# A GLOBAL FALSE DICHOTOMY IN HIGHER EDUCATION: TEACHING VS. RESEARCH

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**ABSTRACT**
There are so many false dichotomies (e.g. nature vs. nurture, theory vs. practice, general vs. vocational, teacher vs. technology) in educational assertions especially in higher education. Forced choice between these dichotomies definitely mystify the option in favor and tend to obscure the other. The purpose this study is to display an empirical evidence for the inseparable nature of research and teaching in higher education. Neither of them can be excelled at the expense of expelling the other. In order to fulfil this purpose Times Higher Education (THE) World University Rankings 2016-17. Pearson product moment correlation was found to be significantly high and positive. In fact the correlation between Teaching and Research is always the highest one among all the other paired criteria in every different context. This finding is not sufficient but necessary evidence to assert that Teaching and Research do not alternate but reinforce each other in higher education.
**Keywords:** False Dichotomy, University Rankings, Quality in Higher Education

## INTRODUCTION

The university is a platform of inquiry, discovery and invention i.e. production of information. Teaching is also an obligation of tertiary education to reproduce available information for society. There are so many ways to assess the amount and the quality of service provided by higher educational institutions. Times Higher Education World University Ranking is an attempt to summarize the performances of leading universities. . In the year THE-2017 report 982 universities from 80 different countries were ranked.

Table 1 displays the universities with respect to their countries.

THE is using the same criteria with the same weights (Teaching 30%, Research 30%, Citations 30%, International Outlook 7.5%, Industrial Income 2.5%) since 2012. In the year 2017 1313 institutions were evaluated and 982 were ranked. The ranking 528000 books published within the 2011-2015 period, and the citations they received are taken into consideration from the Scopus database. These include books, book chapters, and conference proceedings.

### What are the universities good for?

All of these ranking criteria but especially Teaching and Research are important in universities for three main reasons. First, they comprise intellectual value for higher education. Curiosity is the inner drive for academicians. Second, they involve practical value. Information is the most important strategic commodity in the knowledge society. Third, universities attract brighter international students thru these virtues. These qualities allow universities to be world class in education and research (Murray et al., 2011). The capability of an institution for invention, innovation and entrepreneurship is determined by the best minds on the campus. The strength and the reputation of a university is driven largely by bright students and academicians perseverant in learning and teaching (Rizvi & Lingard 2010).

The university as a platform of inquiry, birthplace of sophisticated knowledge must be willing to uncover itself. Openness to public criticism is an inherent quality of science, and it requires self-criticism to begin with. What is to be aimed to criticize in this study is the irresistible attraction of false dichotomies in education in general and higher education in particular.

There are many qualities and merits expected of educational systems. However in many instances these are presented as bipolar options to the stakeholders involved in design or in assessment. Nature vs. nurture,

  

theory vs. practice, teacher centered vs. student centered, quality vs. quantity, public interest vs. private benefit, content vs. process, teacher vs. technology, multiple choice vs. open ended items in testing and many other false dichotomies are the evils in disguise. Forced choice between these dichotomies definitely mystify the option in favor and tend to obscure the other.

**Ranking culture in higher education**

The main purpose this paper is to display an empirical evidence for the inseparable nature of research and teaching in higher education. In order to fulfil this purpose Times Higher Education (THE) World University Rankings 2016-17. There are other and perhaps better rankings: Academic Ranking of World Universities (ARWU), Leiden University, Quacquarelli Symonds (QS), Scimago, U-Multirank are the ones known by the author. New rankings appear quite often, and experts are improving the present ones. International Ranking Expert Group (IREG) evaluates and certifies these ranking systems (Marginson, 2014, Pratt, 2010). Shortly there are rankings for the university ranking systems. Marginson lists eight criteria for evaluating the university rankings: These are materiality, objectivity, externality, comprehensiveness, particularity, ordinal proportionality, performance alignment and transparency (Marginson, 2014; p.48). The reasons for choosing THE-WUR in this study were so practical: timeliness, convenience and availability just before the publication opportunity. Shanghai Academic Ranking of World Universities (ARWU) has been published in 2003. European Universities' Association responded to Global University Rankings. First of the eight main conclusions in this report ends as follows:

