



Samuel Neaman Institute
for National Policy Research

Higher Education

World University Rankings: An Updated Comparative View

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Executive Summary

Due to the vast interest and the great influence of global university rankings, many studies have been published on this subject in recent years, some of these studies deal particularly with comparative analysis of the various ranking systems.

The object of this study is to present an updated comparative view of global university rankings, and particularly – to examine the status of Israel universities in these rankings. Various issues related to the prominent ranking systems are discussed, and updated results obtained by the following 5 systems are presented and compared:

- **ARWU** – Academic Ranking of World Universities (**Shanghai**).
- **THE** – Times Higher Education World University Ranking (**UK**).
- **QS** – Quackuarely Symonds World University Ranking (**UK firm**).
- **LEIDEN** – The Centre for Science and Technology Studies at Leiden University.
- **WEBOMETRICS** – ranking of world universities by Cybermetrics Lab (**CCHS**).

The discussed issues include topics such as – critique, defects, deficiencies, methodological issues, effect of research, opinion-based surveys, geographical bias and more. Various results obtained by the individual ranking systems are presented, and the differences, similarities and correlation of the results – are discussed.

Considering the **ARWU**, **THE**, **QS** rankings, the following main results are presented:

- **World Region Rankings.** The order of the numbers of the best 100 universities according to the ranking systems is as follows:
America – **ARWU-THE-QS**, Europe – **THE-ARWU-QS**, Asia – **QS-THE-ARWU**.
These results can be interpreted as geographical bias:
ARWU – towards America, **THE** – towards Europe, **QS** – towards Asia.
- **Country Rankings.** The results show that there are moderate to high degrees of correlation among the various rankings. The exceptional differences are as follows:
ARWU: High rankings – US, Switzerland, Denmark, Belgium, Israel.
THE: High rankings – Germany, Netherlands. Low rankings – Japan.
QS: High rankings – GB, Japan, China, Singapore, Korea, Hongkong.
Low rankings – Canada, Germany, Netherlands, France, Sweden.
- **Israel university Rankings.** Considering the three longest established and most influential ranking systems – **ARWU**, **THE**, **QS** – it is shown that the highest positions of Israel universities are by **ARWU**, followed by the **QS** and the **THE** rankings.
Considering the **ARWU** rankings, which emphasizes only academic achievements, the following results are observed for the period 2012-2019:
 - 4 Israeli universities are ranked among the world best 200 universities.
 - During this period, the **Technion** is among the best 100 universities – each year, the **Hebrew University** – most of the years, and the **Weizmann Institute** – some years.
 - During this period, there is a clear trend of deterioration of the **Hebrew University**, the **Weizmann Institute** and **Tel Aviv University**.

1. Introduction

1.1 General Background

Globalization processes of higher education increased the mobility of students and scholars and resulted in strong competition for this market. The global ranking phenomenon is a result of increasing globalization of higher education and massive competition for funding and talented faculty, researchers and students, as well as changing universities' roles in knowledge-based economy. Due to these processes, and the need for information on academic quality and the demand for international comparisons, world university ranking systems have been developed significantly during recent years. The global rankings have become an important business for all stakeholders, as well as for international higher education. They can be used to enhance and promote economic competitiveness of higher education systems and nations.

The university rankings have an increasing influence on the higher education landscape in recent years, they enjoy a high-level acceptance among stakeholders and the wider public, because of their simplicity and consumer type information. The academic rankings provide valuable information, they have a great influence on the reputation of the institute and on the behavior of students, academics, donors, administrators and even governments.

One example of the importance of global rankings is the Lisbon strategy, launched by the EU heads of states: "European universities must be able to compete with the best in the world through the completion of the European Higher Education and Research Area be fully open to the world and that Europe's universities aim to become worldwide competitive players".

There is no doubt that rankings have an effect not only on higher education, but also on some socio-economic and cultural sectors – which are influenced. University rankings have evolved beyond their expectations, but there is a tendency to give them a greater meaning than their data allows. It is expected that their influence will grow even more, although there are still those who underestimate their effect on high education. Government agencies consider rankings in assessing achievements, a good place in ratings can affect decision-makers on financing and attracting scholars and students. Rankings create international league of research universities based on world information system, in which the variance will continue and evolve. Universities promote strategies for improving their positions in the rankings, some of them do it explicitly.

Various approaches to evaluate excellence have been developed. They use different criteria and indicators such as reputation, research, innovation and knowledge transfer, teaching and learning, international outlook and orientation, relevance and employability, resources and funds, scientific activity on website.

The various models of academic rankings of universities have different goals, they differ in their usefulness, their relevance and more. The rankings are used for a variety of purposes, they attract a great deal of attention and interest in the entire world, they cannot be neglected. Many decision makers believe that despite the flaws that exist in the ratings, the distributed information will help to repair them and bring improvements.

There is no ideal global ranking until now. They can have positive aspects in terms of teaching improvement, research collaborations, academic and student exchanges, transparency, accountability, increasing competitiveness and academic quality, and more.

But there is a tendency to give the rankings greater meaning than their data allows. Moreover, the rankings are a controversial subject, they have been intensely debated. There are various notable defects and deficiencies, all of them are criticized in one way or another by professionals. Despite their shortcomings, evident biases and flaws, the importance of the rankings is because they are developed to stay.

1.2 The Present Study

Due to the vast interest and the great influence of global university rankings, many studies have been published on this subject in recent years, some of these studies deal particularly with comparative analysis of the various ranking systems, i.e. [1-5]. Some aspects related to Israel Universities are discussed in previous studies by the author [6-10].

The object of this study is to present an updated comparative view of global university rankings, considering 5 prominent ranking systems, and particularly – to examine the status of Israel universities in these rankings. The following issues and topics are presented and discussed:

- **Chapter 2 – Global Ranking Systems.** The 5 prominent ranking systems considered in this study are described, general issues related to university ranking are discussed, and some issues related to the prominent systems and discussed in previous comparative studies – are presented.
- **Chapter 3 – World Region Ranking Results.** World geographical region rankings by the 5 systems described in chapter 2 – and related to the numbers of best 100 universities – are presented and compared.
- **Chapter 4 – Country Ranking Results.** Country rankings by the above systems – and related to the numbers of best 100 universities – are presented and compared.
- **Chapter 5 – Israel University Ranking Results.** Israel university rankings by the above systems are presented and compared.
- **Chapter 6 – References.** A list of references is presented.

2. Global Ranking Systems

Global university ranking systems order universities by combinations of few simple indicators. The ranking is an a-priori weighting system, where different models are considered for different weightings of variables. All ranking systems select a range of easily quantifiable characteristics to base their results on, research performance is a central issue in all the systems. None of the ranking systems give a comprehensive overview of the strengths of the institutions ranked.

Due to financial and other interests, the rankings have received increased attention recently. There are large differences in the rankings of the various institutions, as a result of the different criteria and data sources. Several organizations produce worldwide university rankings, in this study results of 5 prominent ranking systems are presented, discussed and compared.

In section 2.1 the 5 prominent ranking systems considered in this study are described. General issues related to university ranking are discussed in section 2.2, including methodological issues, defects and deficiencies, effect of research, reputation and opinion-based surveys. Some issues related to the prominent ranking systems – considered in this study and discussed in previous comparative studies – are presented in section 2.3.

2.1 Prominent Systems

1. **ARWU [11] – Academic Ranking of World Universities**, by the Center of World Class Universities at Shanghai Jiao Tong University. The **ARWU** ranking system has provided annual global rankings of universities since 2003, making it the earliest of its kind. This system, also known as the Shanghai Ranking, is regarded as one of the three most influential and widely observed university rankings.

The **ARWU** system is based on excellence academic achievements, using a composite of 6 indicators, based on the **Web of Science [16]** data base. Among other criteria, it includes the number of articles published in **Nature** or **Science**, and the number of Nobel Prize winners and Fields Medalists (in Mathematics). **ARWU** methodology is based on the following criteria, indicators and weightings:

Criterion	Indicator	Weighting
Quality of education	Alumni Nobel laureates & Fields Medalists	10%
Quality of faculty	Staff Nobel Laureates & Fields Medalists	20%
	Highly cited researchers in 21 broad subjects	20%
Research output	Papers published in <i>Nature</i> and <i>Science</i>	20%
	Papers in Sci. and Social Sci. Citation Indices	20%
Per capita performance	Per capita performance of an institution	10%

2. **THE [12] – Times Higher Education World University Ranking.** From 2004 to 2009 **THE** published the annual **THE World University Rankings** in association with **Quacquarelli Symonds (QS)**. In 2009, **THE** broke with **QS** and joined the **Web of Science [16]** data base, to provide a new set of world university rankings. In 2010 **THE** proposed a new ranking methodology, based on the following indicators:

Indicator	weighting
Industry Income – innovation	2.5%
International diversity	5%
Teaching – learning environment	30%
Research – volume, income, reputation	30%
Citations – research influence	32.5%

3. **QS [13] – Quacquarelli Symonds World University Ranking.** The **QS** rankings (**UK firm**) are published annually since 2004. From 2004 to 2009 these rankings were published in collaboration with **THE**, from 2010 **QS** assumed sole publication of rankings. The **QS** rankings use peer review data collected from many scholars, academics and recruiters. Both **THE** and **QS** are mainly focused on reputation and internationalization, using surveys. The **QS** ranking methodology is based on six broad overall indicators, a significant part of which (40%) is based on peer review data:

Indicator	Weighting	Elaboration
Academic peer review	40%	Internal global academic survey
Faculty/Student ratio	20%	A measurement of teaching commitment
Citations per faculty	20%	A measurement of research impact
Employer reputation	10%	Survey on graduate employers
International student ratio	5%	Diversity of the student community
International staff ratio	5%	Diversity of the academic staff

4. **LEIDEN [14] – The Centre for Science and Technology Studies at Leiden University.** This ranking was produced in 2007, it maintains a European and worldwide ranking of the top 500 universities. The **LEIDEN** Rankings are based exclusively on bibliometric indicators. It ranks universities worldwide by number of academic publications according to the volume and citation impact of the publications at those institutions, based on the **Web of Science [16]** data base.

The rankings compare research institutions by considering differences in language, discipline and institutional size. Multiple ranking lists are released according to various bibliometric normalization and impact indicators, including the number of publications, citations-per-publication, and field-averaged impact per publication.

The **LEIDEN** ranking provides the following indicators of scientific impact:

Symbol	Indicator
P	Total number of university publications
P (top 1%, top 5%, top 10%, top 50%)	Number of top cited field publications
PP (top 1%, top 5%, top 10%, top 50%)	Proportion of top cited publications
TCS/MCS	Total/average number of citations
TNCS/MNCS	Total/average no. of normalized citations

- 5. WEBOMETRICS [15].** This ranking of world universities started in 2004 by **Cybermetrics Lab (CCHS)**, a unit of the **Spanish National Research Council (CSIC)**, the main public research body in Spain. It offers information about more than 12,000 universities according to their web presence – an assessment of the scholarly contents, visibility and impact of universities on the web. The system is based on indicators that measure institutional commitment to web publications, including both the volume of the web content and the visibility and impact of web publications according to the number of external links they received.

2.2 General Issues

In this section general issues related to university ranking are discussed, including topics presented in previous studies on comparative analysis of university ranking systems [1-5]. In particular, various topics related to the 5 prominent ranking systems considered in this study – **ARWU [11], THE [12], QS [13], LEIDEN [14], and WEBOMETRICS [15]** – are presented, including critique, deficiencies, methodological issues, effect of research, opinion-based surveys, geographical bias, differences, similarities, correlation among the systems, and more.

To enhance the level of understanding and adequacy of interpretation of a ranking system's outcomes, it is important to be familiar with the various systems, and to get more insight into the differences between the various methodologies, especially on how their orientations influence the ranking positions of given institutions.

Based on comparative analysis of various ranking systems and indicators, it has been argued that it is difficult to obtain a comprehensive view by the current interfaces. The current systems are steel one-dimensional in the sense that they provide separate, seemingly unrelated indicator values, rather than offer a data set and tools to observe patterns in multi-faceted data. The various ranking methodologies do indeed measure different aspects, there is no single 'perfect' operationalization of academic excellence.

A ranking system distinguish itself from other rankings through the selection of institutions covered, the definition of how to derive ratings from raw data, the choice of indicators, and the application of normalization or weighting methodology. Each system has its proper orientation or 'profile', influencing the ranking positions of given institutions.

The various global rankings use different methodologies, different criteria, indicators, weights etc. Some of the indicators are similar, others – complement each other, the ranking results are affected by all of these.

A pronounced difference in the results is due to using different databases, different weights for research-based indicators, only quantitative data or both quantitative data and opinion-based indicators (explaining the low overlapping universities between **ARWU** and **QS**).

◀ Critique, Defects, Deficiencies

University rankings is a controversial subject, the rankings produced much debate about their usefulness and accuracy. The expanding diversity in rating methodologies and accompanying criticisms of each, indicate the lack of consensus in the field. There are various defects and deficiencies, all systems have been criticized by professionals in the academic literature [1-5].

UNESCO has questioned whether rankings do more harm than good, while acknowledging that rightly or wrongly, they are perceived as a measure of quality and so create intense competition between universities all over the world.

However, despite the criticism much attention is paid to global rankings, particularly **ARWU**, **QS**, and **THE**. Some countries use university rankings as part of points-based immigration programs, others automatically recognize degrees from higher-ranked universities, require foreign partners to be ranked in the top 500 of the **THE** or **ARWU** ranking, or select international partner institutions using the **THE** and **QS** rankings.

The critique falls primarily along the following lines.

- **Negative effects of rankings on the university conduct.** These include – pressures for high rankings, universities acting against their own values and their original vision, conflict or tension with other priorities of the university, manipulations of data in order to raise the universities ranking, and more.
- **Methodological Issues and technical problems.** Some of the criticisms include incorrect data, statistical inaccuracies, non-appropriate metrics, irrelevant criteria, and more. In this regard, it should be noted that various details related to the methodology of some World University Rankings are not published.
- **Various other Issues.**

◀ Methodological Issues

Methodological issues discussed in previous studies include the following points:

- Weights assigned to indicators are arbitrary and reflect subjective decisions.
- The arbitrary combination of indicators of different aspects of university performance prevents a clear interpretation of the aggregate indicator.
- Assigning a single score to a university that does not accommodate the different missions of universities, the composite score can mask real excellence in specific fields or areas.

- Aggregation of indicators of various dimensions of university performance into a single composite indicator, results in publication of a league table.
- Similar or identical indicators from different ranking systems correlate only moderately.
- Some of the discrepancies among rankings are due to the difference of inclusion criteria – biomedical universities, university hospitals, graduate-only universities.
- There are conceptual and methodological debates on bibliometric issues.
- The **ARWU** is known for relying solely on research indicators, and the ranking is heavily weighted toward institutions whose faculty or alumni have won Nobel Prizes.
- One of the criticisms of **ARWU's** methodology is that it is biased towards the natural sciences and English language science journals, over other subjects. In addition, it does not measure the quality of teaching or the quality of humanities.
- The concerns and criticism of **THE** include undermining of non-science and non-English instructing institutions and relying on subjective reputation survey. Normalizations applied to some of the indicators (**THE** research and teaching performance) have severe effects on some institutions.
- The **QS** ranking has been criticized for its overreliance on subjective indicators and reputation surveys (40%), which tend to fluctuate over the years. Concern also exists regarding the global consistency and integrity of the data used to generate the results.
- The **LEIDEN** ranking criticized in the past for some methodological aspects, e.g. normalizing citation impact by subject field, and normalizing at a higher aggregation level, rather than at the level of individual publications.
- **WEBOMETRICS** is highly criticized for the unreliable sourcing, misrepresentation of the quality of education, bad web policies and bias technology for the individual ranks.

◀ Effect of Research

Global rankings are mainly research oriented (60-100%), the two main databases for collecting bibliometric data for indicators are **Web of Science [16]** and **Scopus [17]** data bases. Research is the most globalized activity in higher education and the research metrics are internationally comparable, based on objective quantitative criteria. Moreover, there is a positive relationship between research and economy growth success.

Whereas each ranking is reflecting different aspects of the university complexity, it has been found in previous studies that for world class universities – research performance is strongly correlated with global quality. In addition, when other factors are considered, such as excellence (prizes), prestige (survey), internationalization or community engagement – different scenarios may appear.

◀ Opinion-based Surveys

The validity of opinion-based surveys has been criticized, most experts are highly critical of the reliability of these surveys, which are based on simply asking a rather un-random group of educators and others involved in high education for their opinions.

It is argued that opinion-based indicators are subjective and questionable regarding the selection of reviewers, many of them are not familiar with all universities.

A major criticism is that international surveys of reputation are methodologically flawed, effectively they only measure research performance and they skew the results in favor of a small number of institutions.

The **QS** and **THE** rankings use opinion-based surveys, focused on reputation and international considerations. They collect data from many scholars, academics and recruiters. The weight of reputation indicators based on a subjective peer review by the three longest established and most influential global ranking systems is as follows: **QS** – 40%, **THE** – 33%, **ARWU** – 0%.

The use of opinion surveys on academic reputation by **QS** and **THE** leads to selection of elite universities only. Experts involved in the surveys usually cannot be regarded as knowledgeable experts in all parts of the evaluations. The use of self-reported data is problematic because of lack of standardized definitions and vulnerability to manipulation.

◀ Geographical and Institutional Bias

- The differences between global geographical regions might be mainly due to differences in excellence in those regions, or also due to the significant role of a regional indicator normalization. Previous studies show that there are substantial differences between the systems, in the distribution of institutions among geographical regions.
- Each system has a proper orientation or bias, **ARWU** towards North America, **LEIDEN** towards emerging Asian countries, and **QS** and **THE** towards Anglo-Saxon countries.
- There is bias in the direction of English language international publications and English-speaking countries, there is no consideration for a wide range of unique institutions.
- Overall institutional performance results in a bias toward comprehensively strong universities and comprehensive universities with medical schools.
- Such an approach to selection can miss world class programs or centers of excellence. It is well recognized that great differences exist in performance among researchers and programs within individual institutions.
- The analysis on the statistical relation between two reputation-based indicators of **QS**, **THE**, reveals the effect of the use of regional 'weightings' to counter discrepancies or unbalances upon the overall results.

