Is There a Relation Between Academic Ranking Measures and Age of a University? A Case Study from Turkey

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Abstract

In line with the changes in higher education policy in Turkey, the number of universities in Turkey has considerably increased in the last decade. In this competitive environment, Turkey's Scientific and Technological Research Institution (TÜBİTAK) has started to rank the universities using several academic measures such number of publications, number of cited articles, number of students (PhD), number of patent applications/grants and etc. In this work, we want to show how these academic performance indicators are affected from the experience of universities. We list the establishment years of the universities and calculate an age for each of the Turkish universities. Subsequently, we investigate how the performance indicators are correlated with the age of universities. As result, we show that the experience (age) is quite correlated with many of the indicators such as: total number of publications, total number of citations, number of projects completed however it is not the only factor to explain all variability in these measures.

Keywords
Academic Ranking, Turkish Universities, Age of Universities

1. Introduction

There has been a remarkable interest in the university rankings in the recent decades. The Times Higher Education World University Rankings, The Academic Ranking of World Universities (ARWU), and QS World University Rankings are some of the well-known examples of world university rankings (N.K. et al. 2018). There numerous benefits of using these rankings for different purposes. First of all, these rankings create a useful benchmark data (Tie 2012) for the universities and it helps university managements to set some measurable objectives for the future of their organizations. These rankings serve also as a marketing and positioning tool within countries and around the globe (Hou and Jacob 2017). On the other side, they are expected to support students and their families for making informed decisions (Dill and Soo 2005) about their choice for higher education.

Although there are different approaches for ranking universities, the most of the current rankings are simply based on a summation of some quality based indicators weighted with a predetermined value (Bornmann et al. 2013; Lukman et al. 2010). In most of these metrics, bibliometrics plays an important role (van Raan 2005). Bibliometrics is concerned with measuring the output of science (Battisti and Salini 2013). Since international journals are major means of distributing research outputs they have a dominant role in the calculation of metrics. Especially, research publications from the Science Citation Index (SCI) and the Social Science Citation Index (SSCI) have relatively higher impact in the rankings. Some critics about idolization of these indexes can be seen in (Su 2014). Citation counts are another indicator of bibliometrics and they are widely employed by the ranking methodologies (Al-Juboori et al. 2011). Patents and spin-offs are included in some of the rankings while some exclude them (Leydesdorff and Meyer 2010). There are also survey based statistics that are widely included by considering the responses collected from the graduated students. For the details of some major metrics Vught and Ziegele (2012) can be visited.

Although there are various ranking systems discussed in the literature, national ranking approaches receives much more attention compared to international ones (Taylor and Braddock 2007). Turkey's Scientific and Technological Research Institution (TÜBİTAK) has also started to release top 50 university rankings of Turkey on an annual base by 2015. The name of this ranking is called as "entrepreneurial and innovative universities" (Gür et al. 2017). We see the newly established and old universities in the same ranking list. Although most of the data for calculating the ranking is normalized to construct a fair comparison base, we think that the experience factor is omitted. There are universities in the list that exist more than 100 years and there are also one year old of universities in the same list. We expect that some measures will be higher in the in the elder universities and in this work we would like to

test if the rankings or any partial dimensions measured with this ranking are affected from the experience of the universities. We assume that age of a university (the years that a certain university has been serving for) is a good indicator of the total experience belonging to a university. In this respect, this paper is an investigation of the correlation of the indicators with the age of the university. In other words, we would like to find an answer to question of: "Is the performance (of universities) affected from the experience?". We, therefore, aimed to evaluate possible effect of age (of universities) on the indicators listed at Table 1. With this purpose in mind, we have used the rankings announced by TUBİTAK in 2020.

2. Ranking system

There are 4 main dimensions and 22 indicators of the ranking system announced by TUBİTAK. The list of these measures and their corresponding dimension can be seen at Table 1. 40% of the overall grade comes from "economical contribution and commercialism" dimension. Net income of the firms that are owned/shared by the university's students or graduates is a dominant indicator with 11% weight. Scientific and technological research capability dimension has %15 effect on total. Several normalization operations are performed to make these calculations much fairer. All of the actual numbers are divided by the total number of academic staff to show the activity per person. The maximum value for an indicator is determined and it is converted to 100 while the minimum value is considered as zero. The value of each indicator is then normalized according to the new scale between zero and 100.