**Since the emergence of global rankings, universities have been unable to avoid national and International comparisons, and this has caused changes in the way universities function (Rauhvargers, 2011, p. 68).**

Almost all of the intellectuals are against the "horse race" among the universities. They scorn the ranking criteria for being narrow and irrelevant with respect to the social and intellectual values of academia. "University Olympics" perpetuates the advantageous positions of leading universities. Universities are not as competitive as political parties to earn prestige at the expense of others. Egalitarian values still prevail in higher education. This is not to deny the existence of stratification of higher institutions. There are inter- institutional differences among the universities in every country. There are also inter-individual differences among students and researchers. These unequal competencies ends up with hierarchical structure and challenge whether we like it or not. These are the main reasons why the ranking culture sustains. It is impossible to avoid it but it is possible and desirable to obtain comparative information for the common concern may be just for curiosity (Savaş & Baykal, 2011).

**Conjugate qualities: Teaching and Research**

The false dichotomy is not a dilemma that implies two negative options. Conjugate qualities or entities are two polarities that may exist together in some proportions as to complement each other. Opposing them with each other and compelling a forced choice between the two is a case of false dichotomy. Research is the primary criterion of performance in academia. All academicians try to improve their ranks on the basis of research performance. Research gains the highest priority also in ranking the universities. Teaching is of secondary importance in collegial stance. However, universities are responsible to enable their students to reconstruct available knowledge; more than that to enable them to produce novel information. This is the binding force between research and teaching.

**METHOD**

Data is directly obtained from the web-site of Times Education World University Ranking. On the Original data matrix rows indicate the universities. Columns indicate some information relevant to theranking.

Table1 represents a segment from the original data matrix obtained from THE-2017. Additional columns were inserted all along the analysis. Some columns which are not used in this study have been deleted.

  

Table 1. Data matrix for analysis

| RN | Name | Country | Teachin | Researc | Citation | Incom | Outloo |
|---|---|---|---|---|---|---|---|
| 1 | University of Oxford | United | 89,6 | 99,1 | 99,2 | 62,5 | 94,5 |
| 2 | California Institute of | United States | 95,5 | 95,7 | 99,8 | 90,8 | 63,4 |
| 3 | Stanford University | United States | 92,6 | 95,9 | 99,9 | 60,9 | 76,5 |
| 4 | University of Cambridge | United | 90,6 | 97,2 | 96,8 | 50,4 | 92,4 |
| | ….. | | ….. | ….. | ….. | ….. | ….. |
| 979 | University of Zagreb | Croatia | 20,4 | 11,6 | 17,1 | 44,6 | 25,4 |
| 980 | University of Zanjan | Iran | 12,5 | 8,5 | 7,7 | 34,3 | 15,3 |
| 981 | University of Łódź | Poland | 15,9 | 8,3 | 14,1 | 32,3 | 21,5 |

Essential descriptive statistics have been will be given to quantify the central tendency and the dispersion characteristics of observations. Correlational inferences are made between the variables. Comparative statistical methods are employed to test the significances between the means of independent samples. These methods will be revealed when they are relevant to the findings in the next coming sections.

## FINDINGS

In this section descriptive and inferential information extracted from THE-2017 World University Ranking will be presented.

### Universities and their countries

Countries parade on Table 2 with respect to the number of (N) universities took place in the THE-2017 World University Ranking. There are 148 universities from the United States on the chart. This is a greater number than the sum of 50 countries that appear at the bottom of the list. There are almost 120 countries shows up in United Nation's reports. Only 80 of all countries emerge on THE-2017 rank chart. This simple figure is enough to delineate the inequality in education on the globe.

