UNIVERSITY AND SOCIAL CHANGE: THE IMPACT OF A NEW INSTITUTION IN TERMS OF MARKETING USING ECONOMETRIC MODELS

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UNIVERSIDAD Y CAMBIO SOCIAL: EL IMPACTO DE UNA NUEVA INSTITUCIÓN EN TÉRMINOS DE MARKETING USANDO MODELOS ECONOMÉTRICOS[2]

ABSTRACT: The University must maintain a professional relationship with the demand of the companies by research labor. The aim of this study is to analyze the scientific production of the Spanish public and private universities. The paper analyzes how it would affect the entry of a new university in the ranking of Spanish public and private universities. For this study, it is used a methodology based on advanced econometric models, the application in the study of a prediction model to determine the effect of the entry in the ranking of a new university. This ranking is based on research published in international journals of greater impact and visibility (i.e. JCR/ISI, SCOPUS), to discover the strengths and weaknesses of the Spanish universities, specially, in different fields of knowledge and research.

KEY WORDS: University, social policies, social change, scholar rankings, institutional marketing, econometric models, science research, bibliometrics indicators.

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RESUMEN: La universidad tiene que mantener una relación profesional con la demanda de la empresa a través de la investigación. El objetivo de este estudio es analizar la productividad científica en la investigación de las universidades públicas y privadas españolas. Se trata de analizar cómo afectaría la entrada de una nueva universidad en un ranking de universidades públicas y privadas españolas. Para el análisis se utiliza una metodología basada en modelos econométricos avanzados, la aplicación en el estudio de un modelo de predicción para conocer el efecto de la entrada en el ranking de una nueva universidad. Este ranking está basado en la investigación publicada en las revistas internacionales de mayor impacto y visibilidad, para descubrir las fortalezas y debilidades del sistema universitario español de investigación en diferentes ámbitos del conocimiento y la investigación.

PALABRAS CLAVE: Universidad, políticas sociales, cambio social, rankings universitarios, marketing institucional, modelos econométricos, investigación científica, indicadores bibliométricos.

1. Introduction

The present article pretends to evaluate the High Education System by academic rankings and econometric models; special attention is paid to the Spanish universities. We start studying the importance of the universities, Why are so important? Why so many studies are performed on them? Why college rankings are done? What factors are primarily involved? Then we study the importance of the university through the rankings, internationally and focusing on the case of Spain.

Universities are increasingly recognized as a cornerstone for developing countries. They are considered as a major factor in increasing the quality of life of its stakeholders and competitiveness. Universities are challenged to confront a world in which production systems are permanently changing. Consequently, changes in communication have turned the way in which we perceive the time and the distance, while open new perspectives for teaching and research (Cuba Guevara, 2010).

For regard to Spanish university, it shows signs of dynamic in research and transfer function. Based on this in general aspect, the university has continued an upward trend in recent years towards the integration and specialization. Especially in the number of researchers, as well as the number of persons engaged in R+D+I. In particular, the number

of scientific publications in Spain has grown continuously since 1981, representing 3.1% of the world total and placing Spain in the tenth place among the 145 countries included in the web of knowledge, and in the thirteenth world ranking of citations per paper.

Not only in the field of scientific research and transfer lies the importance of college. It shows a way towards new models of cooperation that enable significant success making possible the transfer to the results of basic research to applied research. This realization is made possible with support from government and international agencies, as well as collaboration with other academic and research institutions. It must be emphasized in our study the new expressions of development cooperation. These give witness to the new functions of the university in a globalized knowledge society.

In the last decades in Spain it has been favored the creation of many public and private universities. This has meant that, due of a poor scholarship policy; younger could study at a university located closer to home, reducing the economic cost for families that meant.

The option is useful for improving the educational level of the country, to democratize education, and balance the territory. But does it not work if you want to have excellent universities that they become in a world leader and appearing in the rankings (El País, 2010).

But not all are university facilities in this area. This is reflected in some of the main obstacles to the university. These difficulties proposed are the high number of years that the university students needed to complete their studies and high dropout rates, attached to the high cost that training each student college means for public budgets.