2.3 Previous Comparative Studies

In this section some issues related to the prominent ranking systems – considered in this study and discussed in previous comparative studies – are presented.

- All systems claim to adopt a global viewpoint – **ARWU**, **THE** and **QS** explicitly speak of world universities, but they do not analyze the world in the same manner.
- There is no significant importance to the changes in the exact location in the ranking, but some rankings indicate unlikely fluctuations in a year-to-year location of universities.
- An overlap analysis shows that there is no such set as 'the' top 100 universities in terms of excellence, it depends on the ranking system used, different rankings might be preferred for various specific purposes.

- When considering factors that are mostly based on research performance, similarities among the rankings are high. Some of the discrepancies are due to the different inclusion criteria (biomedical universities, university hospitals, graduate-only universities).
- The ranking systems **ARWU**, **THE**, **QS** are the three longest established and most influential global systems, some of the main issues related to these systems are presented below.
- **ARWU** uses only quantitative data from open sources, both **QS** and **THE** are mainly focused on reputational surveys and include nonacademic indicators. Very high similarities were found between **ARWU** rankings for different years, much lower – for survey-based **THE-QS**.
- Different methods are applied to construct indicator scores from raw data, which means severe implications for the interpretation of the scores. **ARWU** and **QS** apply the method of normalizing the maximum (0-100), the **QS** adds for some indicators a cut-off, so that multiple institutions have score 100, the **THE** applies a percentile rank-based approach.
- Analysis on the statistical relation between two reputation-based indicators of **QS**, **THE** reveals the effect of the use of regional 'weightings' to counter discrepancies or unbalances upon the overall results (multiple tops, affected also by type of normalization).
- The degree of skewness is substantially affected by the way of calculating the indicator scores from the raw data. Investigating the skewness of indicator distributions show that **ARWU** indicators have the highest skewness, followed by **THE** indicators and **QS** indicators.
- The **WEBOMETRICS** results show a high correlation with other rankings. However, North American universities are relatively common in the top 200, while small and medium-size biomedical institutions and German, French, Italian and Japanese universities were less common in the top ranks. Possible reasons include publishing via independent research councils, or the large amount of non-English web content, which is less likely to be linked.
- Several studies discussed the advantages of the **ARWU** ranking system, recommend using the results of this system. **ARWU** is the first global ranking published, it emphasizes only academic achievements, and it is the most valid, credible and realistic ranking system.
- **ARWU** ranking system is often praised for the objectivity, stability and transparency of its methodology. It does not rely on surveys and school submissions, but it draws some criticism as it does not adequately adjust for the size of the institution.
- Investigating the correlation between the overall **ARWU** scores and the scores of its individual indicators for the top 100 universities, it has been shown that all indicators have positive correlations with the total score.
- It has been shown that the correlations between overall **ARWU** scores for any year with other years, over various periods, are highly consistent. In addition, there are positive correlations between the overall **ARWU** scores and the individual scores for a specific year,
- Specifically, the year to year correlation coefficients of **ARWU** over 4-year periods are positive, with values ≥ 0.991 , revealing that the correlation between overall **ARWU** scores are highly consistent between any year with other year over these periods.
- The **ARWU** is known for relying solely on research indicators, and the ranking is heavily weighted toward institutions whose faculty or alumni have won Nobel Prizes.
- One of the primary criticisms of **ARWU**'s methodology is that it is biased towards the natural sciences and English language science journals over other subjects.
- Based on qualitative analysis, previous studies argued that there were some similarities and differences among ranking systems. There is a pretty high statistical correlation between the university rankings, namely, the best universities will be good, and so are the bad ones.

- Previous studies argued that there were some similarities and differences among the various ranking systems.
- There are moderate to high degrees of correlation between the results of six major global rankings. An obvious positive correlation in ranking results (ranking order and score) between each pair of the studied rankings.
- Low overlapping has been found between **QS** and **ARWU** due to different methodologies:
 - **ARWU** emphasizes only academic achievement, **QS** include nonacademic indicators.
 - Different weights for research-based indicators.
 - Different data base for research indicators: **QS** – Scopus, **ARWU** – Web of Science.
 - **ARWU** uses only quantitative data from open sources, **QS** uses data from universities and other peoples' views (reputation surveys).
- A very strong correlation is found between the number of publications in the **ARWU** and **LEIDEN** rankings (both are based on the **Web of Science**). A lower correlation is found between **ARWU** publications in Nature and Science, and **LEIDEN** 'top' publications.
- An analysis on the correlation between academic reputation and citation impact in the **THE** ranking, raises an unclear (important) phenomenon – large differences between countries as regards the correlation between the two types of indicators.
- A pairwise correlation analysis shows for the major part of the pairs – moderate or strong correlation. The indicators are related to one another, but at the same time a certain degree of complementary exists among the various ranking systems.
- The citation-based indicators from **ARWU**, **THE**, **LEIDEN** and **U-MULTIRANK** show strong rank correlations with one another but correlate only weakly with the **QS** indicators.
- Analysis on the correlation between academic reputation and citation impact in the **THE** ranking, raises an unclear and important phenomenon – large differences between countries as regards the correlation between the two types of indicators.

3. World Region Rankings

3.1 ARWU, THE, QS – Rankings

In this section results obtained by the **ARWU**, **THE**, and **QS** ranking systems for geographical regions are presented and compared. All the results are related to the numbers of best 100 universities for each of the above rankings, during the period 2015-2019.

Fig. 3.1. shows the numbers of best 100 universities by each ranking for all years during this period, and **Fig. 3.2.** shows these numbers for each year during this period.

Fig. 3.3 shows a comparison of these numbers for each ranking/region and region/ranking during this period. It can be observed that there are significant differences of the numbers of universities by the different rankings. Specifically, the numbers of universities by **ARWU**, **THE** and **QS**, respectively are as follows: America (260, 230, 174), Europe (169, 200, 150), Asia (42, 52, 107), Oceania (29, 30, 36). That is, a relatively large numbers of universities are obtained for America (by **ARWU**), Europe (by **THE**), and Asia (by **QS**).

Fig. 3.4. shows a comparison of each region/year during these years. It can be observed that the number of universities obtained by **ARWU** for America over the years – is decreased, whereas the numbers obtained by **ARWU** for Oceania, and by **ARWU** and **QS** for Asia – is increased. It can be observed, again, that there are significant differences of the numbers of universities by the various rankings.

The results show that the order of the best 100 universities for the various regions, according to the ranking systems, is as follows: America – **ARWU-THE-QS**, Europe – **THE-ARWU-QS**, Asia – **QS-THE-ARWU**. This can be interpreted as a geographical bias: **ARWU** – towards America, **THE** – towards Europe, **QS** – towards Asia.

Fig. 3.1. Numbers of Universities – ARWU [11], THE [12], QS [13] – All Years 2015-2019

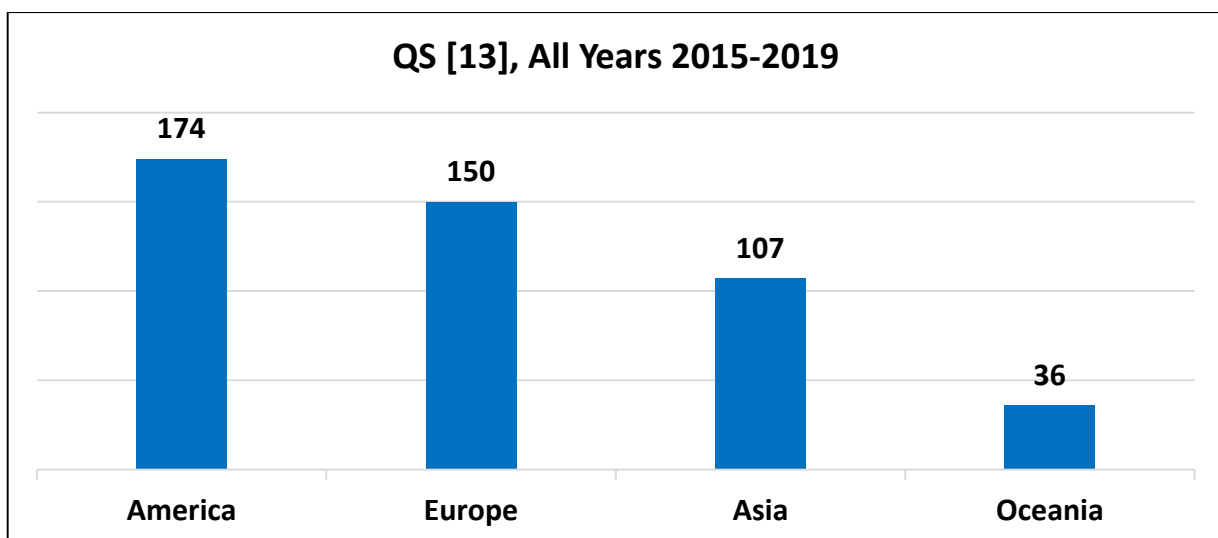
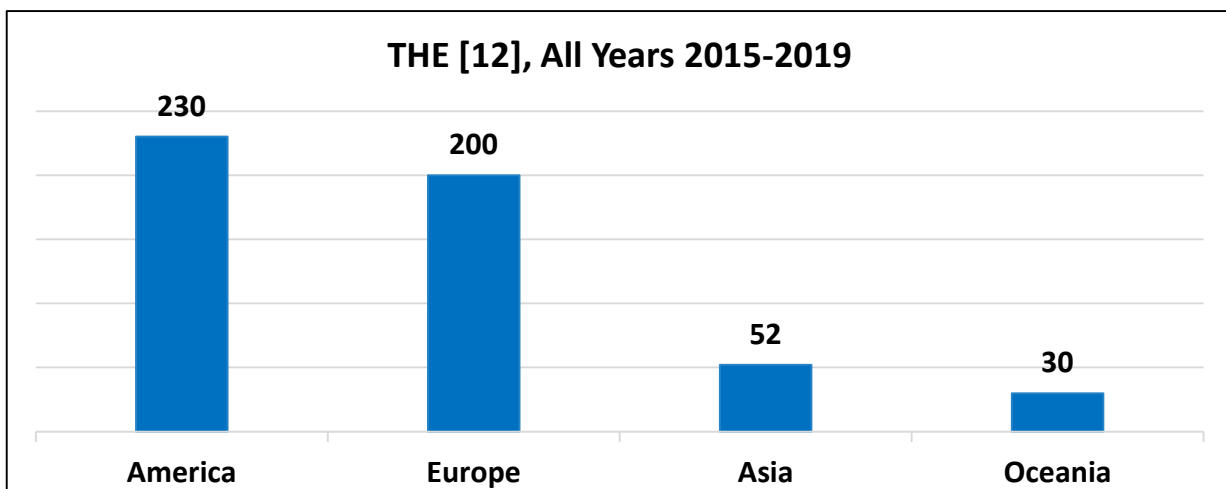
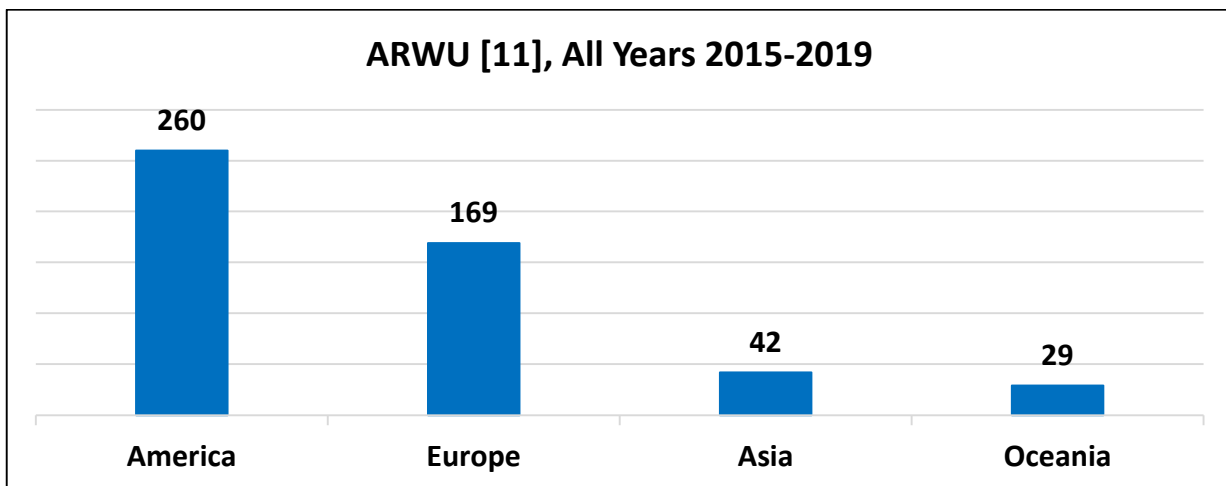


Fig. 3.2. Numbers of Universities – ARWU [11], THE [12], QS [13] – Each Year 2015-2019

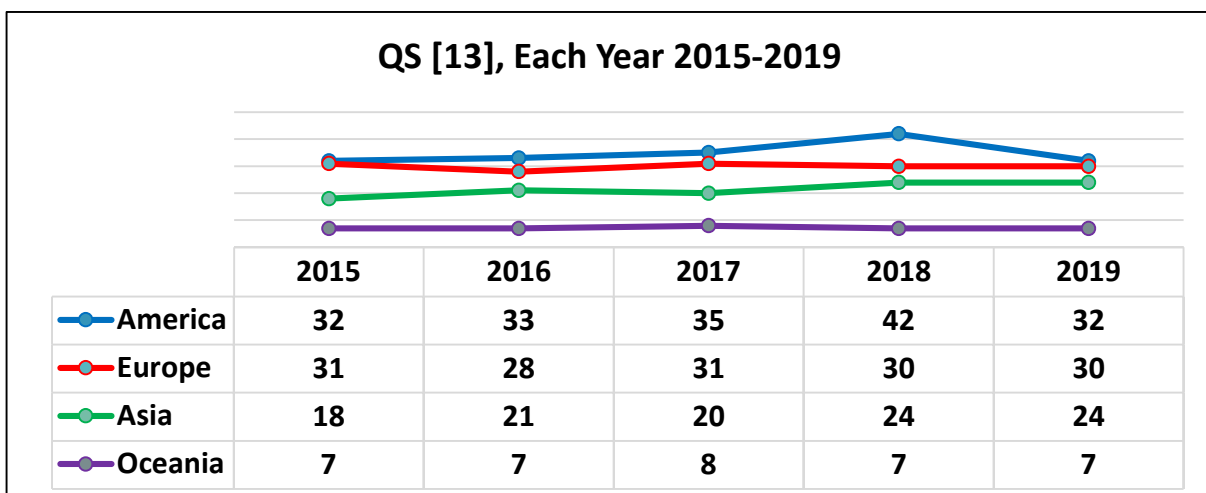
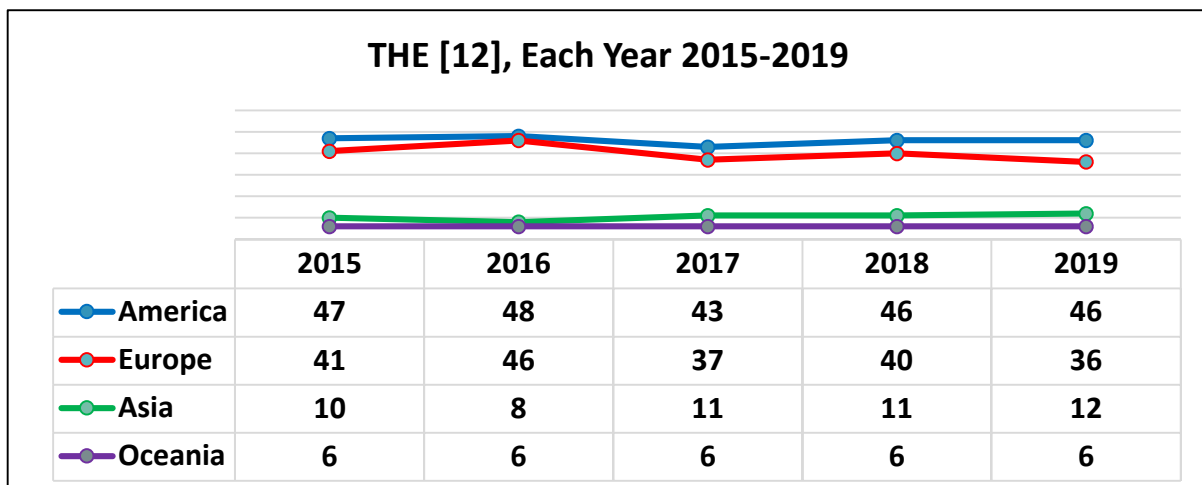
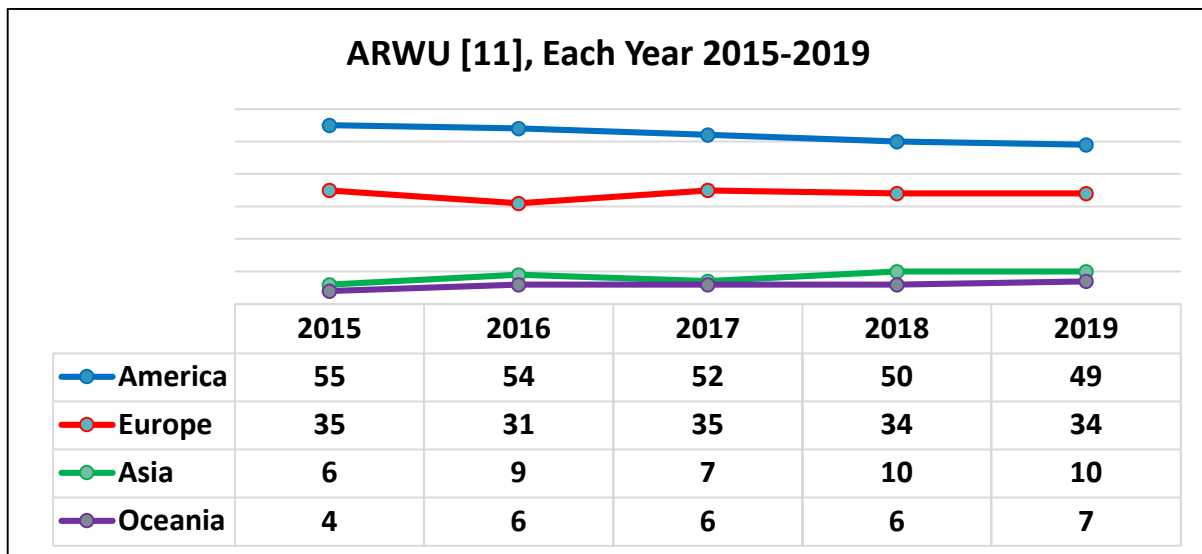