Table 2. Frequency of Universities across Countries in THE 2017 University Rankings

| Country | N | Country | N | Country | N | Country | N | Country | N |
|---|---|---|---|---|---|---|---|---|---|
| United States | 148 | Germany | 41 | Finland | 9 | Norway | 5 | Algeria | 1 |
| United | 91 | Italy | 38 | Ireland | 9 | Romania | 4 | Argentina | 1 |
| Japan | 69 | Australia | 35 | Poland | 9 | Saudi Arabia | 4 | Belarus | 1 |
| China | 52 | India | 31 | Thailand | 9 | Ukraine | 4 | Bulgaria | 1 |
| | | France | 29 | Belgium | 8 | Colombia | 3 | Costa Rica | 1 |
| | | Brazil | 27 | Egypt | 8 | Jordan | 3 | Croatia | 1 |
| | | Spain | 27 | New | 8 | Morocco | 3 | Georgia | 1 |
| | | Canada | 26 | Portugal | 8 | United Arab | 3 | Ghana | 1 |
| | | Taiwan | 26 | South | 8 | Cyprus | 2 | Iceland | 1 |
| | | South Korea | 25 | Denmark | 7 | Estonia | 2 | Kenya | 1 |
| | | Russian | 24 | Hungary | 7 | Indonesia | 2 | Kuwait | 1 |
| | | Turkey | 17 | Malaysia | 7 | Latvia | 2 | Lebanon | 1 |
| | | Iran | 13 | Mexico | 7 | Lithuania | 2 | Luxembourg | 1 |
| | | Netherlands | 13 | Pakistan | 7 | Singapore | 2 | Macao | 1 |
| | | Czech | 12 | Austria | 6 | Slovakia | 2 | Nigeria | 1 |
| | | Sweden | 11 | Greece | 6 | Slovenia | 2 | Northern | 1 |
| | | Chile | 10 | Hong | 6 | Tunisia | 2 | Oman | 1 |
| | | Switzerland | 10 | Israel | 6 | Venezuela | 2 | Philippines | 1 |
| | | | | | | | | Qatar | 1 |
| | | | | | | | | Serbia | 1 |
| | | | | | | | | Sri Lanka | 1 |
| | | | | | | | | Uganda | 1 |

### Inequality within the 981 universities

In order to be able to make some inferences 981 universities have been subdivided to 10 bands almost equal in size (99 on the top, 81 at the bottom and 100 in each of the 8 strata in the middle). Also 981 universities have been classified with respect to their continental location on the earth. Then 981 universities have been cross-tabulated with respect to these two different classification scheme. Table 3 quantifies this picture.

  

Table 3: Cross-tabulation of universities with respect to rank strata vs. continents in THE 2017

| Rank-Band | Africa | Asia | Western | Eastern | North | South | Oceania | Total |
|---|---|---|---|---|---|---|---|---|
| 1-99 | 0 | 11 | 39 | 0 | 43 | 0 | 6 | 99 |
| 100-199 | 2 | 7 | 59 | 2 | 27 | 0 | 3 | 100 |
| 200-299 | 0 | 11 | 45 | 1 | 29 | 1 | 13 | 100 |
| 300-399 | 0 | 11 | 49 | 7 | 26 | 0 | 7 | 100 |
| 400-499 | 2 | 18 | 44 | 9 | 15 | 3 | 9 | 100 |
| 500-599 | 1 | 29 | 32 | 8 | 20 | 5 | 5 | 100 |
| 600-699 | 2 | 45 | 25 | 11 | 4 | 12 | 1 | 100 |
| 700-799 | 2 | 54 | 21 | 12 | 8 | 3 | 0 | 100 |
| 800-899 | 5 | 53 | 5 | 19 | 1 | 17 | 0 | 100 |
| 900-982 | 3 | 42 | 5 | 20 | 1 | 11 | 0 | 82 |
| 1-982 | 17 | 281 | 324 | 89 | 174 | 52 | 44 | 981 |

Contingency coefficient between vertical stratification and the geographical location was found to be significant (C=0,472; p<0,001) for this cross-tabulation. North American, Western European and Australian universities are usually on the top strata. Eastern European, Asian and South Americans are usually at the bottom African universities

Ranking is an ordinal level measurement to discriminate the subjects observed with respect to a pre- specified criterion. THE-2017 ranks the countries with respect to an "Overall" point-score obtained by assigning differential weights to point-scores for 5 criteria namely Teaching, Research, Citations, Industrial Income and International Outlook. Table 4 displays the major descriptive measures for different criteria used in rankings with respect to the strata (rank-bands).