This situation develops with other underlying trends that are present in a singular mode in the Spanish university system. Such as the continuing decline in enrollments and graduates in tertiary education in Spain, the decline in the number of students enrolled in first and second cycle, the limited capacity to attract foreign students to Spain, etc. (Casas, 2005).

The university is not unfamiliar with the reality that is considered particularly positive in terms of research and technology transfer. Is more, it is far from it with respect to the teaching function of the university. This is observed in the original differentiation process that is taking place between Spanish universities, in particular. While generally it is developed so different perspective about the Spanish university, which it's at the base of the different perceptions that are examined around.

Today, the increasing globalization and the changing that affect the society make the classic paradigm of a traditional college not result very consistent with the new realities and social and scientific demands. Moreover, researches are increasingly important and they agree that any actual society is superior to its universities.

It is therefore obvious that the university is an essential tool for development and progress. Indeed, there isn't highly advanced countries that do not have an effective university system and within this system, which have a solid and permanent research (Casas, 2005).

In an overview of needs and barriers to university reform, lies the idea is to highlight the extraordinary importance of the incorporation of the innovation process in its modern sense. This would be done to establish substantial changes, integrated and prospective universities. To set the importance of the concept of innovation, Albornoz (2002) claims that innovation is the basis of the knowledge society and one of the drivers of globalization. Add that to the social and human development is sustainable, innovation should be governed by ethical and moral values.

But, why college is better than another? Why are there such differences in positions in the rankings? They are considered some factors to keep in mind when choosing a college that meets educational and social needs of the interested.

Geographic location is one of the main factors. Some students decide that they want to study at a university in a different community to their house, while others prefer to stay close to home. Choose university strictly about location can severely limit the options, as there may be other factors that are more important than location.

Another factor to consider is the number and characteristics of students. When deciding the size of the institution, they have to be considered a range of universities with more or less the number of students ideal. When visiting any of the universities they are able to observe the preference of the institution.

In the study of the choice of a university is of great relevance that it is public or private, because universities are financed with public or private funds. States operating in the public and they are partly funded with state tax, which generates a lower cost than private universities. Private universities, on the other hand, are funded by tuition, fees, and private and corporate donations. Therefore, they are generally more expensive than public colleges, although they tend to offer more scholarships and have classes with fewer students than public.

Consider the fact that some institutions are religious or not. While most public universities are secular, some of them are managed by a religious organization and religious activities and courses required. Other institutions are linked with a religion, but students of any religion may attend and to exercise their own religions.

A good way to evaluate a university's academic approach is to consider the most popular majors and the percentage of students in those majors. Each university has its own requirements for each specialization. Some of them have strict requirements that allow for few electives; while others have few requirements and offer freedom of choice the subjects they want and don't require a formal specialization. People who think they need more guidance and structure might prefer a university with more stringent requirements. In contrast, people with a defined academic and career plan may choose a facility that offers more flexibility.

Finally, we have to be considered extracurricular activities, which are performed outside the classroom are also important factors in the decision. Participation in these activities will facilitate the job search for college graduates (Schuldt, 2012).

1.1.   The establishment of the university rankings

As discussed above, it is necessary to observe the causes of the realization rankings of universities, both internationally and in the specific case of Spain.

The realization of rankings to assess and compare the quality of the systems and institutions has become fashionable in all areas of education and research. In many countries, such as Spain, this fact is accompanied by a promotion strategy of national universities of excellence, so that they can compete on the world of universities (Krüger, 2010).

Referring to excellence strategies, the concept of the global university is vital: a reference point for university policies, introducing competition among universities. At the same time, strengthening the position of the university type of intensive research oriented. Thus obtained results that the rankings and excellence initiatives, as currently designed, they are closely linked. Both strategies are combined forming part of the power play in the university system, which is especially struggle for access to resources in addition to scientific excellence. It is on the rise the fight for a new distribution of power between the faculties, universities, scientists and various departments at different levels (Krüger, 2010).

To carry out the proposed study is part of the scientific productivity analysis in the field of research in public and private universities in Spain. For this analysis, they are used in accordance with the evaluation criteria of research in Spain, trying to analyze how it would affect the entry of a new university in a ranking of Spanish universities. The proposed ranking is based on research data published in various international journals of high visibility and impact.