Fig. 3.3. A Comparison of the Number of Universities – All Years 2015-2019

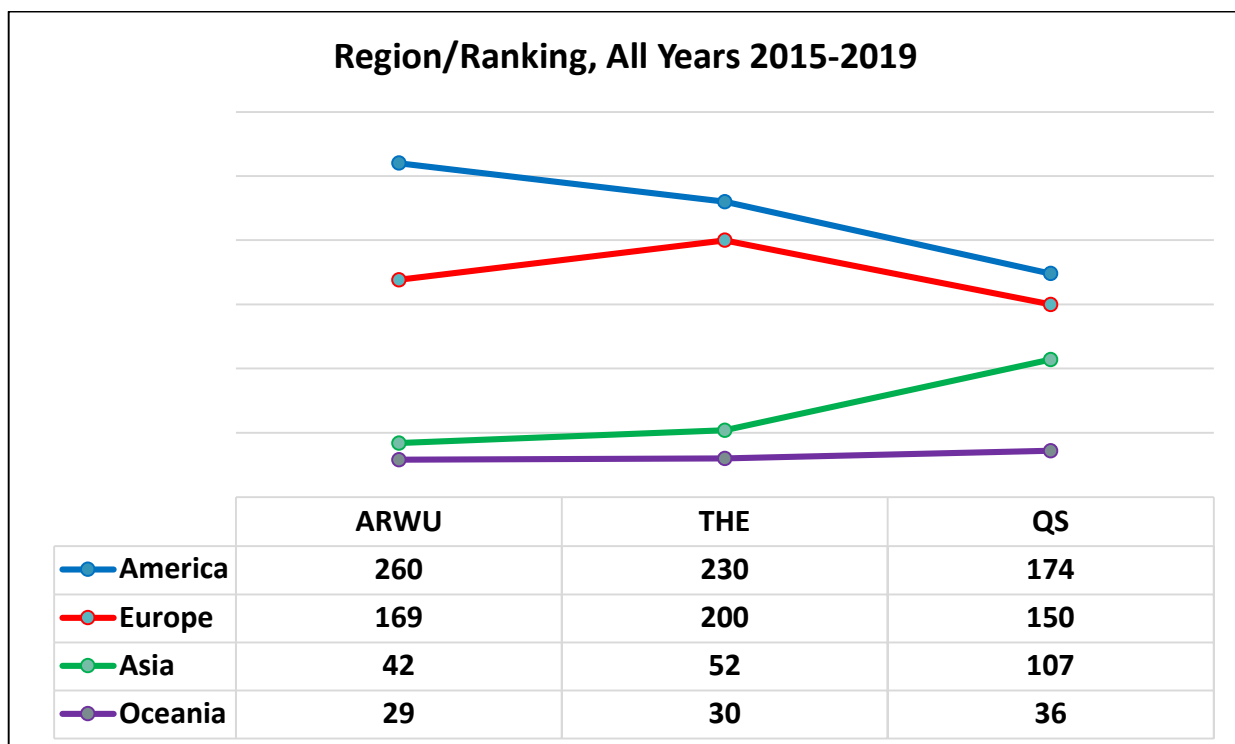
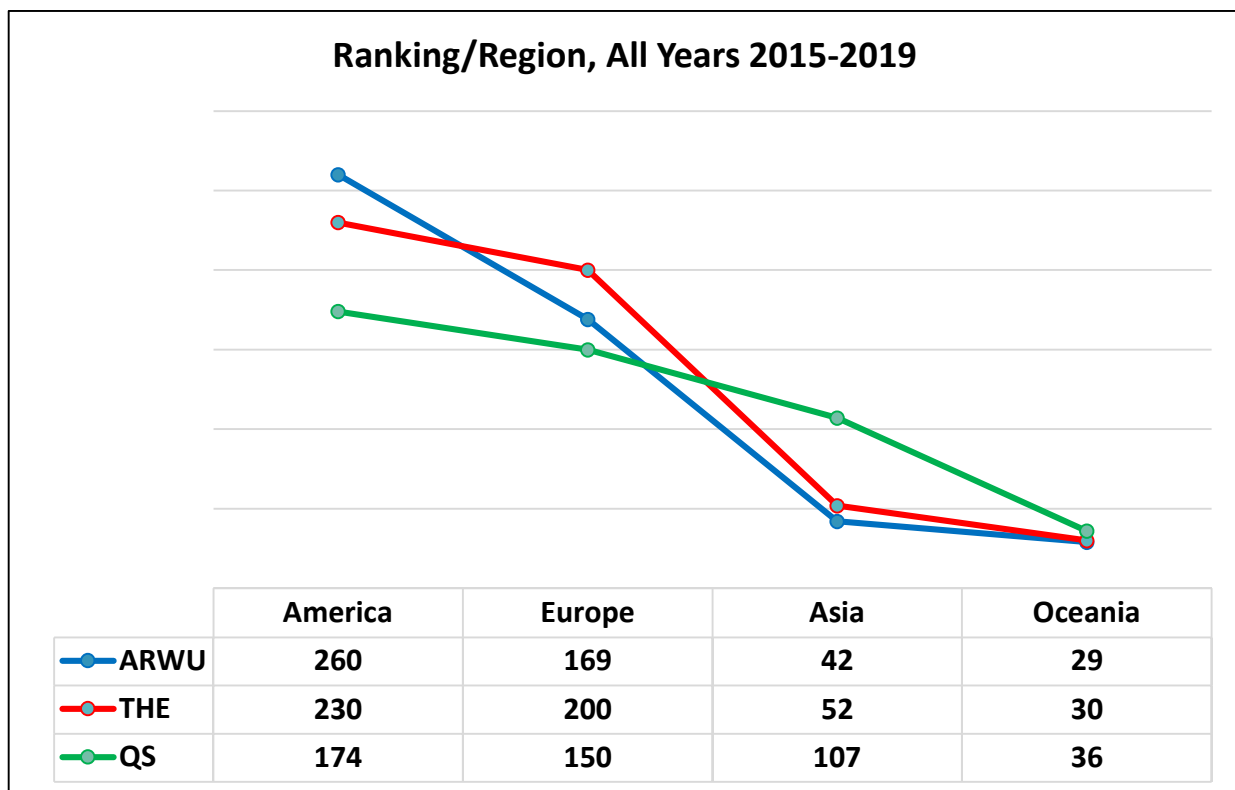


Fig. 3.4. A Comparison of the Number of Universities – Each Year 2015-2019

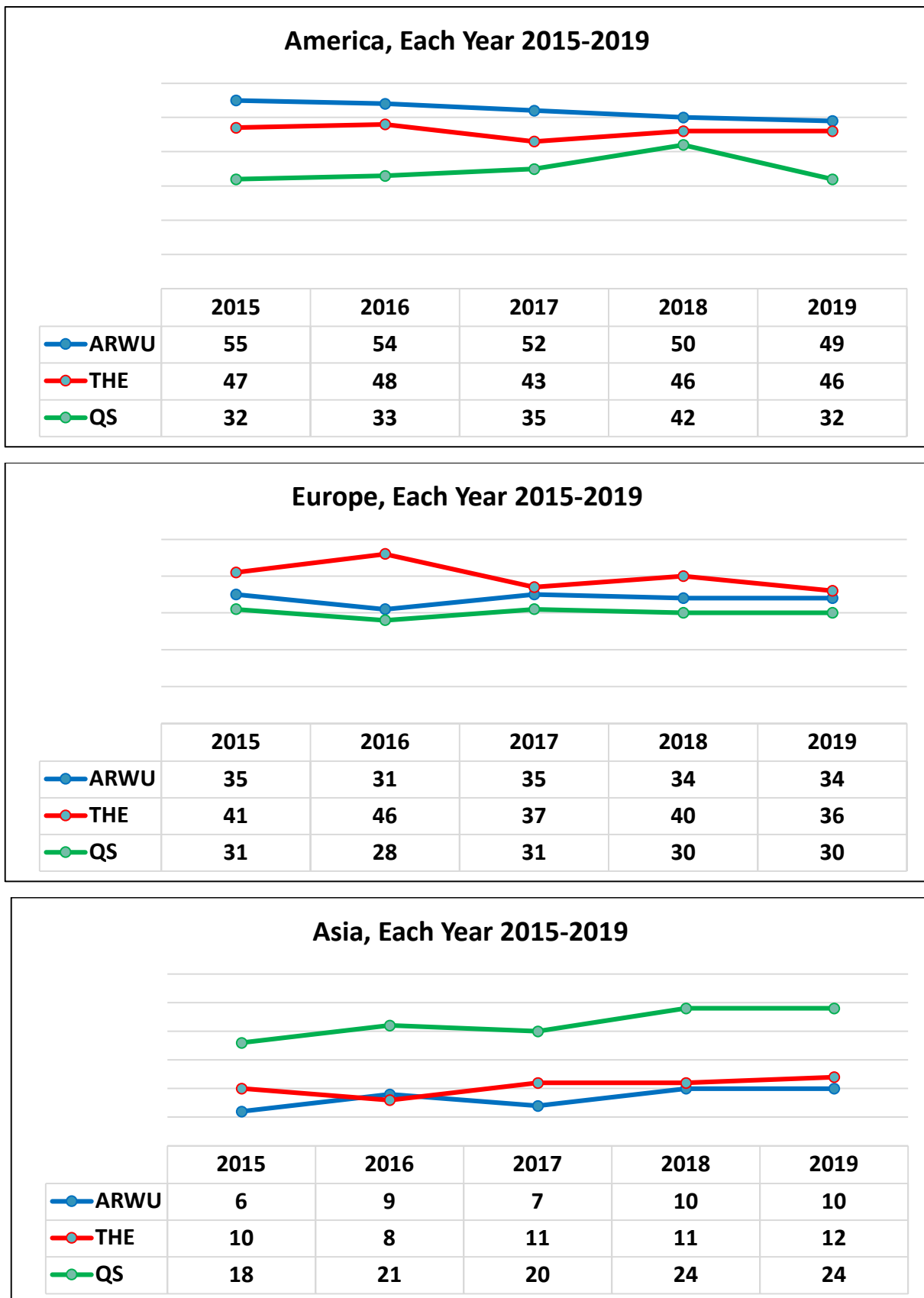
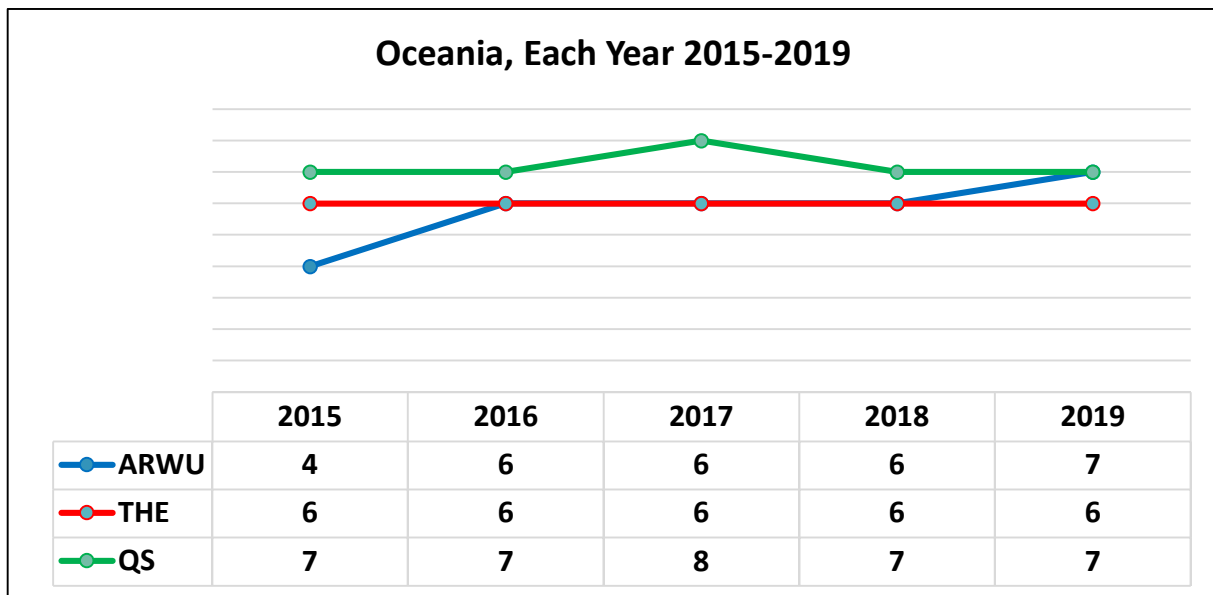


Fig. 3.4 (continuation)



3.2 LEIDEN, WEBOMETRICS – Rankings

In this section results obtained by the systems **CWTS-LEIDEN** (average 2014-2017), **WEBOMETRICS** (2019), **ARWU** (average 2015-2019), for the various geographical regions are presented and compared. All the results are related to the numbers of best 100 universities for each of the above rankings.

Fig. 3.5. shows the numbers of best 100 universities by **LEIDEN** Indicators. It can be observed that the number of **North American and Asian** universities is increased for higher quality indicators. An opposite trend can be observed for the number of universities in **Europe** – for higher quality indicators the number of universities is decreased. The smaller number of universities for **Oceania** is unchanged with the type of indicator.

Fig. 3.6. shows the numbers of best 100 universities by **WEBOMETRICS** Excellence indicator, and **Fig. 3.7.** shows a comparison of the best 100 Universities by **ARWU**, and **LEIDEN** indicators. It can be observed that the **ARWU** ranking and the **LEIDEN P (top 1%)** indicator demonstrate similar patterns.

Fig. 3.8. shows a comparison of the best 100 Universities by **ARWU**, **LEIDEN P (top 1%)** indicator and **WEBOMETRICS** excellence indicator. It can be observed that the 3 rankings demonstrate similar patterns.