Table 1. List of indicators in the entrepreneurial and innovative universities ranking system

Variable	Indicator	Dimension	Weight
X1	1.1. Number of scientific publications in 2018	Scientific and Technological Research Capability Dimension	%2,5
X2	1.2. Number of citations to publications in 2018	Scientific and Technological Research Capability Dimension	%3,5
X3	1.3. Number of projects completed in 2018	Scientific and Technological Research Capability Dimension	%2
X4	1.4. Amount of innovative and R&D project funds received	Scientific and Technological Research Capability Dimension	%3
X5	1.5. Number of National / international science awards	Scientific and Technological Research Capability Dimension	%1,5
X6	1.6. Number of students graduated from PhD programs	Scientific and Technological Research Capability Dimension	%2,5
X7	2.1. Number of national patents granted	Intellectual Property Pool Dimension	%5,2
X8	2.2. Number of national utility models granted	Intellectual Property Pool Dimension	%3
X9	2.3. Number of international patent applications	Intellectual Property Pool Dimension	%5
X10	2.4. Number of international patents granted	Intellectual Property Pool Dimension	%6,8
X11	3.1. Number of R&D and innovation projects in cooperation with the industry	Cooperation and Interaction Dimension	%5
X12	3.2. Amount of funds received for projects in cooperation with industry	Cooperation and Interaction Dimension	%6
X13	3.3. Number of international cooperation projects	Cooperation and Interaction Dimension	%5
X14	3.4. Amount of the funds received with international cooperation projects.	Cooperation and Interaction Dimension	%6
X15	3.5. Number of circulation activities of lecturers and students	Cooperation and Interaction Dimension	%1,44
X16	3.6. Number of students registered to industrial PhD program of Turkey's Scientific and Technological Research Institution (TÜBİTAK)	Cooperation and Interaction Dimension	%1,56
X17	4.1. Number of the firms that are owned/shared by the university's academic staff	Economical contribution and commercialism	%6
X18	4.2. Number of the firms that are owned/ shared by the university's students or graduates	Economical contribution and commercialism	%8

X19	4.3. Net income of the firms that are owned/shared by the university's academic staff	Economical contribution and commercialism	%8
X20	4.4. Net income of the firms that are owned/shared by the university's students or graduates	Economical contribution and commercialism	%11
X21	4.5. Number of patents or utility models that are licensed	Economical contribution and commercialism	%4
X22	4.6. Number of the firms established with the support of BIGG capital investment program of Turkey's Scientific and Technological Research Institution (TÜBİTAK)	Economical contribution and commercialism	%3

3. Analysis

We attempt to check for existence of a possible relation between the academic performance indicators and the age of the universities. The pearson correlation values indicate that, there is statistically significant correlation between the age of the university and the performance metrics: X1 (Number of scientific publications), X2 (Number of citations to publications), X3 (Number of projects), X6 (Number of students graduated from PhD programs) and X7 (Number of national patents granted). It seems to be reasonable to state that these metrics are affected from the amount of experience that a university has. The experience mentioned here is not only the experience of staff; it is also the experiences coming from institutionalism and specific university culture. In most of the time, universities have their systems and culture that dates back to years.

The correlation between the age and number of publications is 0.660 (p value: 0.000) whereas it is 0.552 (p value: 0.000) for the number of citations. These positive correlations indicate that number of publications and citations tend to increase as the age of the university increases. The ratio of publication score to age of university range between 0.74 and 5. Abdullah Gül University and the Özyeğin Universities appear at the top of the list. These universities have relatively higher scores when compared to their ages. We also see that Gazi and Yıldız Teknik University are unusual observations among the other universities. Since their publication and citation scores are relatively low while their ages are high. We can state that the publication and citation scores are less than predicted. The ratio of the publication score to the age is less than one for these two universities. %43.5 (R square) of variability in the publication scores can be explained with the age of the universities by using a linear model, while it increases up to %54.1 (R square) for a cubic model. The cubic model is as represented in Figure 1. We see that the universities up to 70 years old, produce much publications subsequently the line gets steady.

