Chapter 12

Management Challenge in the Entrepreneurial University and Academic Performance

Luis Antonio Orozco, Jeimy Paola Aristizabal and José Luis Villaveces

Additional information is available at the end of the chapter

http://dx.doi.org/10.5772/intechopen.71754

Abstract

Universities with a market orientation, through transfer of technology, innovation, and entrepreneurship activities, corresponding to what is known as "the third mission," face several managerial challenges and tensions, among them, organizing professors in terms of activities and incentives, to balance their dedication to teaching, research, and the marketing of knowledge. In the aim to understand the open and equal access to learning in school management, orientation toward the third mission of some professors may have an impact on their students' academic performance insofar as they may put greater or lesser effort in educating. Literature and empirical studies evaluating the relationship between market orientations through entrepreneurship with the academic quality of professional education are scant. Using 114 higher education institutions (HEI) in Colombia as a sample and logistic and Poisson regression, we found that universities with higher undergraduate education quality results also have higher participation in entrepreneurial contests in a significant relationship. This suggests that universities that have good quality in academic education of students in their professional training are best prepared to assume the third mission.

Keywords: university, entrepreneurship, undergraduate, academic performance, faculty time, Latin America, Colombia

1. Introduction

It is well known that universities train students, do research, and have been incorporating third mission activities aimed at contributing to the economic development through innovation, technology transfer, and entrepreneurship. National policies, changes in legislation, university reforms [1, 2], investment funds for entrepreneurship [1, 3], financial groups [4, 5],

university entrepreneurship [6, 7], as well as the international university rankings [8] influence in the orientation of universities toward the entrepreneurial model.

As predicted by Etzkowitz and Leydesdorff [9], the entrepreneurial university model imposes itself as a global imitation phenomenon in which market-oriented universities become gradually involved [1, 10]. This seems to be an unavoidable trend, given the legitimization of higher education as the agent of national innovation systems, changes in copyright legislation, and the financing dynamics of innovation and entrepreneurship [11, 12].

The third mission has meant the managerial reorganization of university resources to create capabilities that enable the generation of transferable knowledge, especially in the creation of new organizations with which their value can be exploited. However, the incorporation of this third mission could represent major challenges for university management due to the need to strike a balance between teaching, research, and the marketing of its results [13].

The adoption of the entrepreneurial university model could involve risks and challenges for the management of higher education institutions. Faculty members must make exchanges between the amounts of time devoted to improve teaching, conduct research, and perform the required activities to comply with the third mission [12, 14]. Although universities have established policies to balance faculty members' time for the performance of different activities [15], we have found no empirical evidence of any assessment of the relationship between university results in entrepreneurship and those obtained by students in terms of academic quality.

Literature on entrepreneurial university can be summarized in four main topics: research and entrepreneurship, productivity of technology transfer offices, business start-up, and environments that foster network development for innovation, technology transfer, and entrepreneurship [16]. However, empirical research involving the role of teaching and its results in entrepreneurial universities is not common and is rarely used in discussions that have been conducted on the tensions between teaching—especially at the undergraduate level—and academic entrepreneurship.

As stated by Kitagawa [17], "further studies are needed which focus on the ability of different universities to deliver areas of expertise through various internal allocations of resources for teaching, research and commercializing their research." Likewise, Sam and van der Sijde sustain that "It is suggested that a review about the trends of universities in developing countries toward entrepreneurial universities be conducted for better understanding. Similarly, an empirical study is also needed to add to the existing body of knowledge due to the limited literature on entrepreneurial universities in developing countries" [18].

Actually, CINDA (Centro Interuniversitario de Desarrollo), RedEmprendia, and Universia launched the book *La transferencia de I+D, la innovación y el emprendimiento en las universidades. Educación superior en Iberoamérica - Informe 2015* in which Colombia has a chapter that presents the first landscape for the third mission in the higher education system [19].

http://dx.doi.org/10.5772/intechopen.71754

This research extended the overview presented in Colombian chapter analyzing, in the light of the open and equal access to learning in school management, if higher education institutions that present better results in the 2013 Higher Education Quality State Examination—Saber Pro—of the Instituto Colombiano para el Fomento de la Educación Superior (ICFES) are well prepared to present better performance in entrepreneurship activities from 2004 to 2013.

This chapter has three sections: the first chapter presents a review of the literature on the entrepreneurship university and the tension between teaching and the activities of the third mission to propose the research question; the second section presents the methodology; and the third part presents the results, discussion, and conclusions.

2. Development of the entrepreneurial university model in Latin America and Colombia

The entrepreneurial university has its foundations on the activities to commercialize the new knowledge to steer economic growth [9, 11]. Universities introduced activities for knowledge transfer like counseling; contracted training and research, patenting, and licensing; development of infrastructures like technology parks; and promote the creation of new enterprises [12, 18, 53, 54].

However, in emerging economies like Chile [20] and Croatia [21], universities need much to be done to articulate resources for the development of the capabilities required for a better market orientation. As stated by Arocena and Sutz, "the Latin American idea of university highly values an active institutional compromise with social progress. (…) Consequently, many people inside and outside the university expect research groups to co-operate with different actors in tasks related to solving collective problems" [22].