Table 4. Means and standard deviations of ranking criteria

| Strata | Statistics | Teaching | Research | Citations | Income | Outlook |
|---|---|---|---|---|---|---|
| 1 | Mean | 63,2 | 69,1 | 88,6 | 60,5 | 68,4 |
| | Std. Deviation | 15,2 | 15,4 | 10,3 | 21,9 | 19,1 |
| 2 | Mean | 41,2 | 41,0 | 80,9 | 52,9 | 67,3 |
| | Std. Deviation | 8,2 | 7,3 | 11,4 | 19,3 | 19,1 |
| 3 | Mean | 34,1 | 31,5 | 71,5 | 52,6 | 59,1 |
| | Std. Deviation | 8,2 | 9,7 | 13,8 | 18,4 | 20,3 |
| 4 | Mean | 28,7 | 24,8 | 64,1 | 44,0 | 56,3 |
| | Std. Deviation | 7,0 | 7,2 | 12,5 | 14,8 | 19,8 |
| 5 | Mean | 26,6 | 20,9 | 54,4 | 44,5 | 48,9 |
| | Std. Deviation | 7,8 | 7,5 | 14,8 | 16,5 | 20,8 |
| 6 | Mean | 23,6 | 18,7 | 44,0 | 46,1 | 45,1 |
| | Std. Deviation | 5,9 | 6,0 | 10,8 | 18,7 | 20,9 |
| 7 | Mean | 21,5 | 14,8 | 28,1 | 40,6 | 37,4 |
| | Std. Deviation | 6,4 | 5,3 | 9,9 | 12,6 | 20,6 |
| 8 | Mean | 22,1 | 14,5 | 28,0 | 41,3 | 34,8 |
| | Std. Deviation | 5,6 | 5,2 | 10,2 | 14,3 | 17,1 |
| 9 | Mean | 18,4 | 9,1 | 12,8 | 37,2 | 27,8 |
| | Std. Deviation | 4,7 | 3,1 | 6,0 | 13,6 | 12,5 |
| 10 | Mean | 18,7 | 9,7 | 12,7 | 36,8 | 24,9 |
| | Std. Deviation | 3,9 | 2,2 | 6,8 | 11,7 | 11,1 |
| Total | Mean | 30,0 | 25,7 | 49,1 | 45,8 | 47,4 |
| | Std. Deviation | 15,2 | 19,0 | 28,2 | 18,0 | 23,6 |

In order to avoid error of isomorphism these quantities for different "qualities" will not be compared by statistical operations. Instead all of the means of different ranking criteria can be compared one between the different strata.

**Are there significant differences between the strata of THE 2017 ranking?**

One way ANOVA for independent groups is used to answer the sub-title question. The answer is "Yes". There are significant differences between the means of "Teaching" scores obtained for 10 different strata. The same is true for all the other ranking criteria namely Research, Citations, Income and Outlook.

Table 5 summarizes these 5 findings.

  

Table 5. One way ANOVA findings for the mean comparisons between 10 strata

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Teaching | 165981,8 | 9 | 18442,4 | 294,0 | 0,000 |
| Research | 293334,8 | 9 | 32592,8 | 536,6 | 0,000 |
| Citations | 662986,1 | 9 | 73665,1 | 605,5 | 0,000 |
| Income | 50286,4 | 9 | 5587,4 | 20,4 | 0,000 |
| Outlook | 211748,9 | 9 | 23527,7 | 68,4 | 0,000 |

Table 6 shows the results of post-hoc test (S-N-K) made to identify the homogeneous sub-sets in Teaching.

Table 6. Homogeneous subsets (strata) for the ranking criterion: Teaching

| Strata | Rank-Band | Means for groups in homogeneous subsets | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9 | 800-899 | 18,4 | | | | | | |
| 10 | 900-982 | 18,7 | | | | | | |
| 7 | 600-699 | 21,5 | 21,5 | | | | | |
| 8 | 700-799 | 22,1 | 22,1 | | | | | |
| 6 | 600-699 | | 23,6 | 23,6 | | | | |
| 5 | 500-599 | | | 26,6 | 26,6 | | | |
| 4 | 400-499 | | | | 28,7 | | | |
| 3 | 300-399 | | | | | 34, l | | |
| 2 | 200-299 | | | | | | 41,2 | |
| 1 | 1-99 | | | | | | | 63,2 |

p < 0.001

Table 6 implies that 10 strata can be reduced to 7 distinct layers in Teaching quality for 981 universities. Fist top three strata are really distinct groups. Last 4 strata can be combined as the lowest in Teaching.