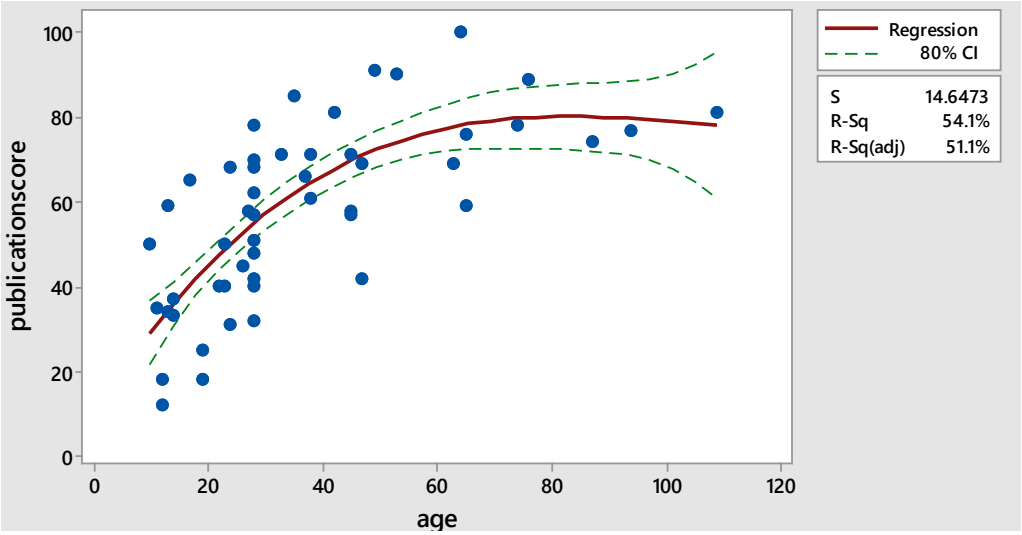

Figure 1. The fitted cubic model for publication versus age of universities

The results show that the correlation between the age of a university and the number of projects is 0.479 (p value: 0.000). %22.98 (R square) of variations in number of projects can be explained with a linear model. Gazi and Yıldız Teknik universities have fewer projects than expected (if we consider age of university as a factor). On the other hand, Koç University has more projects than expected. Our linear model fits 60 points for Koç University's projects score, however actual score is 100.

Number of PhD graduates is correlated with the age with a value of 0.738 (P value 0.000). %54.45 of the total variation in PhD graduates can be explained with the age of universities. As shown in Figure 2, quadratic model can predict 68.5% of the total variation.

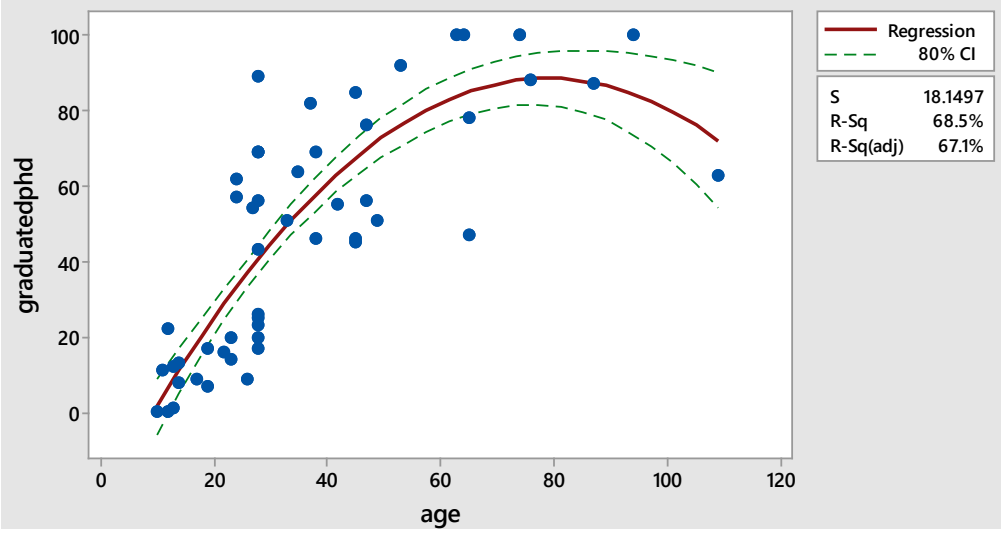

Figure 2. The quadratic model for number of graduated PhD students versus age of universities

Correlation of the number of national patents granted with the age is 0.476 (P value 0.000). R square value is %21.86 for the linear model.

We also checked the correlation of the rank of the universities with the age of the universities. We see that the correlation value is -0.523 with the p value of 0.000 (higher age means a better/smaller rank). We can conclude that age of a university has strong relations with the rank of universities. %27.31 of the change in rank can be explained the age of the universities. These findings indicate that the age of a university a good indicator of the experiences for many performance criteria. The results also indicate that rank of Sabancı University slight better than expected and it over performs when compared to its age.

Conclusion

Academic performance indicators such as number of papers published is expected to be influenced by several factors including the experience. This experience is not only the experience of the individuals; it is also the traditions arising from cultural climate of the universities. However, little is known regarding the influence of experience on these indicators. In this work, we see the age of a university as the proxy of experience and check if the academic measures are correlated with the age of universities. The results indicate that the number of publications, number of citations, number of projects, number of granted patents and the number of PhD graduates are positively correlated to age of the universities. We can infer that the statistics tend to be significantly different for the different ages of the universities. Most of these indicator values increase as the age of the university increases. We have two different categories of unusual observations. The first one is about the elder universities with relatively lower performances. The second category is the relatively higher performances although the university is a young one. If these rankings are assumed to be an indicator of the success, we believe that the second category of unusual observations should be announced as the success stories. In other words, the universities should be compared and ranked with the similar universities (we mean the age similarity). We have to state that there is a significant limitation of this work due to sparsely available data and these findings indicate a relation however we cannot infer causality directly.

Although there are lots of studies on academic ranking, the interrelations between the indicators has not been widely considered. We hypothesize that there are some certain dependencies among these indicators. These dependencies can be checked in future work.

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