Decisions on the adoption of entrepreneurial university in Latin America are not only the exclusive property and interest of universities but also concern the institutional pressures of their surroundings [20, 22, 24]. In addition to the global tension of the market orientation, to the detriment of the quality and autonomy of the university in Latin America [23, 25, 26], and to the pressure for privatization in the production of knowledge [20, 22], there is "a regionally specific tension between two notions of external involvement (…) fostered by the rise of a new set of market-dominated relations with governments and entrepreneurs" [22].

The market-oriented innovation and entrepreneurship university model are close to neoliberalism, emphasizing market power as the engine for development [1, 10]. As pointed out (see [27]), as negative aspects of this university model for Latin America, that education is considered as a good one buys in the market and that in a competitive environment, the university must be a profitable entity demanding the reduction of free services.

As Arocena and Sutz argued in Latin America:

since market logic decided which courses were given or not, public universities were pushed to act as 'educational enterprises' and it is said that their sense of mission was deteriorated A similar trend has been observed in Colombia: exaggerated adaptation to market demands has negatively affected knowledge generation as a university function. Due to the usually weak market demand for advanced knowledge, an 'entrepreneurial university' in Latin America will probably be asked to perform much less creative activities than in highly industrialized countries [22].

Buchbinder from the context of North America and Europe [28], and Orozco from Latin America [26], agree on the fact that this market-oriented research responds more to the production of merchandise quality goods than to social knowledge enabling nations to become the solution of problems such as inequity, employment, and poverty in productive systems.

The market orientation leaves education and research subordinated to the interests of those who finance and buy university services [27, 28]. Thus, market-oriented universities become mere corporate education and research units, whose purpose is the creation of knowledge to be exploited with private profit, turning the university into "an enterprise having as the main objective the production of profits" [27].

The higher education system in Colombia is ruled by Law 30 of 1992. This frame stated that institutions must provide education, research, and other activities to contribute in socioeconomic and environmental development. Law 1014 of 2006 stated that higher education system must provide teaching in entrepreneurship without considering instruments to promote university's R&D activities to create knowledge-based firms [24]. Only the most important universities move toward the third mission and establish activities and infrastructure to promote entrepreneurship [19].

Isomorphic pressures steer the introduction of policies and incentives to promote entrepreneurship. However, the general results are scant and show several gaps according to performance of higher education systems in countries like Spain, Brazil, and Mexico [29]. Colombia has been debating the model of university, and several challenges cannot be assumed because of restrictions in funding, statutory missions. and activities that remember the tension between teaching and the third mission activities [19].

It has been discussed how the urgency of pertinence and satisfaction of market demands can go to the detriment of the basic concept of university and of the quality of its faculty members and their scientific teaching, if an adequate balance between the different university activities is not achieved [23, 26, 30]. In other words, if a university does not achieve better performance in teaching, there will be no legitimate capacities to evolve toward the third mission.

According to OECD, "The examination system run by the Instituto Colombiano para la Evaluación de la Educación (ICFES) – which measures students' abilities when they enter and leave tertiary education – puts Colombia in a position to be a global leader in both the measurement of value-added in tertiary education and, perhaps more importantly, the use of assessment findings for tertiary quality improvement" [31].

http://dx.doi.org/10.5772/intechopen.71754

The examination of higher education quality—Saber Pro (formerly known as ECAES) exam—in the country is compulsory by Act 1324 of 2009 and is designed by the academic community in keeping with the "training by skills" policy deemed basic for the future professional education graduates. This examination evaluates civic skills, written communication, critical reading, quantitative reasoning, and English language. It also evaluates knowledge on the corresponding professional training disciplines.

Then, the evaluation of teaching could be done by using the Saber Pro examinations as a result of the achievement of the first university mission defined in training and formation of human capital in the educational activities.

3. Tensions between teaching and entrepreneurship

There are several tensions in the entrepreneurship-oriented university and the development of the teaching activity. The most important is the allocation of the professors' time. It is warned by Gibbons that orientation toward the entrepreneurial university model "can also be destructive of academic work, reducing research to consultancy, subordinating academic teaching to low level repetitive performance for financial return and encouraging an approach to university management based solely on financial criteria" [32]. Likewise, Wright and colleagues stated that "academic entrepreneurs, who are expected to spend time commercializing their IP (intellectual property), will not be able to dedicate the same amount of time to the traditional areas of teaching, research and administration" [14].

Research universities have policies that establish the time assigned to teaching, to research, and to other institutional development activities that include administrative tasks, participation in meetings, and provision of university outreach services [15] that can include entrepreneurship. Results, as evidence in the case of Los Andes University in Colombia, are positive regarding research [33].

It is also essential to admit that elite universities in the world have changed from a collegiate government model, based on academic freedom with lack of commercial interest for the progress of science, to a corporate one, based on profit and on activities that benefit trade, corporations, and political interests [28, 34, 35].

It is stated by Ridgeway that "the professor entrepreneurs, who dart back and forth from university to government to business, help shape corporate structures and policies" [35]. Likewise, "the development of entrepreneurial professors with equity in private companies and large outside funding tends to relocate power away from the departmental level to the center and to the entrepreneurial professor who often has control over large sums of money" [28].

As summarized by Gibbons "the university has moved much closer to an industrial pattern of organization with senior management teams and strategic plans, line managers, and cost centers. Just as universities have moved closer to a corporate model of management […]" [34].