Fig. 3.5. Numbers of Universities – LEIDEN [14] Indicators – 2014-2017

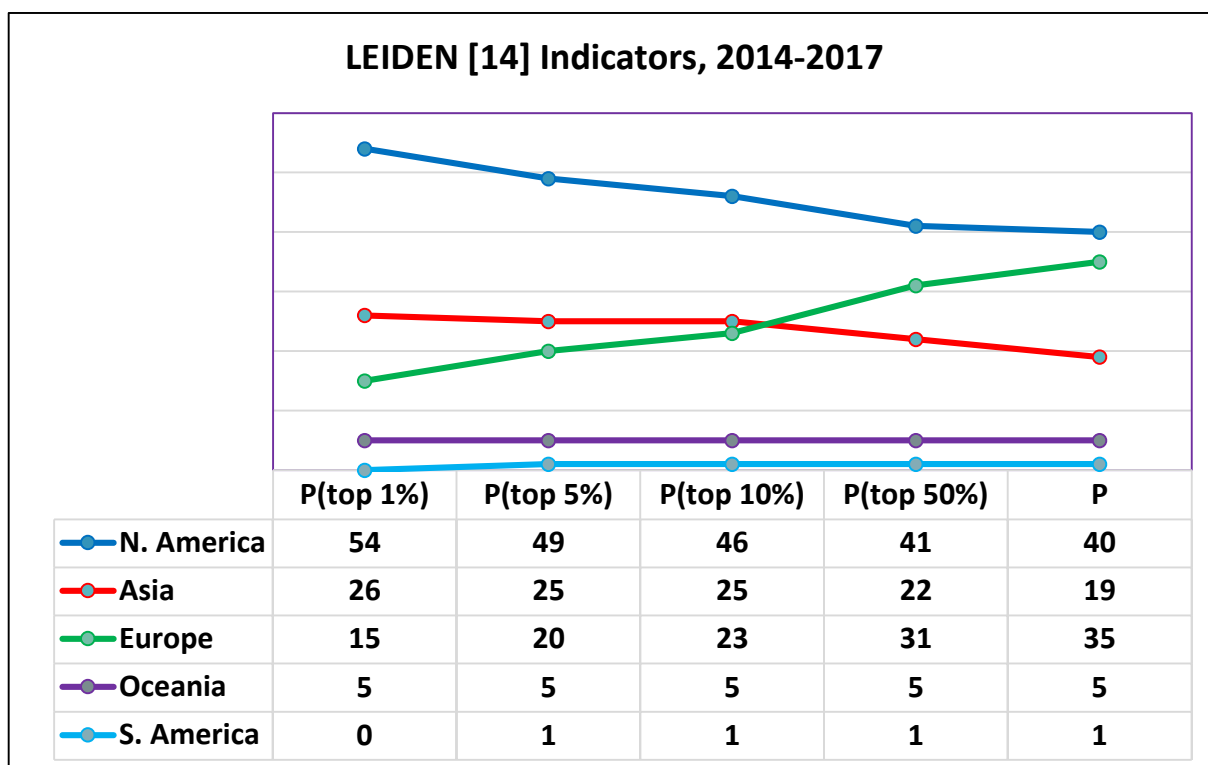


Fig. 3.6. Numbers of Universities – WEBOMETRICS [15] Excellence Indicator – 2019

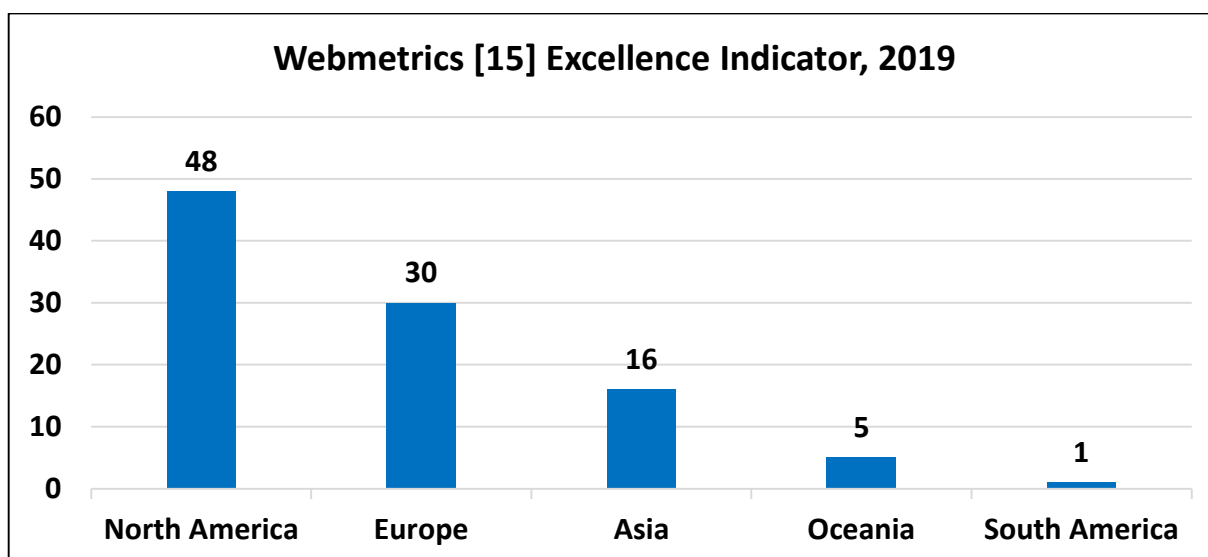


Fig. 3.7. A Comparison, ARWU [11] 2015-2019 – LEIDEN [14] 2014-2017

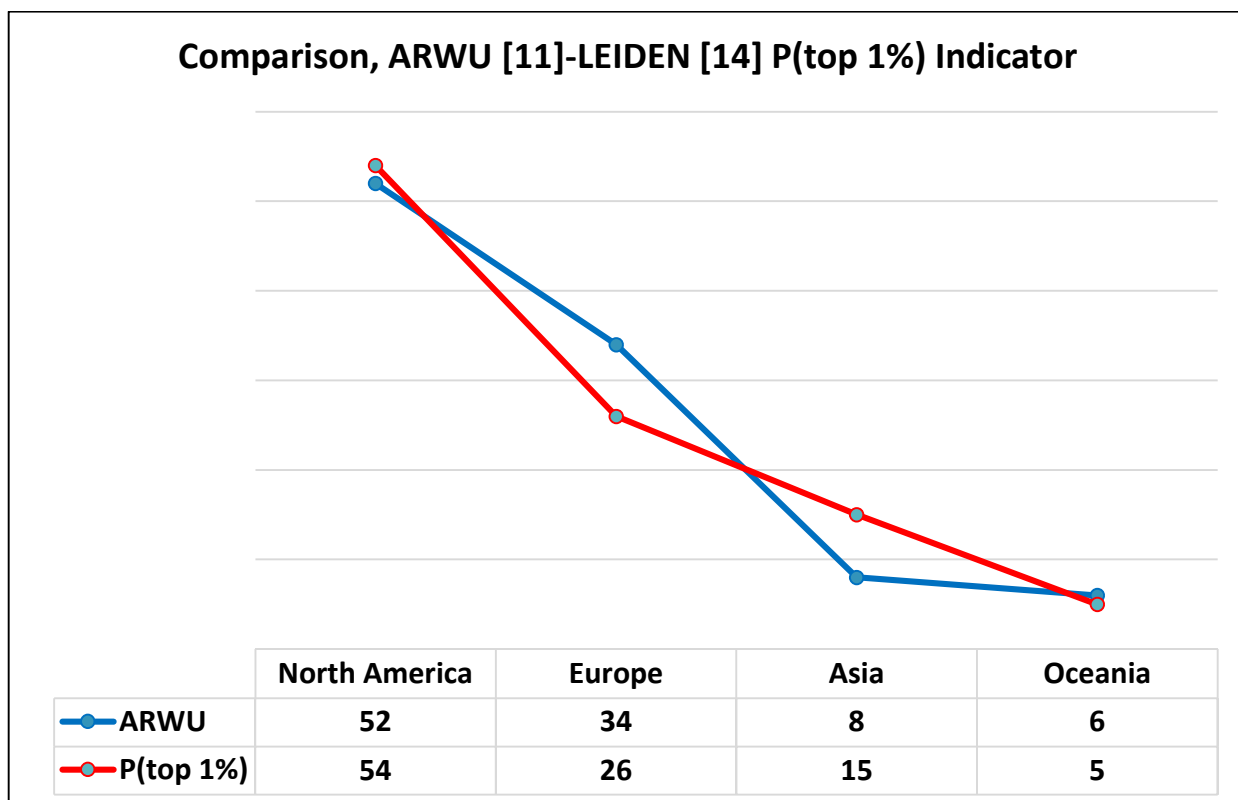
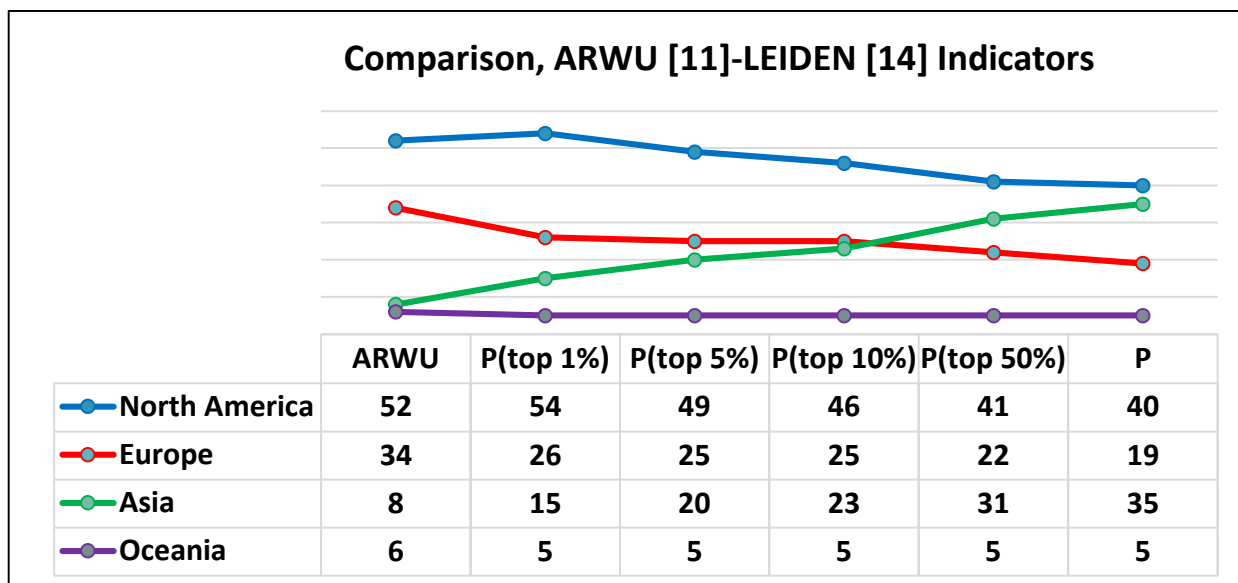
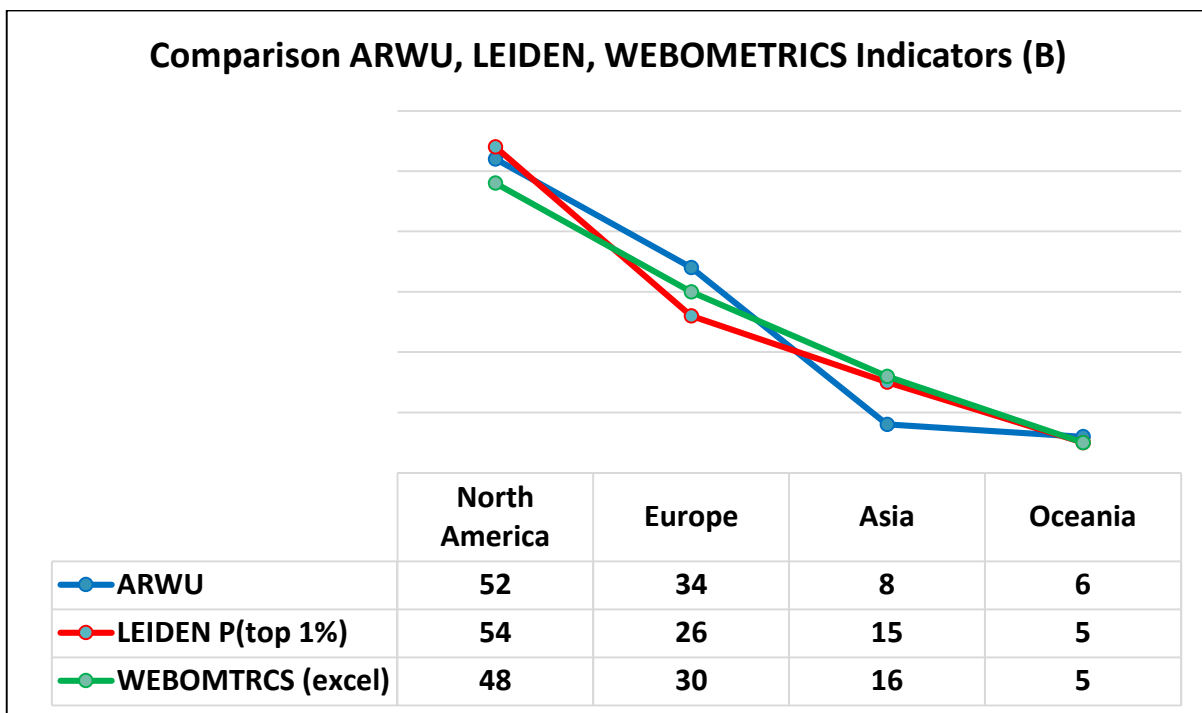
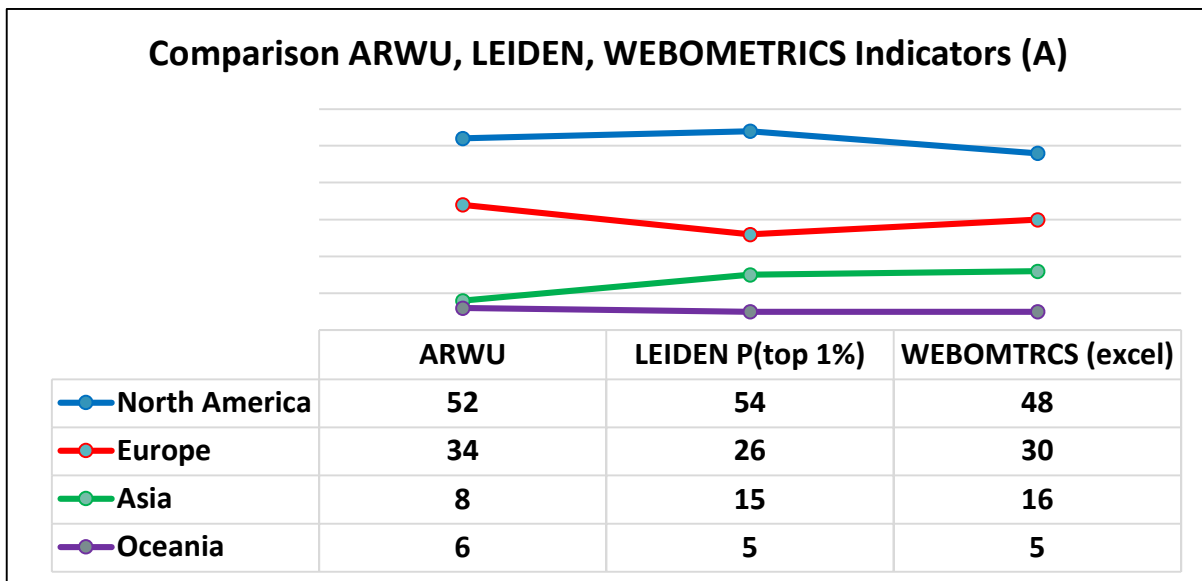


Fig. 3.8. A Comparison, ARWU [11] – LEIDEN [14] – WEBOMETRICS [15]



4. Country Rankings

4.1 ARWU, THE, QS – Rankings

In this section results for country rankings obtained by the three longest established and most influential ranking systems – **ARWU**, **THE**, **QS** – are presented and compared. All the results are related to the numbers of best 100 Universities for each of the above rankings, during the period 2015-2019.

Fig. 4.1 shows the numbers of best 100 universities by each ranking for 2019, and **Fig. 4.2** shows these numbers by for all years during the period 2015-2019.

Fig. 4.3 shows a comparison of these numbers by the various ranking systems for 2019. It can be observed that, whereas the results for the best 1-10 countries demonstrate similar patterns, there are significant differences for the next 11-20 countries. An exception is the relatively low numbers of universities by the **QS** from **US** (29) and **Netherlands** (1), and the relatively large numbers of universities by the **QS** from **GB** (18), **China** (6) and **Japan** (5), and by **THE** from **Germany** (8) and **Netherlands** (7).

Specifically, among the best 1-10 countries, the number of **US** universities is the highest (45, 41, 29, respectively), then the number of universities from **GB** (8, 11, 18), **Australia** (7, 6, 6), **Switzerland** (5, 3, 3), **Canada** (4, 5, 3), **Germany** (4, 8, 3), **Netherlands** (4, 7, 1), **China** (4, 3, 6), **Japan** (3, 2, 5), **France** (3, 2, 2). Among the next 11-20 countries, for example, the following significant differences can be observed: **Hongkong** (0, 3, 5), **S. Korea** – (0, 2, 5).

Fig. 4.4 shows comparisons of the numbers of universities by these ranking systems for all years during the period 2015-2019. It can be observed that, to a large extent – the results for 2019 and 2015-2019 are similar: among the first 1-10 countries the number of **US** universities is (240, 209, 149), then the number of universities from **GB** (42, 61, 88), **Australia** (29, 30, 31), **Switzerland** (23, 15, 17), **Canada** (20, 20, 15), **Germany** (19, 49, 15), **Netherlands** (19, 36, 7), **Japan** (17, 10, 25), **France** (16, 13, 8), **Sweden** (15, 14, 7). Relatively large numbers of universities by **QS** can be observed for **GB**, **Japan**, **China**, **South Korea**, **Hongkong**.

The results show the following phenomena: There are moderate to high degrees of correlation between the results of the 3 rankings. The exceptional differences are as follows:

- **ARWU**: High rankings – US, Switzerland, Denmark, Belgium, Israel.
- **THE**: High rankings – Germany, Netherlands. Low rankings – Japan.
- **QS**: High rankings – GB, Japan, China, Singapore, Korea, Hongkong.
Low rankings – Canada, Germany, Netherlands, France, Sweden.

Fig. 4.1. Numbers of Universities, ARWU [11], THE [12], QS [13] – 2019

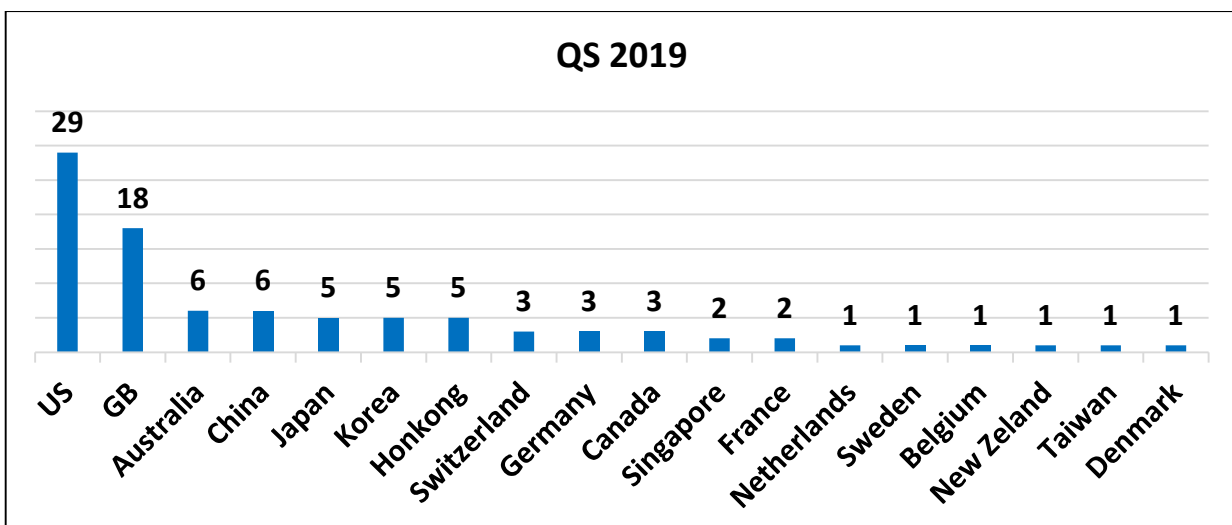
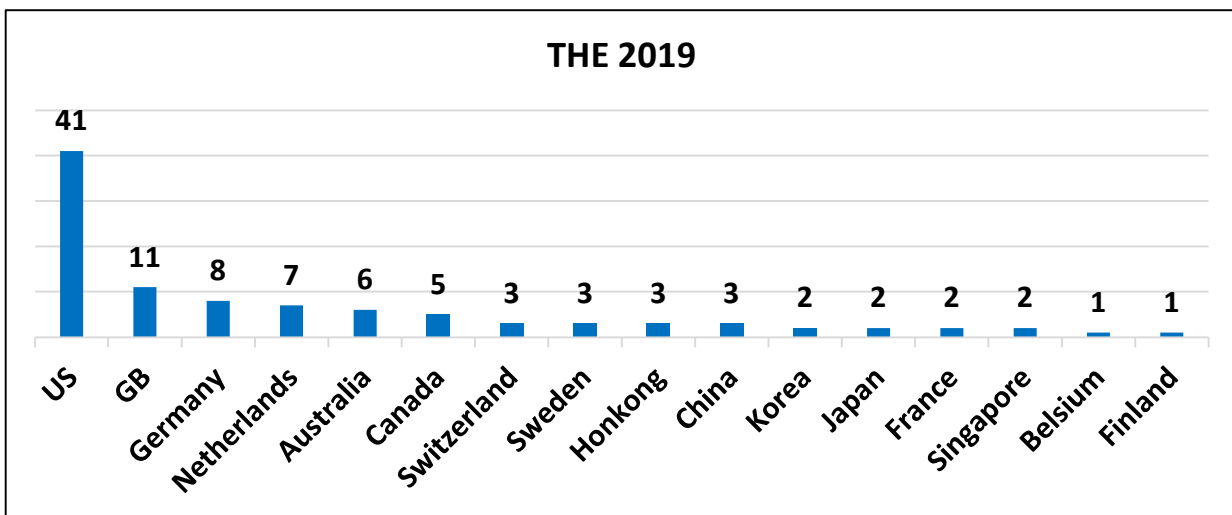
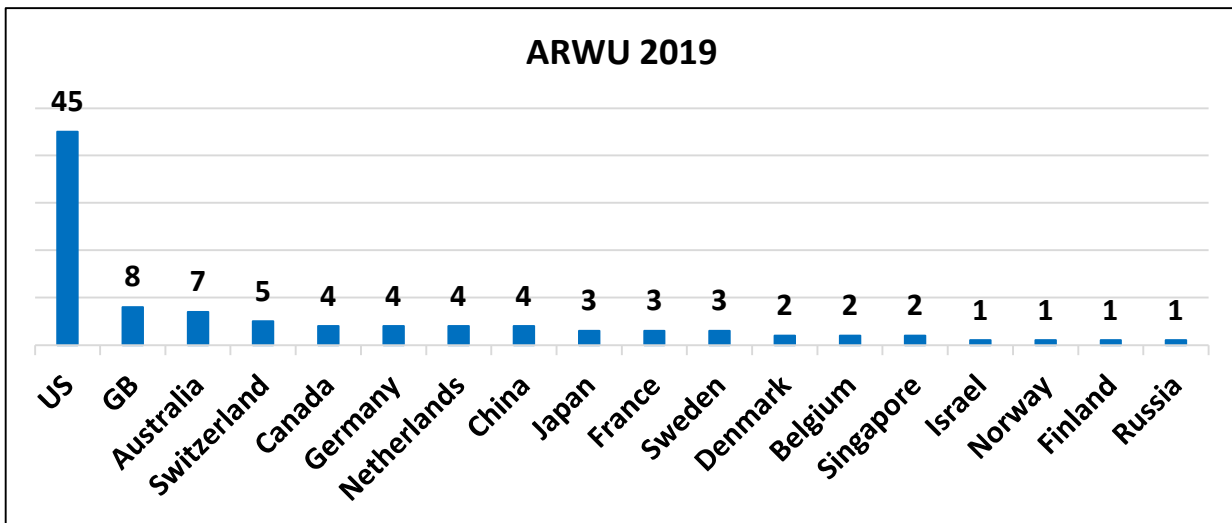