Table 7 shows the results of post-hoc test (S-N-K) made to identify the homogeneous sub-sets in Research. Table

7. Homogeneous subsets (strata) for the ranking criterion: Research

| Strata | Rank-Band | Means for groups in homogeneous subsets | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 |
| 9 | 800-899 | 9,1 | | | | | | |
| 10 | 900-982 | 9,7 | | | | | | |
| 8 | 700-799 | | 14,5 | | | | | |
| 7 | 600-699 | | 14,8 | | | | | |
| 6 | 500-599 | | | 18,7 | | | | |
| 5 | 400-499 | | | 20,9 | | | | |
| 4 | 300-399 | | | | 24,8 | | | |
| 3 | 200-299 | | | | | 31,5 | | |
| 2 | 100-199 | | | | | | 41,0 | |
| 1 | 1-99 | | | | | | | 69,1 |

p < 0.001

Table 7 displays a very clear distinction between 7 homogeneous subsets. Top 4 strata are all different from each other. Down below 6 strata there are three distinct levels comprised of 2 successive strata in each.

  

Table 8 shows the results of post-hoc test (S-N-K) made to identify the homogeneous sub-sets in Citation. Table

8. Homogeneous subsets (strata) for the ranking criterion: Citation

| Strata | Rank-Band | Means for groups in homogeneous subsets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| 10 | 900-982 | 12,7 | | | | | | | |
| 9 | 800-899 | 12,8 | | | | | | | |
| 8 | 700-799 | | 28,0 | | | | | | |
| 7 | 600-699 | | 28,1 | | | | | | |
| 6 | 500-599 | | | 44,0 | | | | | |
| 5 | 400-499 | | | | 54,4 | | | | |
| 4 | 300-399 | | | | | 64,1 | | | |
| 3 | 200-299 | | | | | | 71,5 | | |
| 2 | 100-199 | | | | | | | 80,9 | |
| 1 | 1-99 | | | | | | | | 88,6 |

$p < 0.001$

Table 8 shows that there are 8 homogeneous subsets. Top 6 strata are all significantly different from each other. Down below 4 strata there are two distinct levels comprised of 2 successive strata in each.

Table 9 displays post-hoc (S-N-K) results made to identify the homogeneous sub-sets in Industrial Income. Table

9. Homogeneous subsets (strata) for the ranking criterion: Industrial Income

| **Strata** | Rank-Band | Means for groups in homogeneous subsets | | |
|---|---|---|---|---|
| | | 1 | 2 | 3 |
| **10** | 900-982 | 36,8 | | |
| **9** | 800-899 | 37,2 | | |
| **8** | 700-799 | 40,6 | | |
| **7** | 600-699 | 41,3 | | |
| **6** | 500-599 | 44,0 | 44,0 | |
| **5** | 400-499 | 44,5 | 44,5 | |
| **4** | 300-399 | 46,1 | 46,1 | |
| **3** | 200-299 | | 52,6 | 52,6 |
| **2** | 100-199 | | 52,9 | 52,9 |
| **1** | 1-99 | | | 60,5 |

$p < 0.001$

Table 9 shows that there are only 3 relatively homogeneous subsets. Top first stratum is obviously different than all the others. Lowest 4 strata are also significantly lower than all the others. 5 strata in the middle may change their positions. Second and third strata are quite lose to the top. Fourth, fifth and sixth strata are not very much different than the lowest 4 strata. The best way is to consider all of them as the mid-stratum.

Table 10 displays post-hoc (S-N-K) results made to identify the homogeneous sub-sets in Outlook.