This reduces the traditional democratic collegial management of universities and their autonomy to make academic decisions in the creation of knowledge and in rigorous education away from financial efficiency [28].

The market orientation generates imbalances to provide quality training in Latin America [27]. In this line of thought referring to the market-oriented universities of Japan and the United Kingdom, Yokoyama stated that "there could be conflict between entrepreneurial and traditional collegial culture" [1].

However, the urge to commercialize research exploiting it through the creation of new organizations implies admitting the fact that professors, encouraged by the creation of personal benefits including personal recognition and new financial resources [14, 29], can lower their efforts in teaching. Devoting time to innovation and entrepreneurship can result in a reduction of the educational capabilities, given that professors can lose interest in innovation pedagogy or in reshaping and updating their teaching methods and courses and in the attention given to their students.

López-Segrera [27] indicated that low wages of university professors in developing countries affect academic quality in universities. This could influence in the decision of professors to opt for the entrepreneurial approach as a means to improve their income, as has been the case in Chile [20], at the expense of educational quality [28].

As sustained by Fuller, teaching deprives the researcher of the advantage on a specific knowledge by giving others the possibility of using that knowledge to explore or exploit it. There can be conflict of interests to the extent that professors involved in the development of innovation and entrepreneurship projects may avoid sharing their knowledge and progress with their students to preserve their priority, excluding them from a wider and rigorous education process [36].

As shown by Stephan, in the United States, professors involved in innovation activities avoid sharing their research outcomes, an attitude that can generate negative impacts in students' education [37]. In a similar way, students avoid sharing the full progress of their work and their findings with their professors for fear of losing their advantage to exploit it when they graduate or when they leave the university. In an interview to an entrepreneurial student of the Universidad Distrital in Colombia, evidence of both cases can be found.

There can also be resistance in university faculty members concerning the activities required to comply with the third mission. Not all professors are convinced that becoming involved in entrepreneurship is valuable for their performance and that of their students [12]. Professors who consider science and teaching as a public service, in the Mertonian spirit, can oppose the merchandizing and privatization of knowledge for economic exploitation, as described by Bönte in the case of the Max Planck Society in Germany [29]. Therefore, these professors can contribute to have higher results in universities regarding education, to the detriment of the universities' performance in innovation and entrepreneurship.

Another point of tension is found in the relationship of university management and professors for innovation and technology transfer. In Argentina, Vaccarezza [38] revealed the tensions between university researchers and university managers in the commercialization of research results. Researchers expect the university to develop organizational structures for the sale of technologies, while university management expects researchers to conduct the commercialization. In a similar manner, in the Colombian case, research groups are aware of the high costs in the coordination process with the university management, and these relationships hamper their work dynamics as agents of the national innovation system. This increases the complexity to time allocation for teaching and to the participation of students in the research work due to the arrangements this may require [39].

Another issue-generating tension in the professors' activities is concerning performance assessment. Usually, indicators on teaching, research, and other university activities are separately developed in the OECD countries [36], and there is no standard to assess results concerning entrepreneurship. Baseline indicators to obtain a chair and tenure at the university are linked to publication (and citation) records, as well as research funding and teaching skills [14]. Thus, professors face the dilemma regarding the objective of their effort, given differences in performance assessment in the third university mission.

The transition from Model 1 to Model 2 of knowledge production in universities has been discussed in Latin America, finding that the academic evaluation system is still linked to Model 1 [20, 40], and taking risks for research and entrepreneurship is something only few professors are willing to do, as seen in the case of Chile [20].

On the other hand, Clark's work [41] shows how the entrepreneurial university model has reenergized education in the case of European universities. Clark shows that the creation of entrepreneurially oriented interdisciplinary academic research groups involving students offers new spaces fostering quality education. Student's life improves as professors devote more time to them for collective creation, while students improve their skills and capabilities [41].

The creation of academic research groups involves professors and students in the development of new knowledge in a learning environment, understanding that the present role of professors differs from the traditional one, which is centered in the professor [41]. Present student-centered teaching models foster construction of knowledge instead of having just an information provision base [42].

European university cases described by Clark show that the adoption of the entrepreneurship university model generates synergies between professional training, research results, and entrepreneurship [41]. As stated by Etzkowitz and colleague [43]:

"Teaching is the university's comparative advantage, especially when linked to research and economic development. Students are also potential inventors. They represent a dynamic flow-through of 'human capital' in academic research groups, as opposed to more static industrial laboratories and research institutes. Although they are sometimes considered a necessary distraction, the turnover of students insures the primacy of the university as a source of innovation."

The activities of universities in technology transfer [37], innovation, and entrepreneurship constitute an advantage for students given that it improves the efficiency of their involvement with industry dynamics as a result of a better academic training to respond to the challenges of economic development. We also know that the time devoted by professors to postgraduate teaching in the United States (especially with postdocs, with which progress in research is made) has a positive relationship with university entrepreneurship in the field of health care [44].