The results of this study allow obtaining a ranking of the resulting specific analysis of each of the following criteria: the number of citable papers published in indexed journals recognized by Thomson Reuters; the number of citations received by papers quotable; the H index according to the formula H Hirsch; the percentage of highly cited papers quotable, and the percentage of citable papers published in journals indexed in the first quartile of Thomson Reuters. Further on, once defined methodology is explained in detail the different ranking criteria that will become the model explanatory variables.

Definitely, *Rankings I-UGR de Universidades Españolas según Campos y Disciplinas Científicas* is a product of interest to research managers linked to universities and scientific policy makers (Torres-Salinas et al., 2012).

1.2. *Background on the use of university rankings*

For a few years, all Spanish universities are in need of international rankings appearing more influential, such as The Times or Jiao Tong University form Shanghai. We investigate the indicators used by its creators to see if we can improve. Researchers attending seminars where experts explain the benefits of the rankings and how "slip" in them. Sometimes these researchers collect expert opinion for what do to place a Spanish university among the world's top hundred (El País, 2010).

The elaboration of university rankings enjoys considerable tradition in Anglo-Saxon countries and in recent years have proliferated the university rankings in Europe and particularly in Spain.

In the international context there are various rankings on the quality of universities. The most important have been described and analyzed in various publications, such as Buela-Casal et al. (2007) focusing as a priority on the research results.

However, the criteria of excellence and high level of research and therefore are not equally valid to analyze the productivity of universities not as tall level as in the case of Spanish universities. In fact, in the ranking of world universities, only ten percent of Spanish universities are listed among the five hundred first and none in the top hundred.

The Institute of Higher Education de Shangai Jiao Tong University makes the only international ranking that depends exclusively on data obtained independently of the institutions studied, but not running polls (Docampo, 2008).

The educational supplement of The Times, HIGHER, publishes an annual global ranking of universities where are broken several global rankings are broken down by area and picking up the best universities in the world (Portal Universia, 2008).

It must be considered in all college rankings web impact factor is the criterion used by the Internet Lab CINDOC (CSIC) in Webometrics Ranking. The indicators of presence and penetration through internet about 8,000 universities worldwide are what determine the CSIC study. The list is broken down into blocks of countries and continents, and ordered according to an index that combines the volume of information published. The visibility and impact are organized according to the number of external links received (Portal Universia, 2008).

The use of external rankings and reports on the selection of products and brands is common practice in research on brand equity. Therefore it is necessary to know the ranking of Spanish universities, to establish the centers under study and the characteristics that define the same for these rankings (Buil et al. 2010).

But not all positive reviews, there are scientists who say not have to worry because the rankings are unreliable, but why? Some explain that there are no global university information sources, especially in teaching, that evaluate the 17,000 higher education institutions in the world. Others affirm that the rankings are based on teacher's data provided for the own universities and basic research papers published. Reference is also made to existing linguistic and geographical bias, and the maintenance of high opacity about the methodology used to establish rankings.

It is worth considering not shown neither the budget you have universities, and the staff of the centers in the rankings. It not explains whether or not laws of patronage to encourage investment, not taken into account what the investment in relation to GDP and private participation in

universities. Considering these data, as factors directly affect the quality, these premises are issues of rigor and reliability of the rankings.

So they have not to worry too much about the rankings, but it must take care in the clarification their key features controversial, that can thus benefit seen in its positive aspects (El País, 2010).

2. *Metodology and results: Criteria Database*

In this paper, we present the database extracted from the 2nd edition of 2012 of the *Rankings I-UGR de Universidades Españolas según Campos y Disciplinas Científicas*. This is a ranking of public and private Spanish universities based on research published in international journals of high impact and visibility.

The field chosen for the study was the ranking of Economics, Business and Business between the years 2006-2010. And in this study the ranking differs from others in several aspects:

It's organized by twelve fields and thirty-seven scientific disciplines. In this way is not shown by large areas of knowledge that dilute the different research profiles exhibiting universities. On the contrary is presented any manner which could be captured well in which specialties are most active and influential.

It proposes a method of organizing that synthesizes six Bibliometric indicators and impact measuring qualitative and quantitative aspects of the scientific production of universities. These indicators will be the explanatory variables of the model.