  

Table 10. Homogeneous subsets (strata) for the ranking criterion: International Outlook

| Strata | Rank-Band | Means for groups in homogeneous subsets | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
| **10** | 900-982 | 24,9 | | | | | | | |
| **9** | 800-899 | 27,8 | 27,8 | | | | | | |
| **8** | 700-799 | | 34,8 | 34,8 | | | | | |
| **7** | 600-699 | | | 37,4 | 37,4 | | | | |
| **6** | 500-599 | | | | 45,1 | 45,1 | | | |
| **5** | 400-499 | | | | | 48,9 | 48,9 | | |
| **4** | 300-399 | | | | | | 56,3 | 56,3 | |
| **3** | 200-299 | | | | | | | 59,1 | 59,1 |
| **2** | 100-199 | | | | | | | | 67,3 |
| **1** | 1-99 | | | | | | | | 68,4 |
| p < 0.001 | | | | | | | | | |

In so far as International Outlook is concerned Table 10 indicates that the highest two and the lowest strata are different than all the others at two opposite extremes. The neighboring strata however can be combined in pairs in the middle.

**Is there a significant rank order pattern within the criteria across the universities?**

The null-hypothesis underlying the question as the sub-title has been tested by the non-parametric Friedman analysis of variance method. Friedman test statistics Chi-Square has been found to be 1404,51 (p<0,001). Table 11. Displays the rank order pattern of ranking criteria

Table 1. Rank pattern of ranking criteria

| Ranking Criteria | Mean Rank |
|---|---|
| Income | 3,73 |
| Outlook | 3,63 |
| Citations | 3,65 |
| Teaching | 2,32 |
| Research | 1,67 |
| p<0,001 | |

Table 11 has been transformed into a radar graph in Figure 1 to facilitate the interpretations.

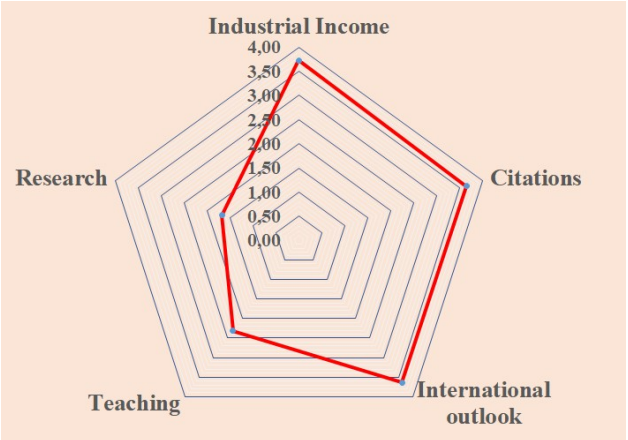


Figure 1: Within university rankings of scores on 5 criteria

  

**Are there significant interrelations between the ranking criteria in THE-2017 university ranking?** Inter-correlations between the pairs of ranking criteria have been computed with the Pearson Product Moment correlation formula and displayed on Table 12.

Table 12. Pearson correlations between 5 fundamental criteria used in THE 2017 Ranking

| Criteria X | Criteria Y | 1-99 | 100-199 | 200-299 | 300-399 | 400-499 | 500-599 | 600-699 | 700-799 | 800-899 | 900-982 | 1-982 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| Teachin | Researc | **,882**$^{**}$ | **,468**$^{**}$ | **,478**$^{**}$ | **,520**$^{**}$ | **,614**$^{**}$ | **,246**$^{*}$ | **,299**$^{**}$ | **,236**$^{*}$ | ,153 | ,153 | ,906* |
| Teachin | Citation | **,273**$^{**}$ | - | - | - | - | - | - | - | - | - | ,598* |
| Teachin | Income | -,035 | **,206**$^{*}$ | **,245**$^{*}$ | **,320**$^{**}$ | **,421**$^{**}$ | **,356**$^{**}$ | ,085 | ,185 | ,115 | ,043 | ,400* |
| Teachin | Outloo | -,058 | - | - | - | - | - | - | - | -,123 | -,124 | ,330* |
| Researc | Citation | ,180 | - | - | - | - | - | - | - | ,114 | ,071 | ,664* |
| Researc | Income | ,024 | **,287**$^{**}$ | **,278**$^{**}$ | **,403**$^{**}$ | **,380**$^{**}$ | **,462**$^{**}$ | **,365**$^{**}$ | **,532**$^{**}$ | **,550**$^{**}$ | **,447**$^{**}$ | ,445* |
| Researc | Outloo | ,092 | -,137 | - | -,028 | -,071 | -,165 | - | -,154 | ,003 | ,074 | ,459* |
| Citation | Income | - | - | - | - | - | - | -,132 | - | -,053 | ,148 | ,223* |
| Citation | Outloo | ,160 | ,064 | **,210**$^{*}$ | -,108 | -,132 | -,062 | ,042 | ,049 | ,169 | -,096 | ,579* |
| Income | Outloo | -,033 | -,231$^{*}$ | -,202$^{*}$ | -,166 | -,220$^{*}$ | -,171 | - | **-,237**$^{*}$ | ,004 | -,152 | ,104* |