Latin American university progress is being made in the creation of interdisciplinary research groups and that Orozco stated:

we are witnessing, in a word, "a world market of knowledge" with characteristics quite different to those shown by amor sciendi, at the beginning of the institution of universities, when they moved on the field of knowledge on purely academic pathways. That being the case, universities are in need of redefining their relationships vis-à-vis knowledge and the use of the human talent they possess. [23]

4. Characteristics of entrepreneurial universities

Although universities converge in market orientation [1], there is no one single model for the entrepreneurial university [18, 44]. There are differences in terms of years of existence, size, full-time professors, and disciplines covered by universities. Likewise, research results, especially those protected by industrial property rights, the existence of a technology transfer office (TTO), as well as the public or private nature of the university, are characteristics that could differentiate entrepreneurial universities.

Size is an important variable since large universities have more probabilities of offering better entrepreneurial results given that they have more students and faculty members to become involved in this activity. In addition, the academic results of students may be more scattered to the extent that since the higher the number of students the greater the diversity of results. There is no relationship between faculty size of 120 universities of the United States, listed in the Carnegie Classification System, and university entrepreneurship, which would perhaps lead us to evaluate this variable in the Latin American context [45].

The years of existence of the variable reflect the path of universities, giving an idea of their prestige and capability to generate good performances. Universities of long tradition have developed accrued capability for excellence in education as well as for contributing to science and innovation systems [46]. The study conducted on 20 elite US universities, almost all of them founded in the nineteenth century, leads to the deduction that the path influences technology transfer and entrepreneurship [47]. Undoubtedly, models such as the Massachusetts Institute of Technology (MIT), given their history and prestige, constitute points of reference for countries as Colombia [48].

The public or private nature of the universities is also a relevant matter vis-à-vis the market orientation. Public universities face restrictions and resistance to develop knowledge

commercialization activities, while private ones can profit from their autonomy to develop the third mission [10, 22]. Therefore, this variable can influence the connection between market-oriented activities and academic quality, as sustained in the case of Management Schools in Ibero-America [49].

The number of industrial property registrations is a key variable since it determines the invention capability of universities. It is the indicator of a university's potential to generate innovations that can be applied in the creation of enterprises that will exploit their commercial value. As indicated in the American universities included in their sample, patenting is a highly significant variable for the creation of enterprises and also the size of TTO [47].

However, other US studies indicate that having industrial property registrations does not necessarily mean more academic entrepreneurship [45, 50]. In the United States, academicians in the life science field are more prone to do business based on patenting, while in social sciences, like management, entrepreneurs are focused on the creation of consulting and industrial advisory firms that do not require patents [51]; thus, this can have an impact on the scope of disciplines of a university.

Therefore, the number of schools in universities can affect both the entrepreneurship and the students' results. This will affect the possibility of creating multidisciplinary research groups [52]. As stated by Bernasconi, there is an imbalance among the different schools in the adoption of the entrepreneurial university model [20]. According to their discipline, some schools find it easier to adopt the entrepreneurship model [51]. Social science professors tend to be critical of the entrepreneurial model, while this is not the case with doctors and engineers [12].

Finally, as we discussed above, full-time professors can neglect teaching when centering on research and knowledge marketing activities. On the other hand, professors can improve their teaching activities through entrepreneurship by transmitting knowledge and experiences valuable for undergraduate students. The main result of teaching activities is the student performance, and the most important indicator to entrepreneurial activity is the participation on awards and the promotion of new firms in the market.

Therefore, the research question is what is the relationship between entrepreneurship orientation (EO) and the results obtained by graduating students in the Saber Pro exam in Colombia?

5. Methodology

A sample of 114 higher educational institutions (HEI) out of a total population of 288 registered at the Ministry of National Education of Colombia in October 2013 was obtained. They were selected for having presented the proof Saber Pro in 2013 and have complete and consistent information about professors. The result of the 2013 Saber Pro exam was obtained for each university in the sample from ICFES database.

We used the correlations and logistic and Poisson regression analysis to assess the relationship between the variables of this study as shown below. To evaluate the asymmetric distribution of zeros in a dependent variable, we used logistic regression to perform data with zero and one, and the Poisson distribution to analyze count data higher than zero. The statistical tests for the models are presented in the annex.

5.1. Dependent variable

Entrepreneurship orientation (EO): the number of participations of each university in entrepreneurship contests conducted by the Ventures group; the Innova price of the Ministry of Commerce, Industry, and Tourism of Colombia in the entrepreneurial university category; and the "Emprendimiento, Ciencia e Innovación" Santander prize from 2004 to 2013.

5.2. Independent variables

Quality of education (QE): the average of results obtained by universities in the 2013 Saber Pro examination, per program, and general skills test.

Total industrial property (IP): the sum of industrial designs and patents granted or pending at the Superintendency of Industry and Commerce (SIC) and the World Intellectual Property Organization (WIPO). We obtained intellectual property registration according to the database of the Superintendency of Industry and Commerce (SIC) from Colombia and of the World Intellectual Property Organization (WIPO) for each HEI.

Technology transfer office (TTO): according to the survey developed by CINDA, RedEmprendia, and Universia [19], we obtained for each university the existence of a TTO.

Total professors (TP): the number of professors reported by HEI in 2012 to the SNIES (National Information System of Higher Education in Colombia).

5.3. Control variables

Years of existence (Y): the years between the foundation of each HEI and 2013. The year of foundation was obtained from each institutional webpage.