Fig. 4.2. Numbers of Universities, ARWU [11], THE [12], QS [13] – All Years 2015-2019

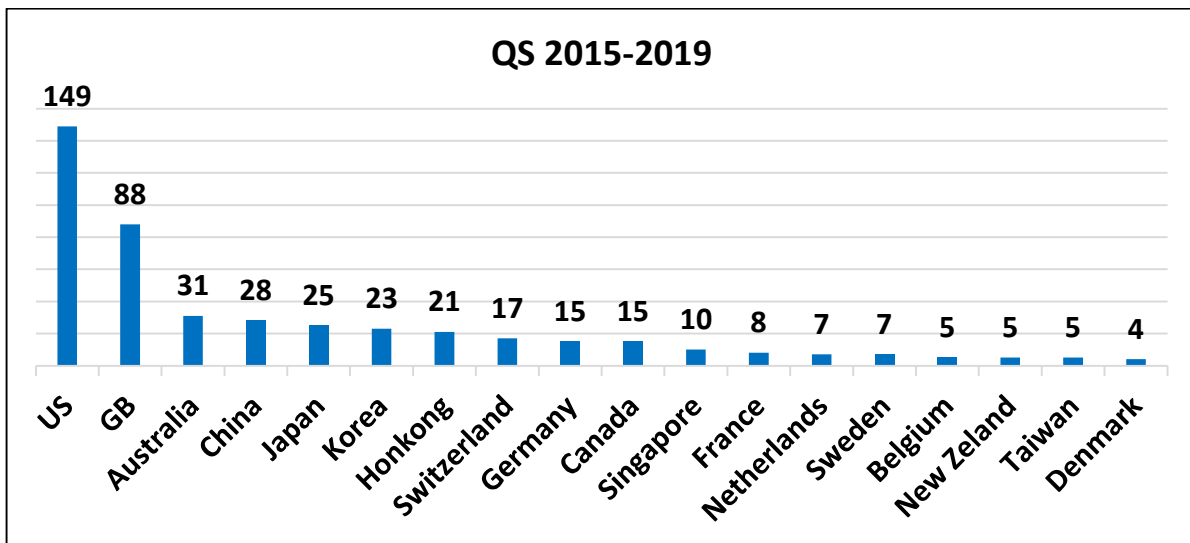
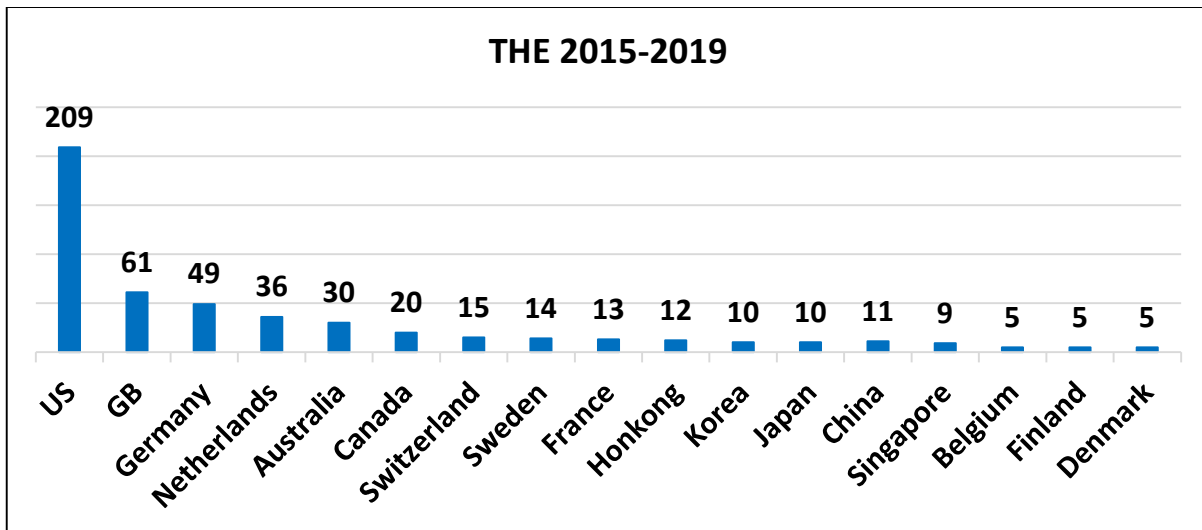
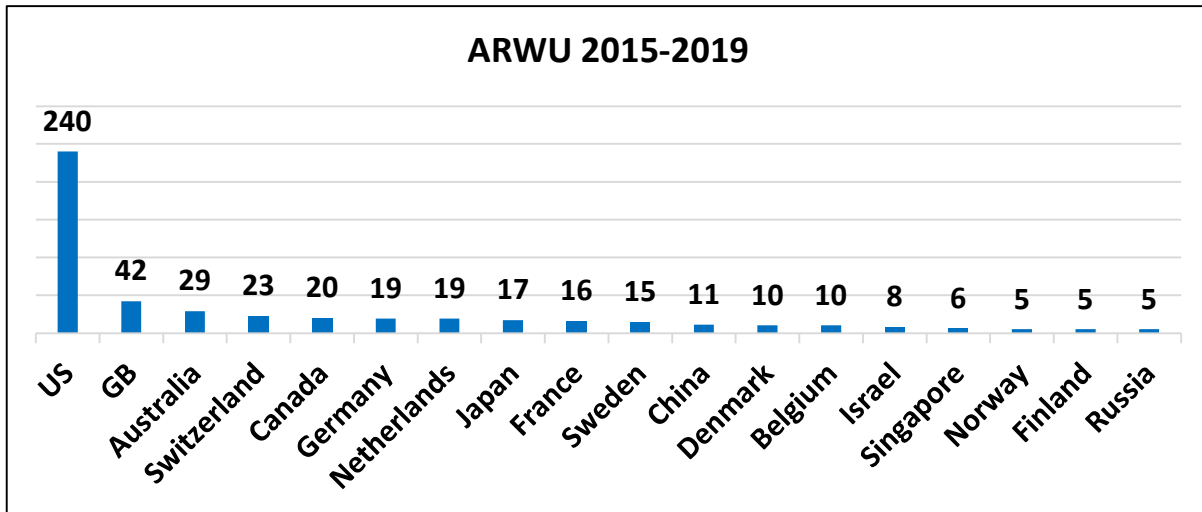


Fig. 4.3. A Comparison of the Number of Universities – 2019

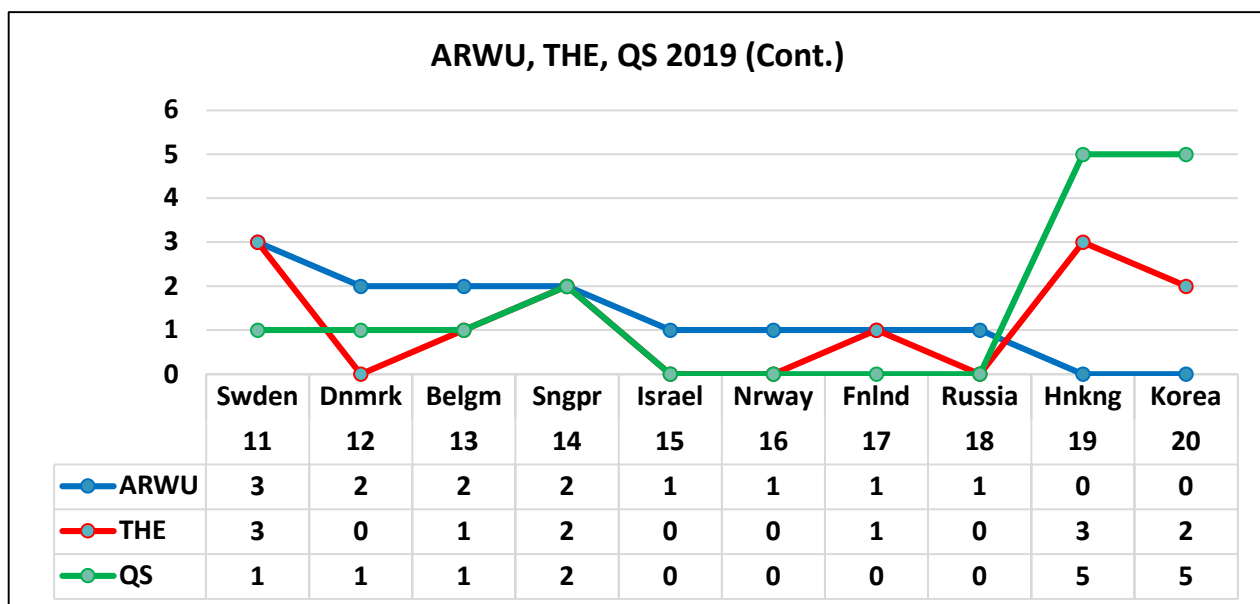
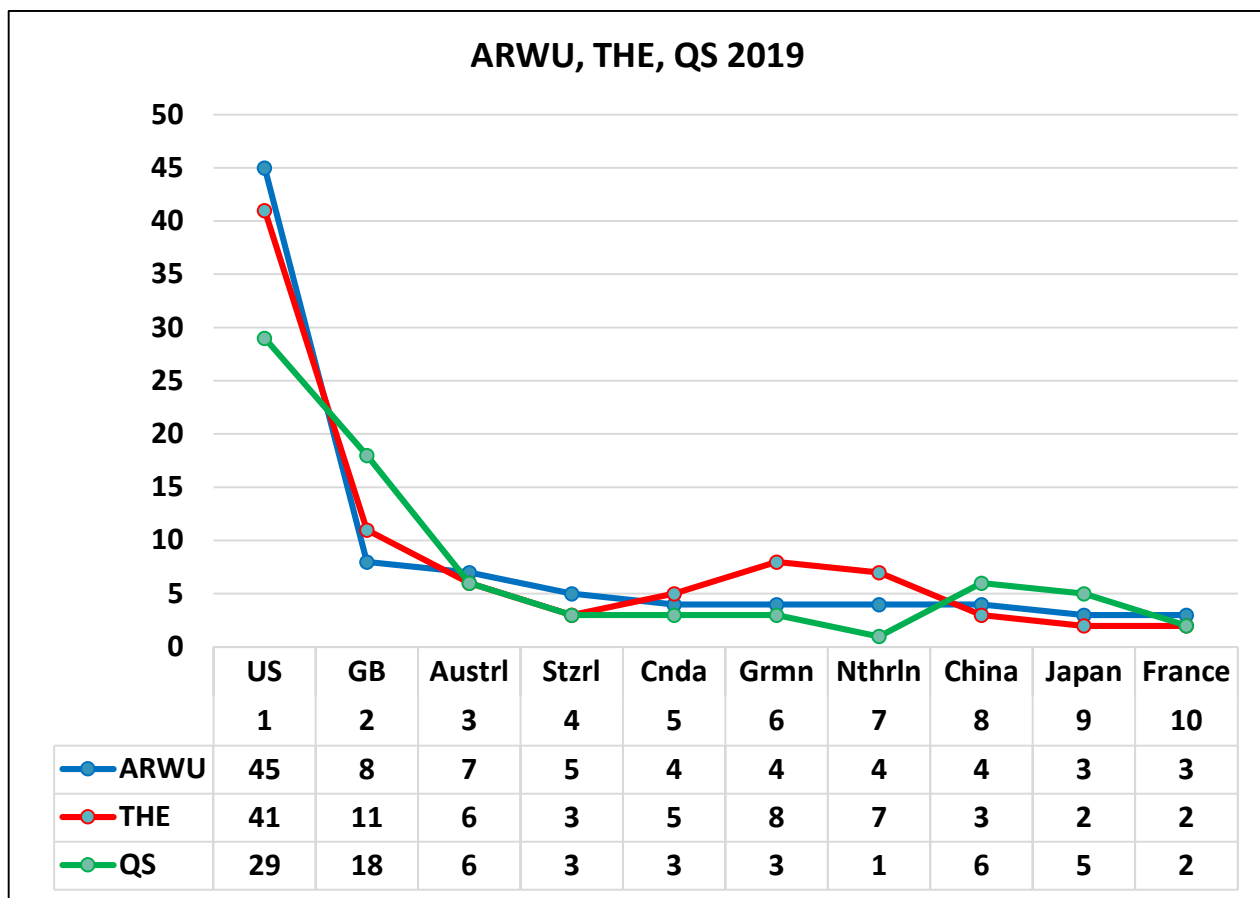
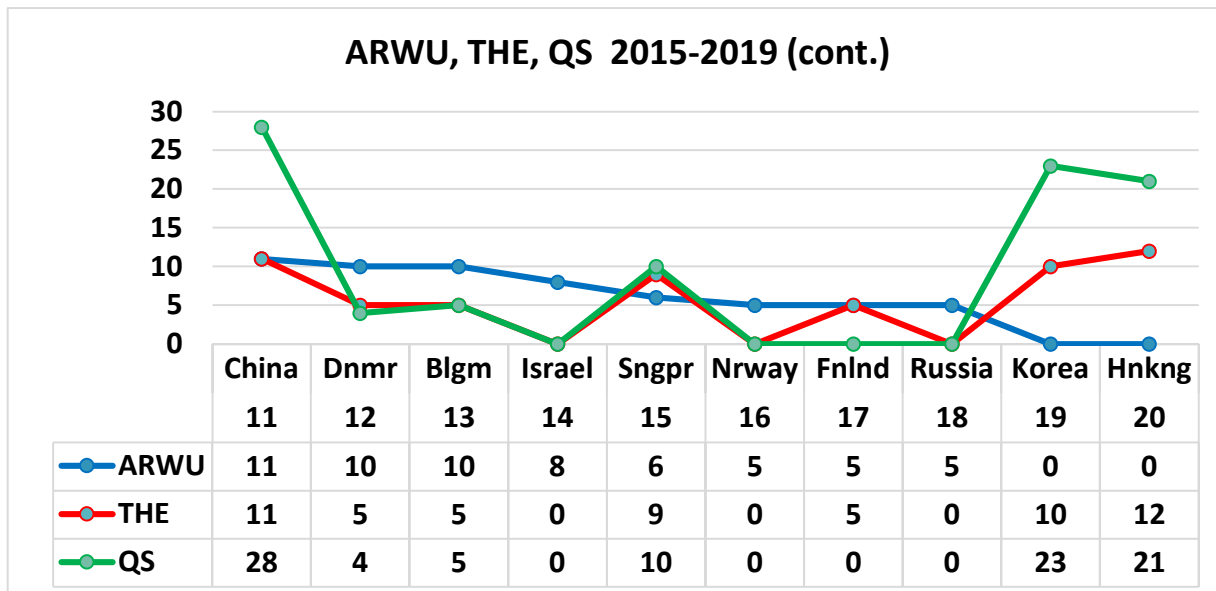
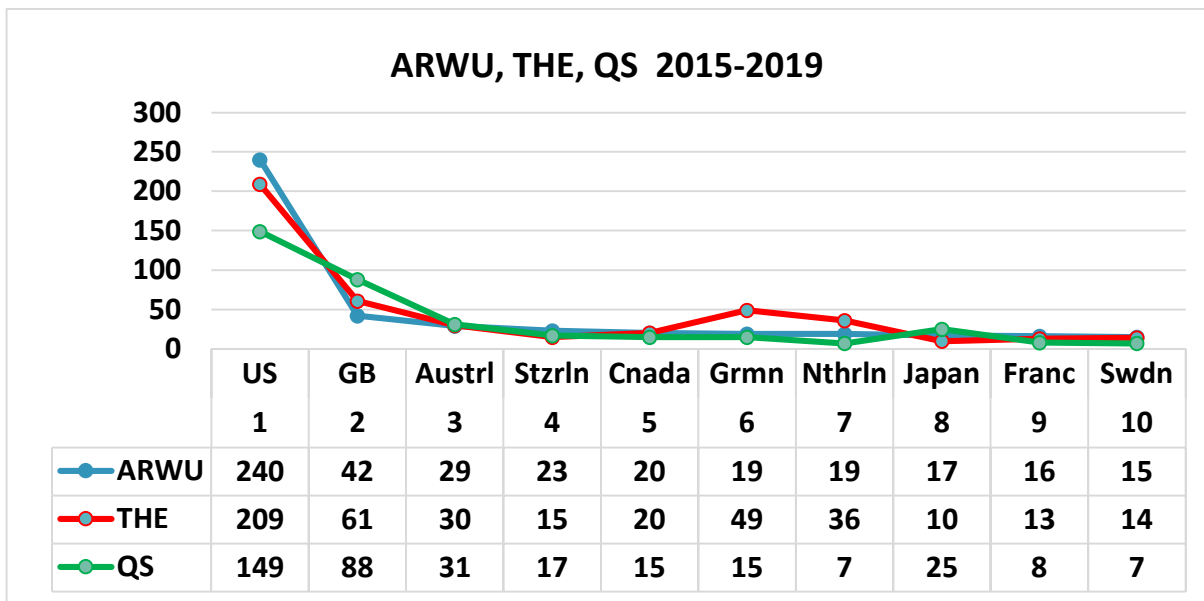


Fig. 4.4. A Comparison of the Number of Universities – All Years 2015-2019



4.2 LEIDEN, WEBOMETRICS – Rankings

In this section results for country rankings obtained by the rankings – **LEIDEN** (2014-2017), **WEBOMETRICS** (2019) – are presented and compared. All the results are related to the numbers of best 100 universities for each of the rankings.