** p < 0.001 * p<0.005

The degree of relationship between Research and Teaching is summarized by the Pearson product moment correlation coefficient obtained from the scores given in THE 2017 University Rankings. One should consider the causes changing the magnitude and the direction of the correlation coefficient. These factors may misguide the reader to overestimate or underestimate the findings.

Here the sample is the top 982 universities to estimate the correlation which exists in the population of all higher institutions in the world. Obviously, the accuracy of the correlation as an estimate of a population value depends upon how representative the sample is of the population. When certain biases exist in the sample the correlation may be a distorted estimate of the population value.

First of all the size of correlation is a function of the relative values of variances of scores given for Research and Teaching. Therefore, if the degree of clustering about the regression line was fairly constant over all segments of the line, then as the range and thus the variance of the Research or Teaching or both are reduced, the correlation will be reduced. Since the ranked sample of universities is circumscribed, the correlation is most probably less than it could be if the complete range of tertiary institutions were sampled. It will be safer to limit the evaluation of a correlation to the population from which the sample was drawn. Also the scores for Research is most likely correlated with some other criteria such as citations, outlook and industrial income etc. A high degree of relationship between these attributes and the Teaching would suggest that Teaching is a valid indicator of Research quality. It is found that the correlation between Research and Teaching is high for the entire sample. On the basis of this information about relevancy one may propose to promote Research on all universities to single out those universities who need to promote their instruction. However, when the sample is restricted to only a one stratum of rank list, this suggestion may not be nearly as valid as it was for the entire sample. Perhaps, the correlation is much smaller for such sub-strata, a figure which would certainly discourage using the findings for that particular purpose.

**Effects of sub-sample configurations on resultant correlations**

In order to interpret the correlational findings in Table XXX some specific features of correlation coefficient especially Pearson product moment formula must be remembered and considered.

  

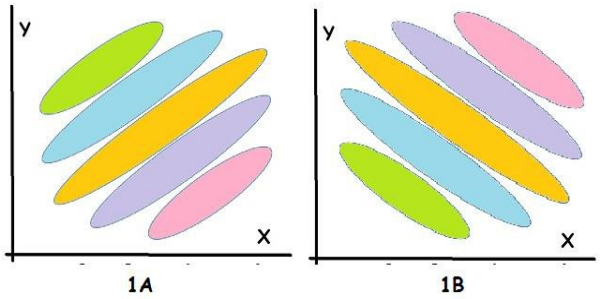


Figure 2.1 Combined group effects: How resultant R approximates to zero with significant correlations in sub-samples

1. In Figure 2.1A there are 5 different sub-samples illustrated with colored elliptic scatterplots. The correlations between X and Y for these sub-samples are all defined as to have been significantly positive (r >> 0). When the samples are aligned as shown in 1A the resultant correlation R might as well approximate to zero
2. In Figure 2.1B there are 5 different sub-samples illustrated with colored elliptic scatterplots. The correlations between X and Y for these sub-samples are all defined as to have been significantly negative (r << 0). When the samples are aligned as shown in 1B the resultant correlation R might as well approximate to zero.