As for the quantitative dimension, we note:

- **NDOC**, this is the number of citable papers published in journals indexed in any category of the Journal Citation Reports (JCR) at Thomson Reuters. It only takes into account the types of article review and rating.

- Another indicator of this dimension is the NCIT, that comprising the number of citations received by citable documents.

- Finally, the H-INDEX indicator sees the H index according to the formula H Hirsch. This is probably the best known index in the current bibliometrics and has proven to be a robust measure of impact.

Regarding the qualitative dimension analysis, indicators are:

- First PCIT is the average quotable quotes from the documents.

- Another significant indicator is TOPCIT, which refers to the percentage of highly cited citable documents. To calculate it, take the documents published by all universities in the field / discipline, highly cited papers being those at the 0.90 percentile according to the number of citations.

- Finally, 1Q is the percentage of citable documents published in journals indexed in the first quartile of any category of *Journal Citation Reports* (Thomson Reuters).

Both dimensions are classified by gross indicators and standardized indicators in the database under study.

The ranking is used as an information database of Thomson-Reuters (formerly ISI) Web of Science and Journal Citation Reports. These products consist in a selection of the best magazines worldwide, and they are established as a basic reference of the evaluation agencies of the performance research for international and national level (CNEAI, ANECA).

Extensive time series are used for a period of five years (2006-2010). Those attempting to provide stability to the results and in this way detect possible changes in scientific activity.

The ranking provides the resulting data of forty-two Spanish universities. It is observed that first established is Pompeu Fabra University and which is in last place is the University of Extremadura, with truly disparate results between the two (Torres-Salinas et al., 2012).

3. Application of econometric models for analysis

The goal of this paper is the observation of the analysis compliance about the scientific productivity researching in Spanish universities. This analysis is performed through the use of the criteria consistent with the evaluation of research in Spain. To observe how it would affect the entry of a new university in a ranking of Spanish public and private universities it is using advanced econometric models through the application of E-Views.

EViews is a computer program which combines the technology of the worksheet (Excel) with common tasks found in software using a

graphical user interface. This program is managed for statistical analysis, but in particular has been especially useful for the realization of the econometric analysis. Also it should be noted in this study the application of a prediction model to determine the effect about the entry of a new university in a ranking.

For the proposed analysis, the total indicators are applied as independent variables. The variable "position of each university" in the ranking is an independent variable through the method of ordinary least squares.

The data regarding the original model are:

- $Posic = \beta_0 + \beta_1 * ndoc + \beta_2 * ncit + \beta_3 * h\text{-}index + \beta_4 * pcit + \beta_5 * topcit + \beta_6 * q$

The result at first was unsatisfactory, as the indicators did not meet the probability function, exceeded 5%. In terms of probability, if the values are above 5% ($\alpha = 5\%$) do not reject the null hypothesis and the exogenous variable does not explain the model.

Therefore, the solution in this case was the use of logarithms, the resulting model is:

- $Lposic = 0,92572 * C - 0,997542 * lndoc - 1,311722 * lpcit + 0.210988 * lq$

This result shows that the greater the number of citable papers published in indexed journals, decreases the number of ranking position (closer to the top positions). A higher average quotable quotes from documents, decreases the number of equally ranking position, while a higher percentage of citable documents published in journals indexed in the first quartile, increased ranking position.

The latter variable should also adversely affect, because the interesting thing is that the university occupied a higher position in the ranking.Then the final result is observed, where all dependent variables (logs) have a probability <0.05, still significant explaining variable behavior lposic. The R^2 of the equation represents the percentage of

variability of the dependent variable explained by the independent variable. Their result in the analysis is also significant success since reached 85.58%.

Table 1

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.925720	0.137398	6.737492	0.0000
LNDOC	-0.997542	0.085797	-11.62681	0.0000
LPCIT	-1.311722	0.200655	-6.537194	0.0000
LQ	0.210988	0.079078	2.668095	0.0112
R-squared	0.855818	F-statistic	75.18548	

White Heteroskedasticity Test:

F-statistic	1.160449	Probability	0.349387
Obs*R-squared	6.968883	Probability	0.323734

Once the analysis of OLS (ordinary least squares), is necessary to examine the heteroskedasticity of the model. This heteroscedasticity means that the variance of disturbances is not constant throughout the observations, violating a basic assumption of the model. This means a loss of efficiency of least squares estimators. The ideal would be that the model would result in a null heteroscedasticity.