Fig. 4.5 shows the numbers of universities for the number of publications and top 1% publications indicators of **LEIDEN**, and **Fig. 4.6** shows these numbers for the excellence indicator of the **WEBOMETRICS** ranking. **Fig. 4.7** shows a comparison of results for the various indicators and the two ranking systems. Whereas the results for the 1-9 best countries demonstrate similar patterns, significant differences can be observed for the 10-18 countries.

Specifically, among the first 1-9 countries, the number of **US** universities is the highest (50, 36, 44, respectively), then the number of universities from **China** (12, 21, 10), **GB** (10, 6, 8), **Australia** (5, 5, 5), **Canada** (4, 4, 4), **Netherlands** (4, 3, 6), **Switzerland** (3, 2, 3), **Belgium** (2, 2, 2), **Japan** (1, 4, 2). Among the next 10-18 countries, for example, relatively high rankings of **WEBOMETRICS** are observed for **France** and **Italy**.

Fig. 4.5. Numbers of Universities by LEIDEN – 2014-2017

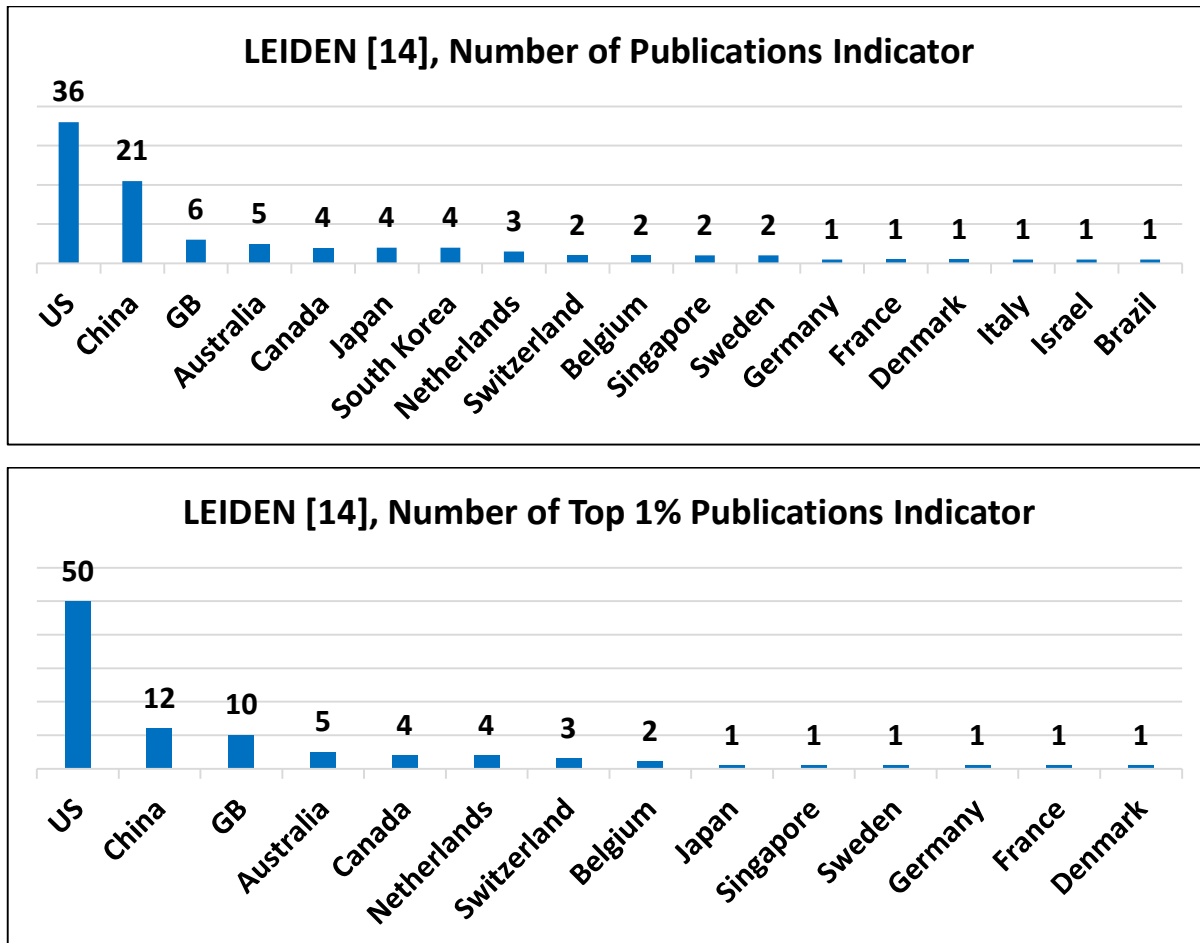


Fig. 4.6. Numbers of Universities by WEBOMETRICS [15] Excellence Indicator – 2019

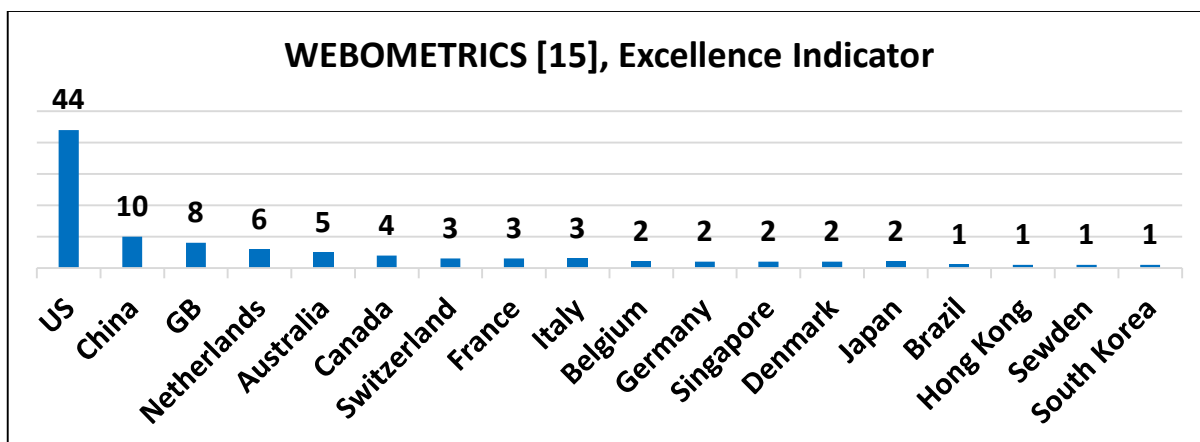
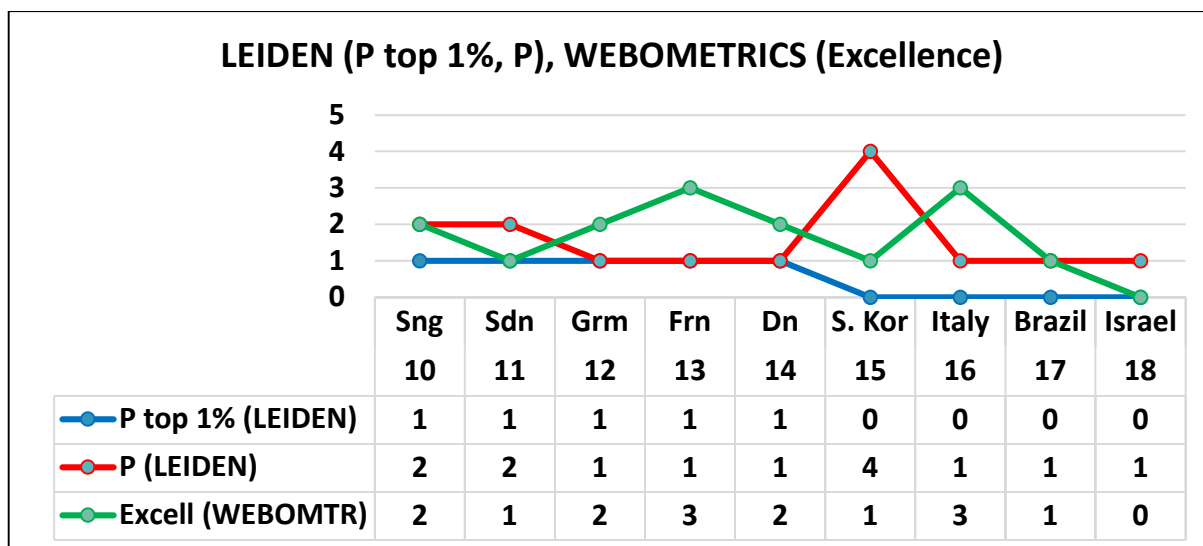
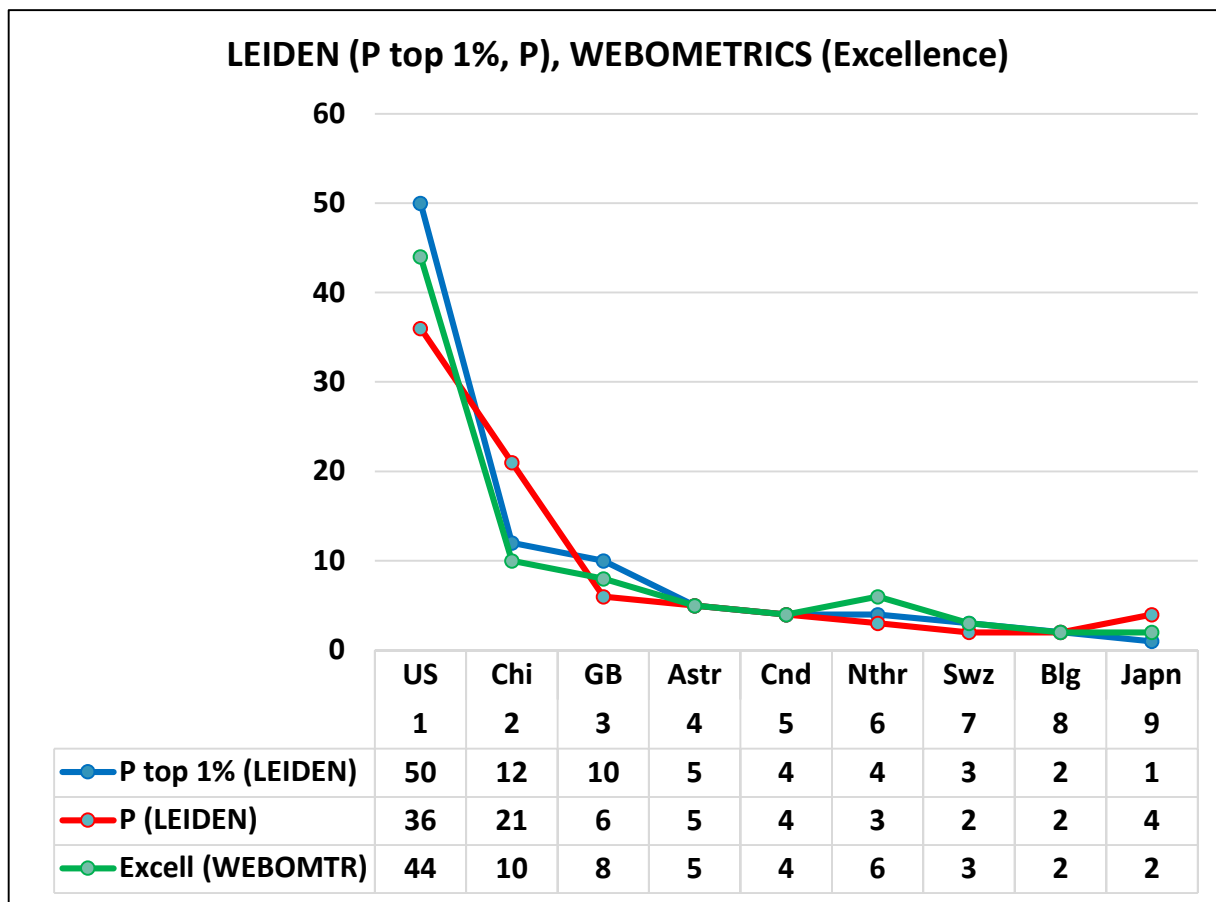


Fig. 4.7. A Comparison, LEIDEN [14] 2014-2017 – WEBOMETRICS [15] 2019



5. Israel University Rankings

5.1 ARWU, THE, QS – Rankings

The ranking position of Israel universities is presented in this section according to the following symbol key: rankings 1-100 – exact location, rankings 101-150 = 125, rankings 151-200 = 175, rankings 201-250 = 225, rankings 251-300 = 275, rankings 301-350 = 325.

Fig. 5.1 shows the following results of **ARWU** rankings, during the period 2012-2019:

- 4 Israeli universities are ranked among the world best 200 universities.
- During this period, the **Technion** is among the best 100 universities – each year, the **Hebrew University** – most of the years, and the **Weizmann Institute** – some years.
- During this period, there is a clear trend of deterioration of the **Hebrew University**, the **Weizmann Institute** and **Tel Aviv University**.

Considering the three longest established and most influential ranking systems – **ARWU**, **THE**, **QS** – the location of Israel universities among the world best universities during 2016-2019 is shown in **Fig. 5.2**, and comparisons of these rankings are shown in **Fig. 5.3**. It is observed that the highest positions are by **ARWU**, followed by the **QS** and the **THE** rankings. In addition, the ranking order by **THE** and **QS** is – **Hebrew university**, **Tel Aviv University**, **Technion**.

Fig.5.1. ARWU [11] Rankings of Israel Universities – Each Year 2012-2019

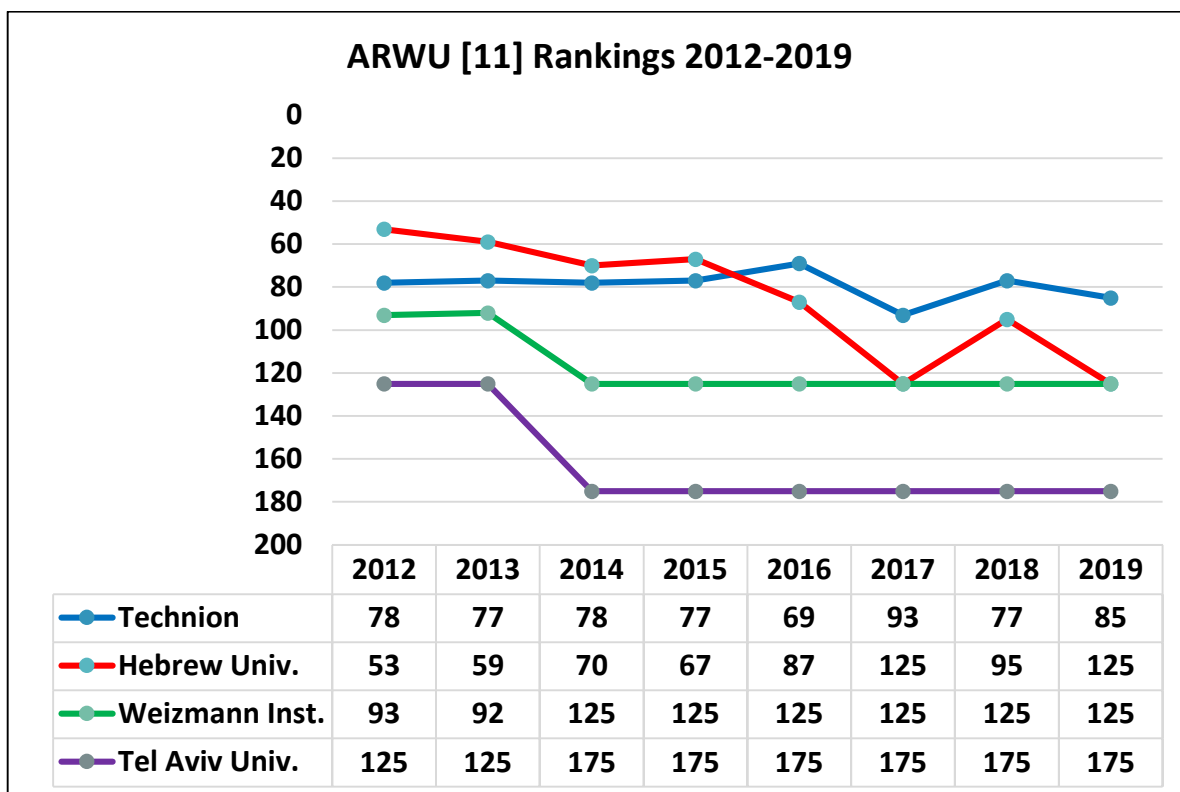


Fig.5.2. ARWU [11], THE [12], QS [13] Rankings of Israel Universities – Each Year