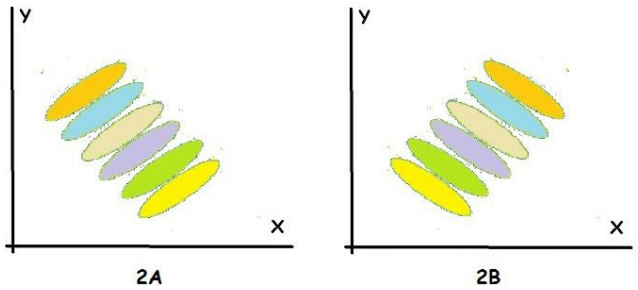


Figure 2.2. Combined group effects: How resultant R may assume significance with significant sub-sample correlations in opposite direction

3. In Figure 2.2A there are 6 different sub-samples illustrated with colored elliptic scatterplots. The correlations between X and Y for these sub-samples are all defined as to have been significantly positive (r>> 0). When the samples are aligned as shown in 2A the resultant correlation R is likely to assume negative correlation significantly high in magnitude.
4. In Figure 2.2B there are 6 different sub-samples illustrated with colored elliptic scatterplots. The correlations between X and Y for these sub-samples are all defined as to have been significantly negative (r << 0). When the samples are aligned as shown in 2B the resultant correlation R is likely to assume positive correlation in significant size.

  

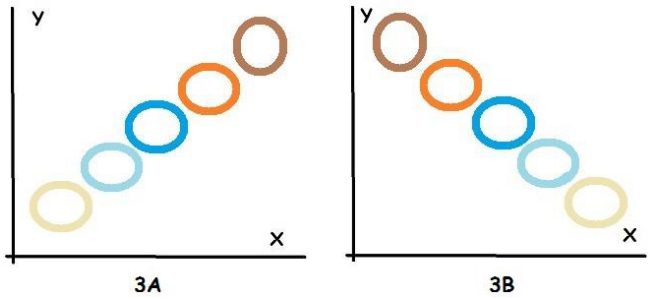


Figure 2.3. Combined group effects: How resultant R may assume significance in both directions with non-significant sub-sample correlations

5. In Figure 2.3A there are 5 different sub-samples illustrated with colored circular scatterplots. The correlations between X and Y for these sub-samples are all defined as to have been zero (r = 0.00). When the samples are aligned as shown in 2A the resultant correlation R is likely to assume ***positive*** correlation in significant size.
6. In Figure 2.3B there are 5 different sub-samples illustrated with colored circular scatterplots. The correlations between X and Y for these sub-samples are all defined as to have been zero (r = 0.00). When the samples are aligned as shown in 2B the resultant correlation R is likely to assume ***negative*** correlation in significant size.

One can generate so many other examples to demonstrate how combined group combinations might yield unpredictable resultant correlations between two variables. In Table 12 the overall correlations between the ranking criteria are all positive and high ($p<0,001$), but within different strata they are not all alike.

**CONCLUSIONS**

The major purpose of this modest study is to find out evidence for two important attributes of higher education institutions: Teaching and Research. If not in the literature in daily communication among colleagues Teaching vs. research is taken for granted as a forced choice higher education. This study is a challenge against this global false dichotomy. There is no hidden agenda, no pedantic advice behind the exploration of cross-country rankings. What is beyond the scope of this study is to extract information to enlighten the university administrators. There is no intention to highlight the features of high rank universities to suggest better practices for the others. International students will find neither overt nor covert cues about the merits of top universities.

Some correlational and comparative inferences were made on the data provided by THE World University Ranking. Correlations and comparisons have been displayed for the subgroups separately as well as for the whole bunch of institutions.

The objective of this study is to analyze the Teaching and Research scores of universities in THE World University Ranking. Obviously Teaching and Research have their own unique qualitative characteristics, functions, restrictions in higher education. Quantitatively the comparative and correlational findings posed clearly that Teaching and Research are inseparable dimensions. They do not alternate but complement each other. They do not overlap each other, they are not redundant, but they do not oppose each other either.

The top 981 universities is not a representative sample of all institutions in tertiary education on the globe. However they are the institutions who set the universal standards. In a way they are the role models for the others. Besides these defensive excuses the main determinant of the sampling choice is the practical reality. A very valuable data was readily available for analysis. Much further than that whatever could have been done will always be open to public criticism.

  

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