Size (S): the number of students according to SNIES in 2012 for four intervals to which the following values were assigned: less than 5,000 students (1); 5,000 to 11,999 students (2); 12,000 to 29,999 students (3); and 30,000+ students (4). This classification is used the QS World University Ranking.

Focus (F): the number of faculties or schools per university, classified in four categories according to the QS Ranking, thus: less than two schools with programs focused on two or less areas of knowledge (1); more than two schools (2); natural sciences, social sciences, and engineering schools (3); and universities that, in addition to the abovementioned schools, have a School of Medicine (4).

Nature of the educational institution (N): public official universities were assigned the value of 0, and private universities were assigned the value of 1.

6. Results, discussion, and conclusions

Table 1 shows that for each ten HEI there are 79 entrepreneurial activities. The mean is very low due to high number of zero in EO. Seventy-five HEI do not present EO. According to ICFES, in QE performance below 9 is considered as very low, and over 11 the results are considered excellent. Then, on average, the sample shows 10.13 that is defined as a regular result. The standard deviation of EQ means that the sample presents very regular results in Saber Pro exam.

Applying Pearson correlation (**Table 2**), the relationship between dependent and quantitative independent variables is positive at $p < 0.05$. Then, the increases in independent variables are related to increases in EO. The results indicate the importance of these features to improve entrepreneurship results. This is consistent with what is seen in elite universities as can be deducted from the O'Shea and colleagues study [47], where accrued capability in size, years of existence, and patenting is significantly related to academic entrepreneurship.

The logistic and Poisson regression presented in **Table 3** shows that QE is significant at $p < 0.01$ in Model 1, performed by logistic regression for HEI. The second level is performed by Poisson distribution of the regression in Model 1 for HEI that does have

	Mean	Standard deviation
EO	0.7895	1.7522
TP	5028	5555.529
QE	10.13963	0.4237
Size (1)	47	
Size (2)	43	
Size (3)	20	
Size (4)	4	
Focus (1)	7	
Focus (2)	26	
Focus (3)	62	
Focus (4)	19	
Nature: Private	82	
Nature: Public	32	
Y	56.54	58.257
TTO_Yes	47	
TTO_No	67	
IP	3921	11.7059

Table 1. Descriptive statistics.

	EO	TP	QE	Y	IP
EO	—	0.5178210	0.5796877	0.3607961	0.5807665
TP	0.5178210	—	0.2868203	0.5250827	0.6215135
QE	0.5796877	0.2868203	—	0.3334894	0.3767650
Y	0.3607961	0.5250827	0.3334894	—	0.2261286
IP	0.5807665	0.6215135	0.3767650	0.2261286	—

Table 2. Pearson correlation.

entrepreneurial activities; the QE is positive and significant at $p < 0.05$. In Model 2 we included TP, and it is significant at $p < 0.10$ for $EO > 0$. Then, more TP increases the odd of the engagement of HEI in entrepreneurial activities. In Model 3 we include TTO and IP. The results indicate that QE remains as an explanatory variable for EO in the logistic regression. In the case of Poisson model, the results indicate that QE and IP are significant at $p < 0.05$ and TP at $p < 0.10$.

Results mean that universities with good academic performance can undertake new tasks, like those of the third mission in terms of patenting and entrepreneurial activities without this having any noticeable effect in their academic rating. It could seem then that HEI in Colombia do not betray their original idea when conducting entrepreneurial activities. Having or not a TTO does not imply that HEI present more entrepreneurial activities. As found, HEI are trying to organize TTO not only for conviction but also for external environmental pressures [19]. The number of professors, the number of schools, and the size in terms of the number of students do not present a significant relationship, as could be expected with the argument of much is better. Then, no matter if a HEI is huge or small, if they reveal good QE, they also tend to present activities in EO.

In the aim to understand the open and equal access to learning in school management, the market orientation focused on innovation and entrepreneurial activities could imply less effort in training and education in undergraduate programs or could be an opportunity to improve learning with the involvement of students and professors. Debate on classical university model against entrepreneurship university model is a significant feature in the higher education system in Latin America [20, 22, 25]. Particularly, there is a risk that demands for commercialization of knowledge and social pertinence can lead universities away from their quality ideal of their traditional mission [23, 25, 27].

The regression results presented here support the adoption of the policies suggested by UNESCO in Budapest Declaration in 1999 for higher education. This shows that universities are capable of being involved in academic entrepreneurship while generating synergies with the professional education that constitutes the basis of their mission.

On the evidence presented here, and from the viewpoint of universities in the Colombian higher education system, we can suggest that a higher participation in academic entrepreneurship contests has fostered the creation of adequate spaces for improving the