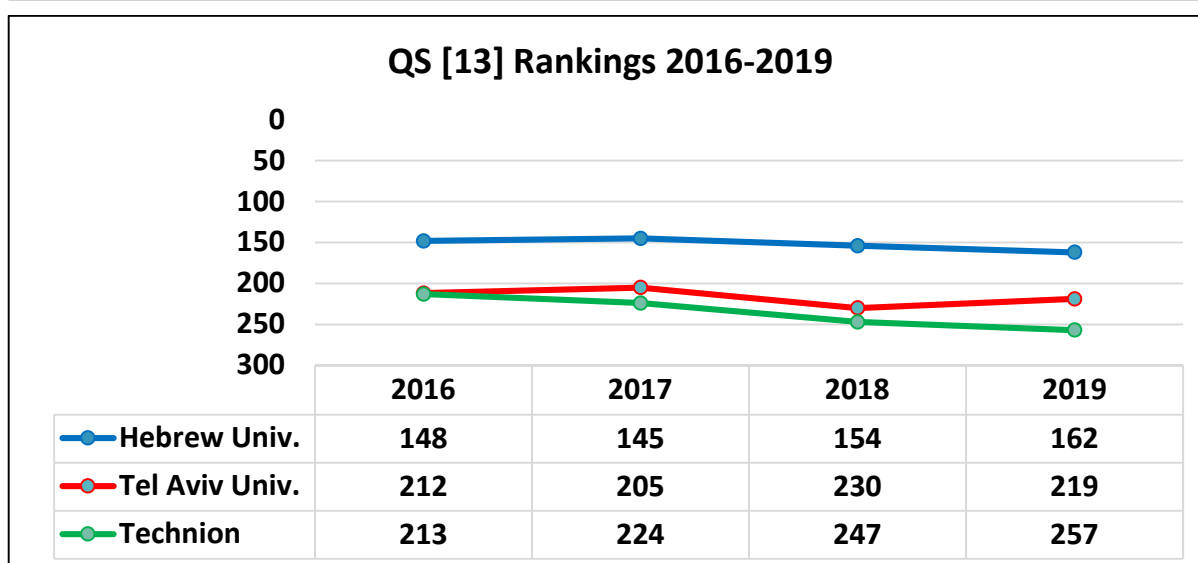
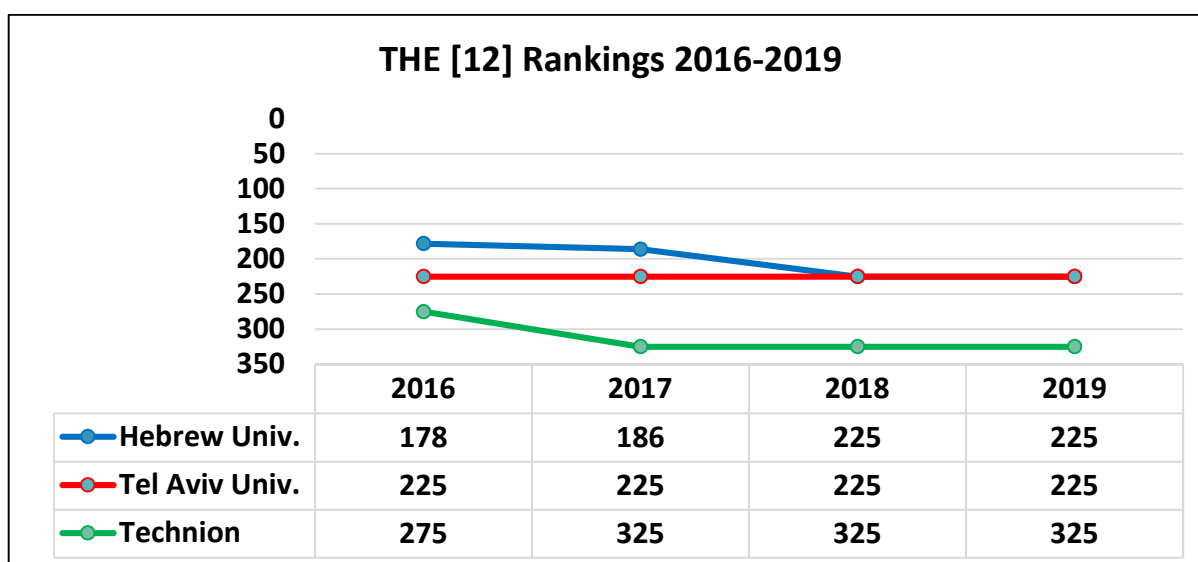
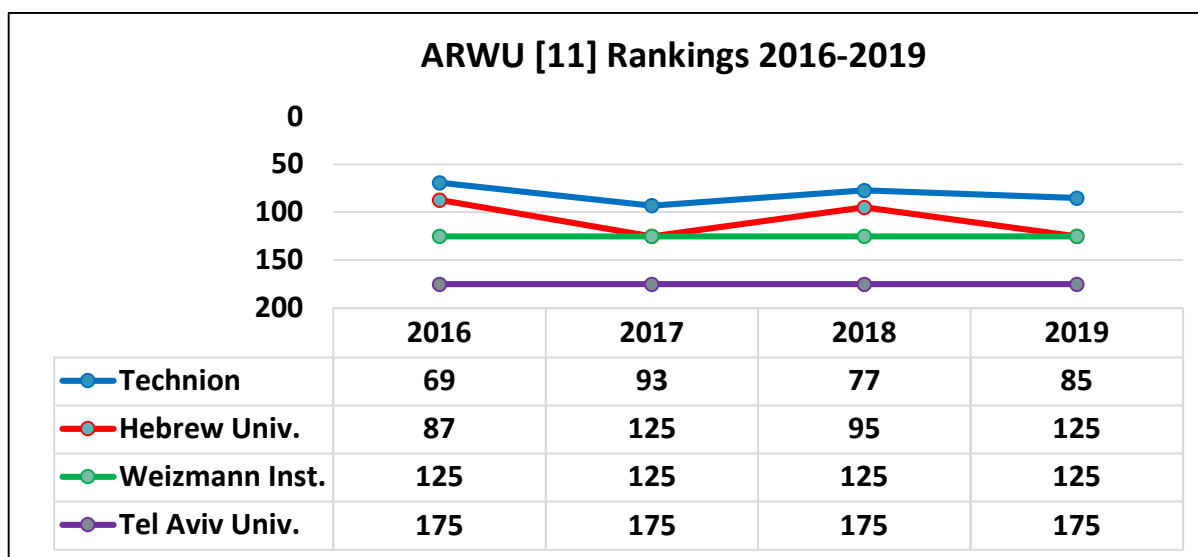
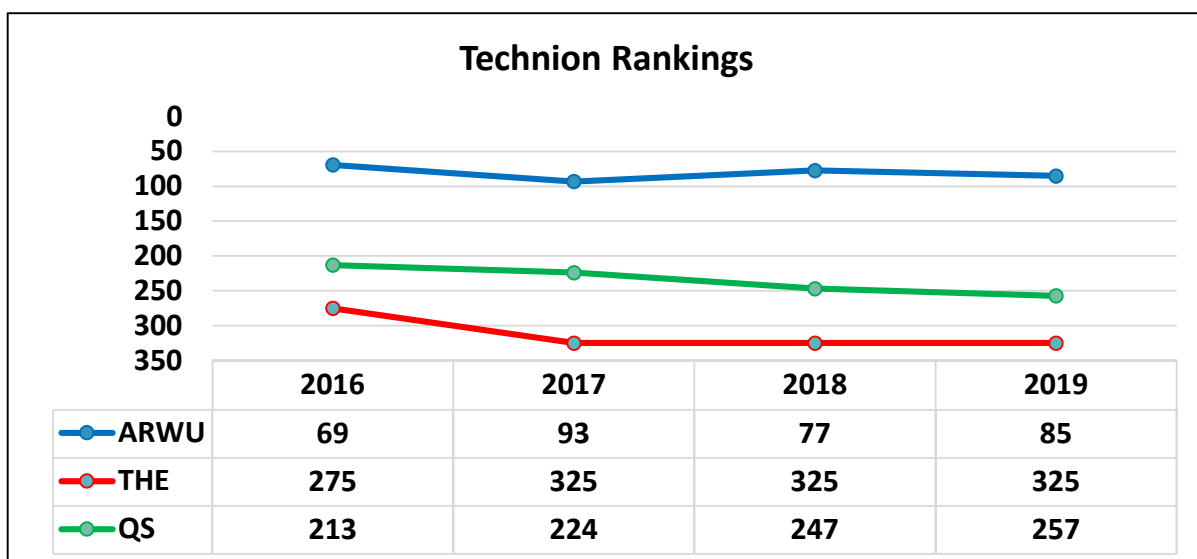
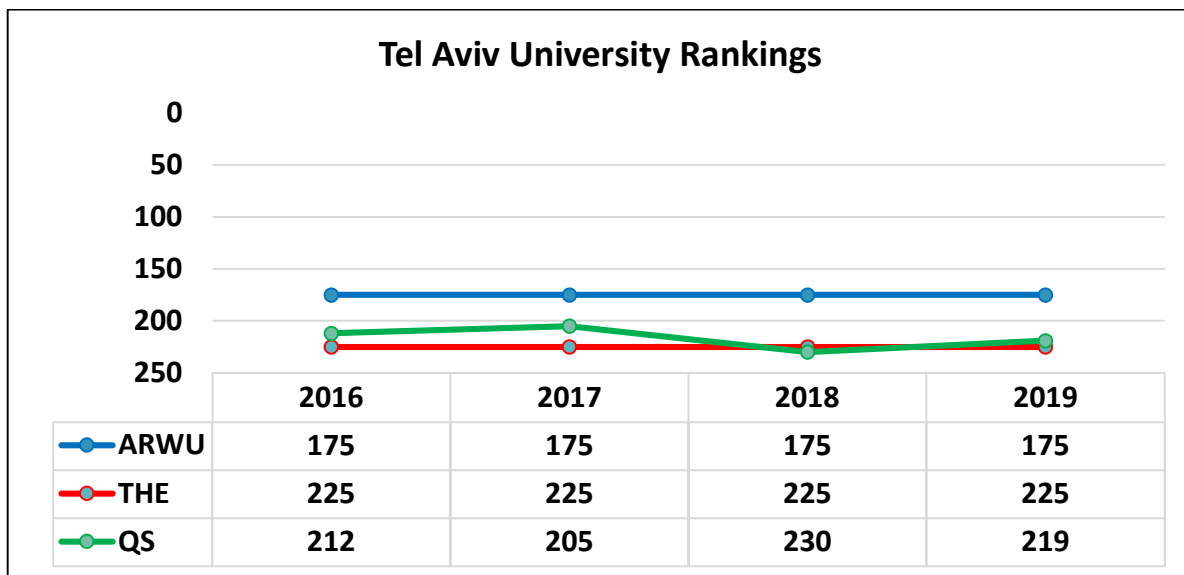
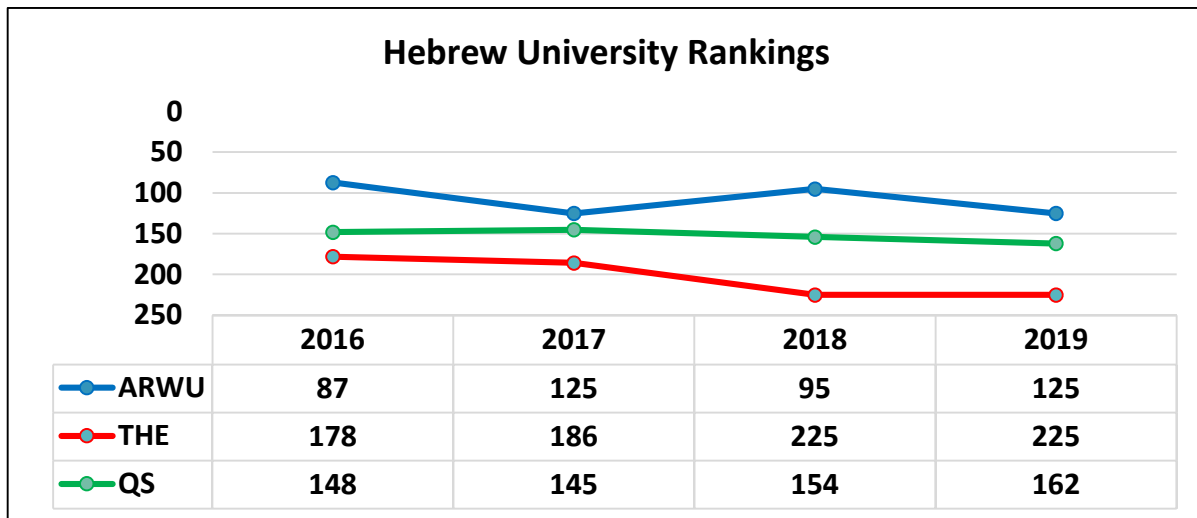


Fig.5.3. A Comparison of Israel Universities Rankings – Each Year 2016-2019



5.2 LEIDEN, WEBOMETRICS – Rankings

In this section results for Israel university rankings obtained by the **LEIDEN** (2014-2017) ranking indicators and the **WEBOMETRICS** (2019) excellence indicator are presented and compared.

Fig.5.4 shows the **LEIDEN** rankings – the number of publications indicator. It is observed that the ranking order is – **Tel Aviv University (77)**, **Hebrew university (187)**, **Technion (218)**.

Fig.5.5. shows the **LEIDEN** rankings – the number of top publications Indicators. Considering for example the number of top 1% publications indicator, the ranking order is – **Tel Aviv University (170)**, **Technion (187)**, **Hebrew University (193)**, **Weizmann Institute (205)**.

Fig.5.6. shows the **LEIDEN** rankings – the proportion of top publications Indicators. Considering for example the proportion of top 1% publications, the ranking order is – **Weizmann Institute (23)**, **Technion (207)**, **Hebrew University (297)**, **Tel Aviv University (543)**. The high ranking of **Weizmann Institute** is due to the high-quality research in life sciences.

Fig.5.7. shows the **WEBOMETRICS** rankings, and **Fig. 5.8.** shows a comparison of **LEIDEN** (Top 1% indicator) and **WEBOMETRICS** (Excellence indicator). It is observed that the ranking orders are – **Aviv University (170, 148 respectively)**, **Technion (187, 270)**, **Hebrew University (193, 298)**, **Weizmann Institute (205, 321)**.