Then we try to make prediction with our model. As we mentioned at the beginning, the purpose of the study is to see how it would affect the entrance of a new university in a ranking. For this, we need to make a sample for the analysis of only forty-one university to discuss what position would enter the new university.

Table 2

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	0.781421	0.133226	5.865371	0.0000
LNDOC	-0.984750	0.076093	-1.294135	0.0000
LPCIT	-1.269543	0.164365	-7.723925	0.0000

The resulting model for prediction is:

- Lposic= 0,781421 - 0,98475 * lndoc - 1,269543 * lpcit

Assuming that data is established, the test result shows an econometric model in the ranking of 179. This is because the data of universities are very inconsistent. There is a huge difference between the data of the first and the last university college[3].

In the predictive case, the greater the number of citable papers published in indexed journals, decreases the number of ranking position (closer to the top positions). And the higher average quotable quotes from documents decreases the number of equally ranking position.

To test and predict information through the resulting model, several simulations were performed to check the results and see what position the new university would be located:

- Lposic= 0,524758 + 0,254789 * lndoc - 0,798451 * lpcit.

- Lposic= 0,125983 - 0,785264 * lndoc - 2,885327 * lpcit

In the first simulation, the new university would be situated at No. 3 ranking, while the second, would be positioned at number 672. For the first simulation, the greater number of citable papers published in indexed journals increases the number of ranking position. Higher average citations citable documents make the decrease in number of equally ranking position. By contrast, in the second simulation the largest number of documents published in journals indexed citable lower the number of the position in the ranking. The highest average citations of citable documents lower the number of equally ranking position.

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[3] Data from the gross indicator variables for the first university in the ranking, the University of Pompeu Fabra ndoc has 245, 802 NCIT, 14 h-index, PCIT 3273, 0167 and 0494 topcit q. By contrast, and showing the difference between the two, the data for the last college rankings, the University of Extremadura has 24 ndoc, 19 NCIT, 2 h-index, PCIT 0792, 0042 and 0.01 q topcit

4. Conclusions

The university as an institution is a key player in the development and modernization of society. As we have seen, it is a key instrument for developing countries. These assertions are recognized globally, without understanding of boundaries. The role of universities is recognized by all as not necessary, but there are essential (more than never, on the rise of the knowledge society). Accordingly, the universities aim should be achieve optimum quality both in appearance and in the investigator teaching.

The requirement of having a higher quality education has become a demand of modern society. Moreover, the world in which society develops has established the need for human labor efficiency. This efficiency is achieved through better preparation, for what the university plays a key role.

It provides a great importance for further progress by the triple relation university-research-company. This relationship is based on the operation of the university as a placement program for university students; second, it is based in training for company employees; and thirdly, it is based in research centers.

Lino Barañao is taking as a reference in this reflection. He argues that the problem is the small number of technology companies and the need for research and development (R + D + I) in technology-based companies.

The relationship of these businesses with the university is very fluid, and is a key relationship in which both companies could join and receive benefits from the relationship. Although this relationship should not remain limited to these businesses, but that research should to become a reference, and the image of the research university to be a constant in business.

We must stimulate the participation of teaching and research staff of universities in research programs. Monitoring should be established in the knowledge of the research and scientific production of the research groups. Equally relevant is the figure of university staff that we must advise and facilitate participation in research programs.

There is a need to disseminate and promote the call for projects in companies. It also must advise and coordinate the managers of these companies to act in the framework of the research groups. This will promote synergies between them and university services.

Regarding the results of the analysis using econometric models, which are just observed some of the significant criteria set as variables

ranking in the field of discipline of economics, business and businesses. Lndoc, lpcit and lq are significant variables to explain the behavior of the variable lposic logarithmic, the ranking position. These variables cited are those used to prepare the analysis and they are extracted with the study results.

Some needs are raised after the analysis, like discovering the strengths and weaknesses of the Spanish university system research in different fields of knowledge. We could also observe thoroughly the university-science-business and how to promote it.

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