		Model 1				Model 2				Model 3			
		Estimate	**Std error**	**Pr(>|z|)**		**Estimate**	**Std error**	**Pr(>|z|)**		**Estimate**	**Std error**	**Pr(>|z|)**	
Logistic model	(Intercept)	−23.8903	8.7349	0.0062	**	−22.7400	8.7090	0.00903	**	−2.24E+01	8.86E+00	0.0115	*
	TP					0.0001	0.0001	0.24279		1.16E−04	1.05E−04	0.2688	
	QE	2.2389	0.8220	0.0065	**	2.1360	0.8219	0.00935	**	2.09E+00	8.49E−01	0.0138	*
	Size (2)	1.2376	0.6069	0.0414	*	0.9525	0.6550	0.14588		8.99E−01	7.08E−01	0.2040	
	Size (3)	0.6005	0.7607	0.4298		−0.1978	1.0470	0.85023		−2.64E−01	1.09E+00	0.8094	
	Size (4)	0.9851	1.4877	0.5079		−1.2990	2.8130	0.64412		−1.37E+00	2.94E+00	0.6416	
	Focus (2)	0.7926	1.0917	0.4678		0.6196	1.1010	0.57344		6.82E−01	1.14E+00	0.5511	
	Focus (3)	−0.8783	1.1598	0.4489		−0.9926	1.1630	0.39354		−8.74E−01	1.29E+00	0.4978	
	Focus (4)	−0.2732	1.2183	0.8226		−0.5968	1.2430	0.63113		−5.77E−01	1.25E+00	0.6431	
	Nature:Private	−0.4530	0.6566	0.4903		−0.5381	0.6689	0.42111		−5.25E−01	6.70E−01	0.4330	
	Y	0.0058	0.0055	0.2935		0.0029	0.0060	0.62852		3.07E−03	6.06E−03	0.6128	
	TTO:Yes									1.42E−01	7.31E−01	0.8457	
	IP									2.89E−03	3.09E−02	0.9254	

http://dx.doi.org/10.5772/intechopen.71754

		Model 1				Model 2				Model 3			
		Estimate	**Std error**	**Pr(>|z|)**		**Estimate**	**Std error**	**Pr(>|z|)**		**Estimate**	**Std error**	**Pr(>|z|)**	
Poisson Model	(Intercept)	−8.5370	2.9100	0.00335	**	−1.07E+01	3.31E+00	0.00131	**	−8.46E+00	3.64E+00	0.0199	*
	TP					7.43E−05	4.09E−05	0.06955		6.87E−05	4.16E−05	0.0983	
	QE	0.0824	0.2806	0.00334	**	1.03E+00	3.19E−01	0.00121	**	8.06E−01	3.68E−01	0.0286	*
	Size (2)	0.2295	0.3818	0.54788		1.97E−02	4.02E−01	0.96093		−2.64E−02	4.25E−01	0.9505	
	Size (3)	1.0470	0.4526	0.02072	*	3.99E−01	5.94E−01	0.50111		2.25E−01	6.30E−01	0.7209	
	Size (4)	1.1680	0.6098	0.05542		−8.88E−01	1.32E+00	0.49991		−1.88E+00	1.37E+00	0.1688	
	Focus (2)	0.0503	0.4470	0.91047		6.16E−02	4.56E−01	0.89252		−2.34E−02	4.50E−01	0.9586	
	Focus (3)	−0.3113	0.4963	0.53045		−1.53E−01	4.99E−01	0.75852		−1.74E−01	6.06E−01	0.7742	
	Focus (4)	0.1893	0.4975	0.70361		2.18E−01	5.01E−01	0.66416		1.36E−01	5.20E−01	0.7931	
	Nature:Private	0.1979	0.3425	0.56325		5.30E−02	3.58E−01	0.88238		3.04E−01	4.24E−01	0.4724	
	Y	0.0001	0.0012	0.94199		−3.03E−03	2.14E−03	0.15626		−2.22E−03	2.21E−03	0.3150	
	TTO:Yes									−5.33E−02	5.05E−01	0.9159	
	IP									2.05E−02	1.01E−02	0.0431	*

**p < 0.01, *p < 0.05, p < 0.10.

Table 3. Logistic and Poisson regression analysis.

education of new professionals. There seems to be no contradiction between the academic quality rated on the basis of the students' results in the State's knowledge rating examination and the entrepreneurial university model orientation.

It is possible that synergies develop in research groups favoring the students' training [41, 52], in Chile [20] and in Colombia [23], and the evidence we have from interviews to students who have participated in the Universidad de Los Andes 2014 InnovAndes Entrepreneurship Fair. Contrary to what could have been expected, judging from the evident tensions regarding teaching and entrepreneurship as indicated in the first part of this paper, the market orientation through entrepreneurship does not go to the detriment of the quality of student education in professional careers [55–60].

With this study we expect to encourage empirical research on entrepreneurship in universities in order to contribute knowledge for the development of policies enabling the management of universities and of the higher education system to improve their contribution to socioeconomic and environmental development and sustainability, in the idea of creation equal to an open access of learning.

Acknowledgements

The authors want to thank Alejandro Venegas, member of the Colombian Ministry of Education, for the accomplishment of this project; also the authors thank the work of Natalia Suarez and Carlos Plata, members of the Management Faculty at the Universidad Externado de Colombia, with whom a research group to create new knowledge about the higher education systems of Colombia and Latin America has been organized.

