreneurial individuals.

As explained in the results section there were changes in the composition of the sample that caused the gender variable to change sign and lose significance in just two years. However, the data shows that there was a decrease in the number of female entrepreneurs, which means that even when in 2010 it Berglann et al. (2009) and Constant (2004) propositions, that is reverted in 2012 and it seems, even when it is not significant that women participate less in entrepreneurial activities.

Despite the various attempts by Costa Rican governments to promote entrepreneurship among women as expressed by policy programs (ie "Costa Rica Embark" and some aspects of the employment policy), empirical evidence suggests that more research on this subject is required. In particular, it would be relevant to analyze why, despite the efforts by public policies that take place in Costa Rica, the rate of female participation in the TEA has not increased.

Unlike the result of Baron and Shane (2008), in which no location has a statistically significant influence, data for Costa Rica suggests that there are specific regions that exert a statistically significant influence (positive or negative) over the TEA. Although this influence consistently from 2010 to 2012, the result is relevant when considering the relative concentration, especially on infrastructure, services, demographic, and technical support centers for entrepreneurs in the Central region as well as higher relative endowment of natural resources (beaches and scenic beauty) and tourist infrastructure (resorts, marinas, coastal national parks) of the Chorotega region. This suggests that entrepreneurship policies should also consider schemes to promote investment atmospheres that take into consideration the particularities of each location. This research does not determine the roots of inter-regional differences; this also opens up an opportunity for further research.

The most important and inter annually-consistent effect in terms of the employment condition is associated to the "self-employed" category. This condition was significant for all models and it increases in about 20 percentage points the probability of being in the TEA. This draws attention to the individual's decision to move from a salaried job to become his/her own boss. Contrary to the results found by Fairlie (2011), in Costa Rica being unemployed reduces the probability of entering the TEA.

When it comes to income, it seems in for the 2010 data that there is a minimum income level below which it is not possible to engage in entrepreneurial activities. In turn, it seems that individuals with relatively high incomes, have an accumulation of capital that facilitates the implementation of firms (Shapiro and Sokol, 1982), which increases the likelihood of starting one, even presenting marginal effects above 50 percentage points in the probability of being a part of the TEA. However, for 2012 this result is not maintained, and the income level does not show statistical significance.

The empirical evidence found, including the importance of cognitive variables (perceptions of specific skills, reading market opportunities and fear of failure) suggests that support policies should be aimed at improving the business environments, in terms of highlighting opportunities and reducing perceived risk.

The level of formal education was not significant, except for the master level but with negative sign on entrepreneurship. This suggests that in the case of Costa Rica formal education is not focused on providing specific skills that empower existing entrepreneurs. This could be due to a relatively low level of technological content and innovation associated with ventures, ventures that could also be little formal knowledge intensive. This is an area that requires further research, since this is a country that has recently shown growth in the field of information and communication technologies (ICT); although not necessarily through new ventures.

Based on the results obtained it could not be argued that public policy should consider a better formal education to promote entrepreneurship. In today's population, formal knowledge is not significant or discourages entrepreneurship. This could be due to the weak link to entrepreneurial processes in most curricula, and the trend among graduates seek paid

positions in established firms instead of starting their own. However, from the perspective of the kind of enterprise that public policy hopes to strengthen in the future, the contents of the most of the formal education programs need to be revised to assess their relationship with the market and start-ups. Particularly those programs that are considered with the greatest potential to generate innovations. This could explain the existence of seed capital funds promoted by the "Costa Rica Emprende" policy which favors entrepreneurship in universities or specialized incubators, where the probability is high of finding academics with new venture ideas. However, the limited availability of resources directed to projects that only require strengthening of specific technical skills should also be reviewed.

The results of this research were presented to government authorities in Costa Rica, and were considered in the entrepreneurship policy. However, due to the decisive influence cognitive factors (self-perceptions) on the decision of starting a business, and complexity associated with these, it is convenient to further research on the role of formal education, technical skills and cognitive aspects in different types of firms or industries. One way is to supplement the survey GEM-Costa Rica with additional questions to shed light on the characterizations of firms; level of innovation, survival dynamics, repetition rates. Also achieving greater descriptive detail of the psychosocial motivators, perceptions of risks and opportunities for entrepreneurs in Costa Rica.

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## Appendix

### Appendix 1. Marginal effects in the alternative models expunging the determinants of entrepreneurship in Costa Rica (2010 and 2012)

Variables	2010	2012
<i>Suskill</i>	0.16	0.0876
<i>Fearfail</i>	-0.0488	-0.0589
<i>Opport</i>	0.1254	0.0403
<i>Gender</i>	-0.0884	0.0244
<i>Age</i>	-0.0015	-0.001
<i>Occupation</i>	Control: Part or full time	
<i>Self-employed</i>	0.2218	0.2672
<i>Unemployed</i>	-0.0535	-0.052
<i>Housewife</i>	-0.0861	-0.0443
<i>Region</i>	Control: Central	
<i>Chorotega</i>	0.1797	-0.0434
<i>Brunca</i>	0.0836	-0.0389
<i>Another</i>	0.0113	-0.0025
<i>Income</i>	Control: Less than c80.000	
<i>80,001 – 158,000</i>	-0.0988	-0.0094
<i>158,001-241,000</i>	-0.0728	-0.0306
<i>241,001-362,000</i>	-0.0016	-0.0139
<i>362,001-800,000</i>	0.1426	-0.0014
<i>800,001-920,000</i>	0.178	0.0603
<i>920,000-1,200,000</i>	0.4191	0.0048
<i>Over 1,200,000</i>	0.3895	0.0629
<i>Education</i>	Control: Non formal education	
<i>Primary incomplete</i>	0,0041	-0,1000
<i>Primary complete</i>	0,0903	-0,0626
<i>Secondary incomplete</i>	0,0444	0,0011
<i>Secondary complete</i>	0,0569	-0,0307
<i>Incomplete University</i>	0,0237	-0,0467
<i>Complete University</i>	-0,0235	-0,0224
<i>Incomplete master 's/postgraduate</i>	-0,0699	ND
<i>Full master/graduate</i>	-0,1163	-0,0860
<i>Technical/paraprofessional</i>	-0,0354	0,07456

Source: Own elaboration with data from the APS survey. GEM-Costa Rica Consortium.