Fig.5.4. LEIDEN Rankings, Number of Publications Indicator – 2014-2017

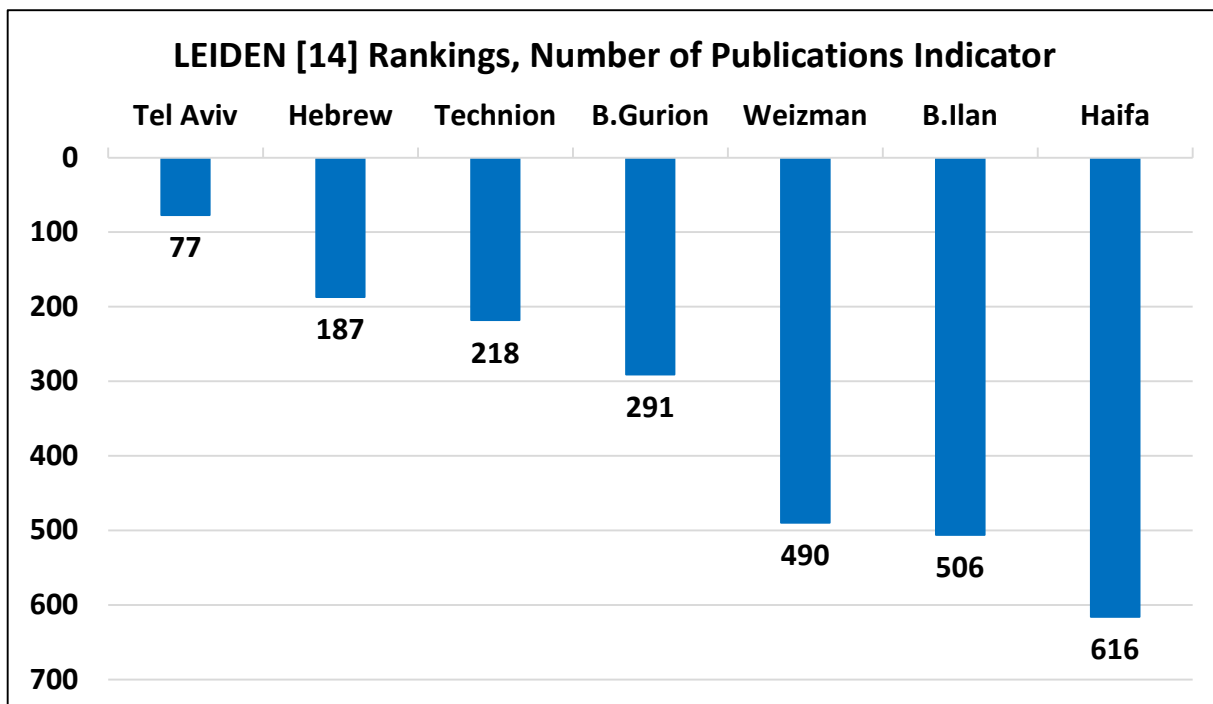


Fig.5.5. LEIDEN [14] Rankings, Number of Top Publications Indicators – 2014-2017

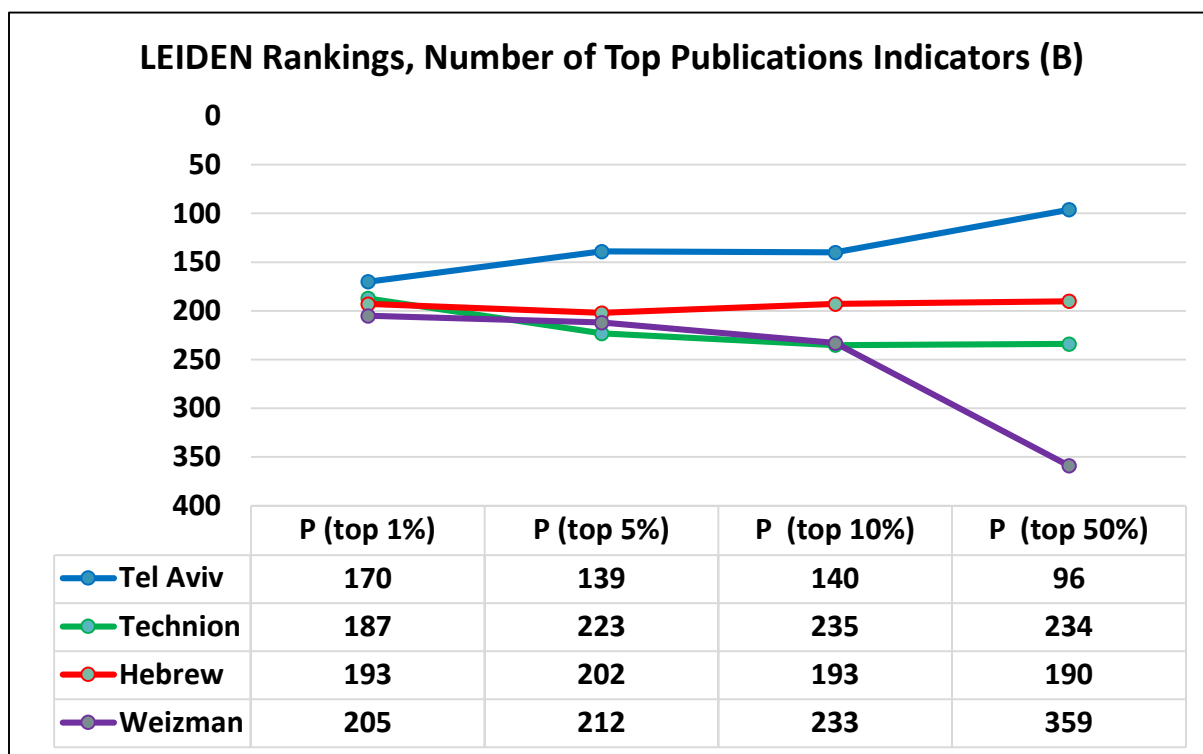
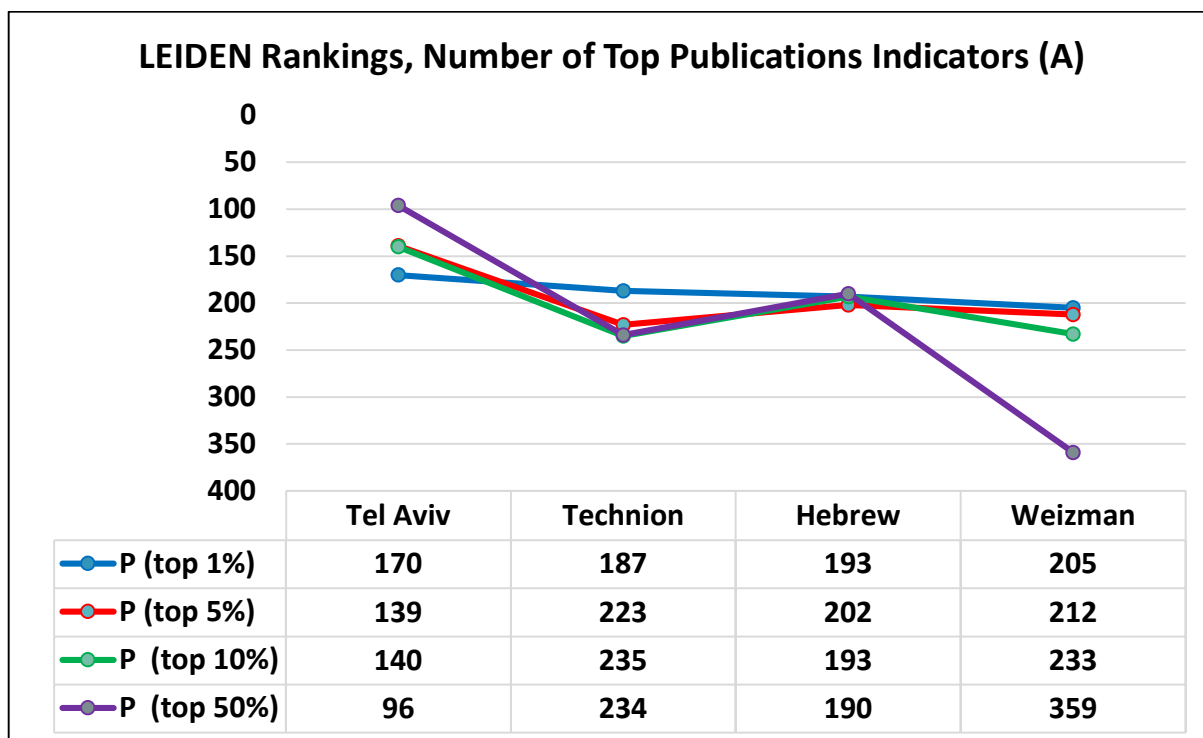


Fig.5.6. LEIDEN [14] Rankings, Proportion of Top Publications Indicators – 2014-2017

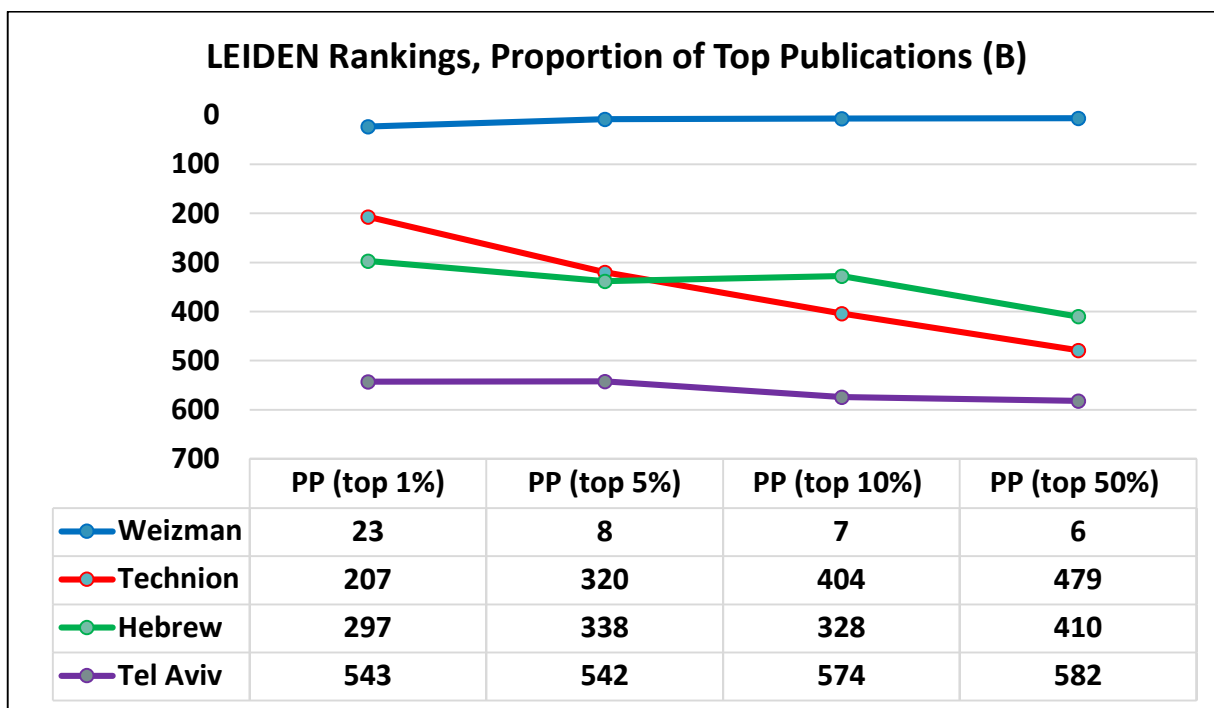
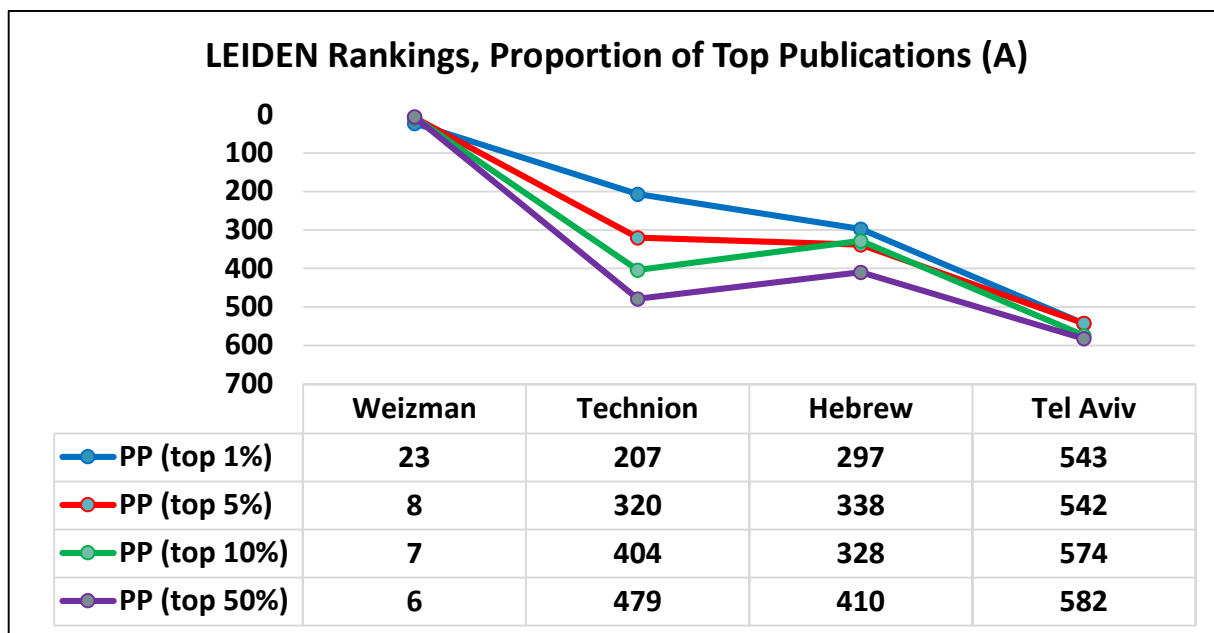


Fig.5.7. WEBOMETRICS [15] Rankings, Various Indicators – 2019

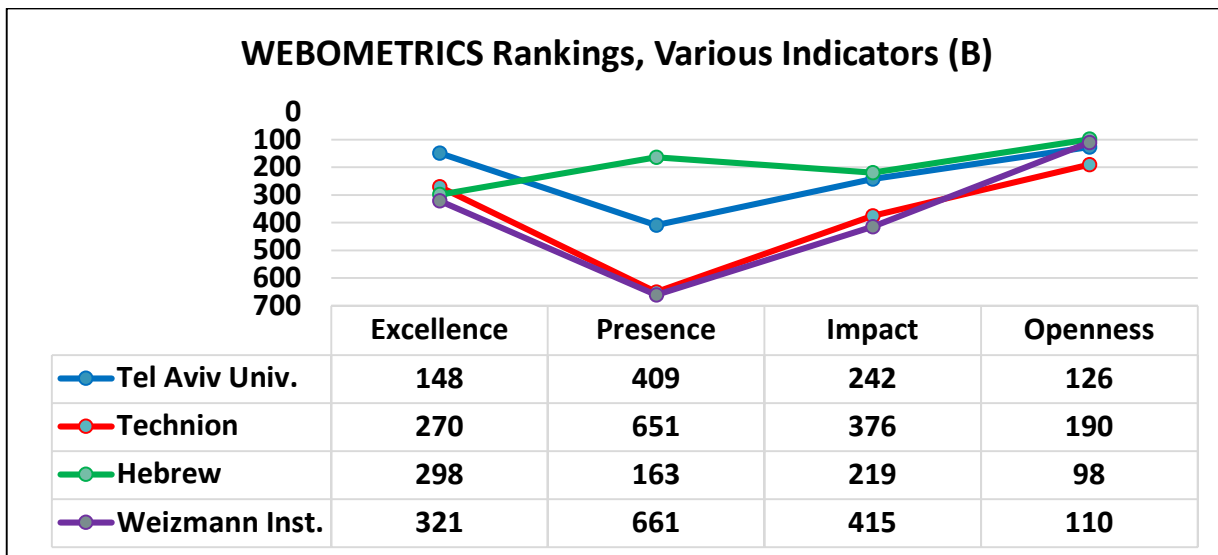
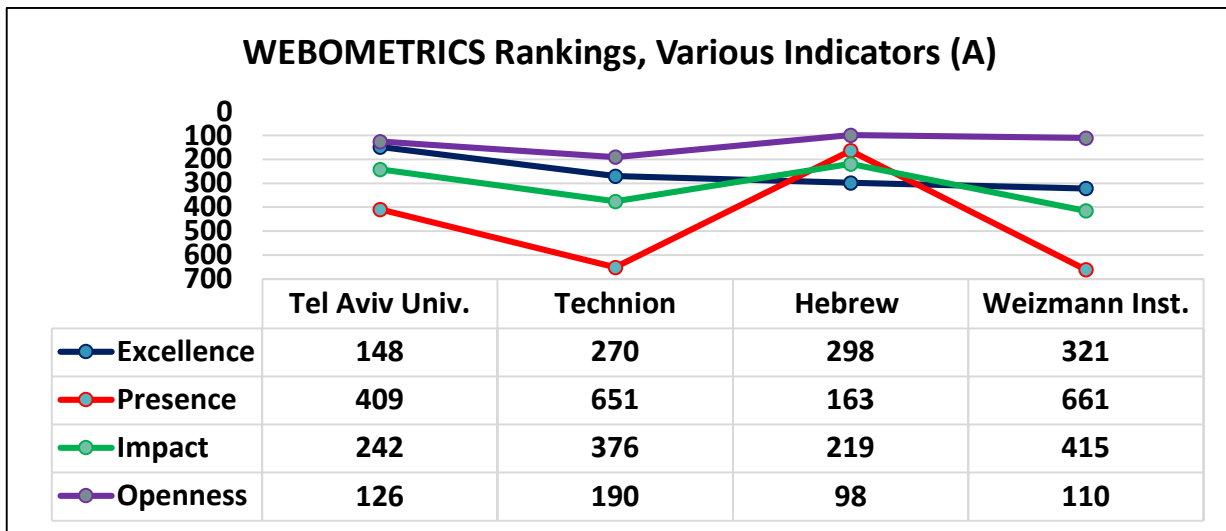
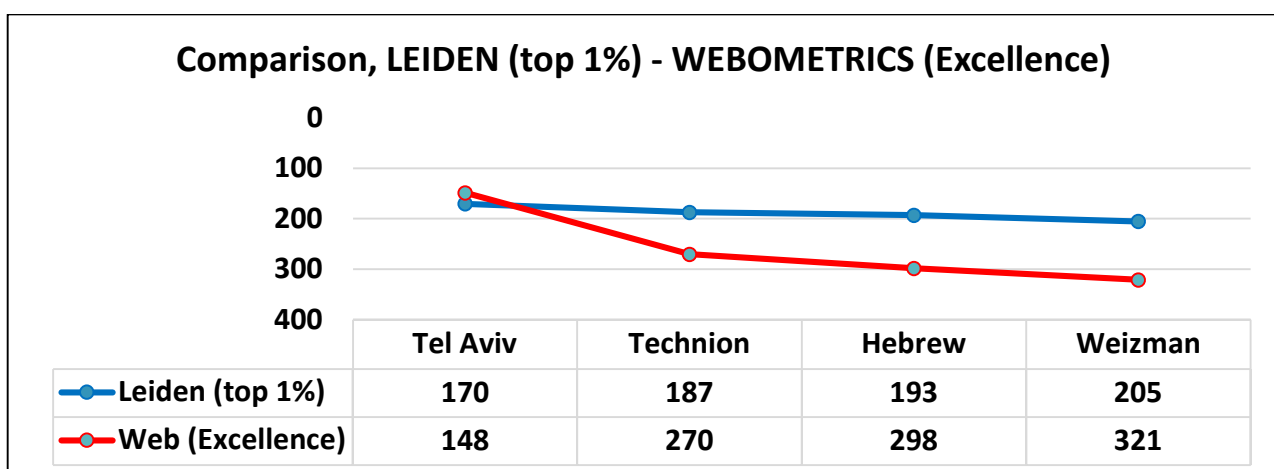


Fig.5.8. A Comparison LEIDEN [14] (Top 1%) – WEBOMETRICS [15] (Excellences)



6. References

1. Aguillo I. F., Bar-Ilan J., Levene M., Ortega J., L., Comparing University Rankings. *Scientometrics* (2010), 85, 243-256.
2. Bassiliades N., Collecting University Rankings for Comparison Using Web Extraction and Entity Linking Techniques. *CCIS 469*, 23-46, 2014.
3. Shehatta I., Mahmood K., Correlation among top 100 universities in the major six global rankings: policy implications. *Scientometrics* (2016), 109, 1231-1254.
4. Haddawy P., Hassan S. U., Abby C. W., Beng L. I., Uncovering research excellence: The global research benchmarking system. *J. of Infometrics*, 11 (2017), 389-406.
5. Moed H. F., A critical Comparative Analysis of Five World University Rankings. (2017). *Scientometrics*, 110, 967-990.
6. Kirsch U., Excellence Evaluations of the Universities in Israel - Approaches, Issues and Achievements, Neaman Institute, Technion Haifa, July 2011.
7. Kirsch U., A comparative study on the scientific and technological research in Israel and some middle eastern countries, using quantitative indicators, Neaman Institute, Technion Haifa, September 2011.
8. Kirsch U., Research Standing of Israeli Universities by Quantitative Indicators, Neaman Institute, Technion Haifa, January 2014.
9. Kirsch U., Israel Research Status – What the Indices Really Describe, Neaman Institute, Technion Haifa, October 2016.
10. Kirsch U., Israel Universities – Unique Aspects in a Changing World, Neaman Institute, Technion Haifa, February 2018.
11. **ARWU** – Academic Ranking of World Universities (www.shanghairanking.com).
12. **THE** – Times Higher Education University Ranking (www.timeshighereducation.com).
13. **QS** – Quackuarely Symonds University Ranking (www.topuniversities.com).
14. **CWTS-LEIDEN** – Centre for Science and Technology Studies (www.leidenranking.com).
15. **WEBOMETRICS** – by the Spanish National Research Council (www.webometrics.com).
16. Web of Science data base (www.ThomsonReuters.com).
17. Scopus data base (www.Scimago.com).

Higher Education



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