Author details

Luis Antonio Orozco[1]*, Jeimy Paola Aristizabal[1] and José Luis Villaveces[2,3]

*Address all correspondence to: luis.orozco@uexternado.edu.co

1 School of Management, Externado University of Colombia, Bogota, Colombia

2 Honorary at Colombian Academy of Exact, Physical and Natural Sciences, Bogota, Colombia

3 Colombian Association for the Advancement of Science, Bogota, Colombia

References

[1] Yokoyama K. Entrepreneurialism in Japanese and UK universities: Governance, management, leadership, and funding. Higher Education. 2006;**52**(3):523-555

[2] Murdock KA. Entrepreneurship policy: Trade-offs and impact in the EU. Entrepreneurship and Regional Development. 2012;**24**(9-10):879-893

[3] Etzkowitz H. The evolution of the entrepreneurial university. International Journal of Technology and Globalisation. 2004;**1**(1):64-77

[4] Schugurensky D. The heteronomous university and the question of social justice: In search of a new social contract. World Studies in Education. 2007;**8**(1):51-71

[5] Eom BY, Lee K. Modes of knowledge transfer from PROs and firm performance: The case of Korea. Seul Jorunal of Economics. 2009;**22**(4):499-528

[6] Cruz A, Quilapay M. Análisis de las actividades de investigación más desarrollo + innovación + emprendimiento en universidades de Iberoamérica. La Coruña: Red Emprendia. Editorial Netbiblo SL; 2014

[7] Mitra J. Entrepreneurship, Innovation and Regional Development. New York: Routledge; 2012

[8] Montesinos P, Carot JM, Martinez JM, Mora F. Third mission ranking for world class universities: Beyond teaching and research. Higher Education in Europe. 2008;**33**(2-3):259-271

[9] Etzkowitz H, Leydesdorff L. The dynamics of innovation: From National Systems and "mode 2" to a triple helix of university–industry–government relations. Research Policy. 2000;**29**(2):109-123

[10] Häyrinen-Alestalo M, Peltola U. The problem of a market-oriented university. Higher Education. 2006;**52**(2):251-281

[11] Yusuf S, Nabeshima K, editors. How Universities Promote Economic Growth. Washington, DC. The World Bank; 2007

[12] Philpott K, Dooley L, O'Reilly C, Lupton G. The entrepreneurial university: Examining the underlying academic tensions. Technovation. 2011;**31**(4):161-170

[13] Connell H, editor. University Research Management. Meeting the Institutional Challenge. Paris: OECD; 2004

[14] Wright M, Clarysse B, Mustar P, Lockett A. Academic Entrepreneurship in Europe. Cheltenham: Edward Elgar Publishing; 2007

[15] Villaveces JL. Introducción. La investigación en la Universidad de los Andes 2007. En: Orozco LA. (Ed). La investigación en Uniandes 2007. Elementos para una política. Vicerrectoría de investigaciones. Universidad de los Andes. Ediciones Uniandes. Bogotá; 2007

[16] Rothaermel FT, Agung SD, Jiang L. University entrepreneurship: A taxonomy of the literature. Industrial and Corporate Change. 2007;**16**(4):691-791

[17] Kitagawa F. Entrepreneurial universities and the development of regional societies: A spatial view of the Europe of knowledge. Higher Education Management and Policy. 2005;**17**(3):65

[18] Sam C, van der Sijde P. Understanding the concept of the entrepreneurial university from the perspective of higher education models. Higher Education. 2014;**68**(6):891-908

[19] Villaveces JL, Orozco LA. Colombia. In: Barro S, (Coord). La transferencia de I+D, la innovación y el emprendimiento en las universidades. Educación superior en Iberoamérica - Informe 2015. Santiago de Chile: CINDA – RedEmprendia- Universia; 2015

[20] Bernasconi A. University entrepreneurship in a developing country: The case of the P. Universidad Católica de Chile, 1985-2000. Higher Education. 2005;**50**(2):247-274

[21] Pavičić J, Alfirević N, Mihanović Z. Market orientation in managing relationships with multiple constituencies of Croatian higher education. Higher Education. 2009;**57**(2): 191-207

[22] Arocena R, Sutz J. Changing knowledge production and Latin American universities. Research Policy. 2001;**30**(8):1221-1234

[23] Orozco LE. Tareas pendientes de las universidades en América Latina. Quórum: revista de pensamiento iberoamericano, No. 2006;**15**:77-92

[24] Orozco LA, Chavarro DA. University and entrepreneurship. Hallazgos revista de investigaciones. 2008;**10**:65-97

[25] Orozco LE, Castillo LC, Roa A. La educación superior en Iberoamérica 2011. La educación superior en Colombia 2005-2009. Santiago de Chile: CINDA - UNIVERSIA; 2011

[26] Orozco LE. Calidad académica y relevancia social de la educación superior en América Latina. Revista Iberoamericana de Educación Superior. 2010;**1**(1):24-36

[27] López-Segrera F. Notas para un estudio comparado de la educación superior a nivel mundial. Buenos Aires: CLACSO; 2007

[28] Buchbinder H. The market oriented university and the changing role of knowledge. Higher Education. 1993;**26**(3):331-347

[29] Bönte W. What do scientists think about commercialization activities? In: Audretsch DB, Falck O, Heblich S, editors. Handbook of Research on Innovation and Entrepreneurship. Edward Elgar Publishing; 2011

[30] Orozco LA, Chavarro DA, Olaya D, Villaveces JL. Methodology for measuring the socioeconomic impacts of biotechnology: A case study of potatoes in Colombia. Research Evaluation. 2007;**16**(2):107-122

[31] OECD/International Bank for Reconstruction and Development/The World Bank. Reviews of National Policies for Education: Tertiary Education in Colombia 2012. OECD Publishing; 2012. http://dx.doi.org/10.1787/9789264180697-en

[32] Shattock M. European universities for entrepreneurship: Their role in the Europe of knowledge the theoretical context. Higher Education Management and Policy. 2005;**17**(3):13

[33] Uniandes. In: Orozco LA, editor. La investigación en Uniandes. Construcción de una política. Bogotá: Ediciones Uniandes; 2010

[34] Gibbons M. Higher Education Relevance in the 21st Century. Washington, DC: World Bank; 1998

[35] Ridgeway J. The Closed Corporation; American Universities in Crisis. Nueva York: Bllantine Books Inc; 1968

[36] Fuller S. What makes universities unique? Updating the ideal for an entrepreneurial age. Higher Education Management and Policy. 2005;**17**(3):27

[37] Stephan PE. Educational implications of university–industry technology transfer. The Journal of Technology Transfer. 2001;**26**(3):199-205

[38] Vaccarezza LS. Las estrategias de desempeño de la profesión académica. Ciencia periférica y sustentabilidad del rol de investigador universitario. Redes. 2000;**7**(15):15-43

[39] Robledo J. De los grupos consolidados de investigación a los sistemas dinámicos de innovación: el desafío actual del desarrollo científico y tecnológico colombiano. DYNA. 2007;**74**(152):1-7

[40] Arocena R, Sutz J. Latin American Universities: From an original revolution to an uncertain transition. Higher Education. 2005;**50**(4):573-592

[41] Clark B. Creating Entrepreneurial Universities: Organizational Pathways of Transformation. UK: Emerald; 2008

[42] Tigelaar DE, Dolmans DH, Wolfhagen IH, Van der Vleuten CP. The development and validation of a framework for teaching competencies in higher education. Higher Education. 2004;**48**(2):253-268

[43] Etzkowitz H, Webster A, Gebhardt C, Terra BRC. The future of the university and the university of the future: Evolution of ivory tower to entrepreneurial paradigm. Research Policy. 2000;**29**(2):313-330

[44] Louis KS, Jones LM, Anderson MS, Blumenthal D, Campbell EG. Entrepreneurship, secrecy, and productivity: A comparison of clinical and non-clinical life sciences faculty. The Journal of Technology Transfer. 2001;**26**(3):233-245

[45] Powers JB, McDougall PP. University start-up formation and technology licensing with firms that go public: A resource-based view of academic entrepreneurship. Journal of Business Venturing. 2005;**20**(3):291-311

[46] Shane SA. Academic Entrepreneurship: University Spinoffs and Wealth Creation. Cheltenham, UK Edward Elgar Publishing; 2004

[47] O'Shea RP, Allen TJ, Chevalier A, Roche F. Entrepreneurial orientation, technology transfer and spinoff performance of US universities. Research Policy. 2005;**34**(7):994-1009

[48] Aldana, E. El caso de Colombia. En: Sentelices, B (Ed.) El rol de las universidades en el desarrollo científico y tecnológico. Educación superior en Iberoamérica 2010. CINDA – UNIVERSIA – Secretaría General Iberoaméricana. Santiago de Chile; 2010

[49] Rivera-Camino J, Mejia LG. Management education in Ibero-America: An exploratory analysis and perspective. Journal of World Business. 2006;**41**(3):205-220

[50] Marion TJ, Dunlap DR, Friar JH. The university entrepreneur: A census and survey of attributes and outcomes. RandD Management. 2012;**42**(5):401-419

[51] Fini R, Lactera N, Shane S. Inside or outside the ip system? Business creation in academia. Research Policy. 2010;**39**:1060-1069

[52] Clark BR. The modern integration of research activities with teaching and learning. Journal of Higher Education. 1997;**68**(3):241-255

[53] Bramwell A, Wolfe DA. Universities and regional economic development: The entrepreneurial University of Waterloo. Research Policy. 2008;**37**(8):1175-1187

[54] Etzkowitz H. Entrepreneurial scientists and entrepreneurial universities in American academic science. Minerva. 1983;**21**(2):198-233

[55] Etzkowitz H. Research groups as 'quasi-firms': The invention of the entrepreneurial university. Research Policy. 2003;**32**(1):109-121

[56] Garnsey E. Entrepreneurial university. The idea and its critics. In: Yusuf S, Nabeshima K, editors. How Universities Promote Economic Growth. Washington, DC. The World Bank; 2007

[57] Kadir MBA, Salim M, Kamarudin H. The relationship between educational support and entrepreneurial intentions in Malaysian higher learning institution. Procedia-Social and Behavioral Sciences. 2012;**69**:2164-2173

[58] Merton RK. La Sociología de la ciencia: investigaciones teóricas y empíricas. Madrid: Alianza Editorial; 1977

[59] Mowery DC. University-Industry Research Collaboration and Technology Transfer in the United States since 1980. In: Yusuf S, Nabeshima K, editors. How Universities Promote Economic Growth. Washington, DC. The World Bank; 2007

[60] Pittaway L, Cope J. Entrepreneurship education a systematic review of the evidence. International Small Business Journal. 2007;**25**(5):479-510

IntechOpen