APPENDIX A: Measuring Research and Citations

There are many ways to measure research and citations such as the number of citations for all publications from an institution to indexes normalised by subject and size. Bibliometric alternatives include categorizing in citations into top 10% or quartiles for the topic. Other options are SciVal's "Views" or Web of Science's "Usage". They may be supplemented by social media data. Drilling down into the raw data shows that rankings are distorted when a per paper or a per faculty metric is used if a small number of authors are part of mega-authored publications with mega-citations.

THE is the only ranking that has separate weighted categories for Research, including a reputation survey, research income, and research productivity, and Citations, based on the average number of citations per paper: 11 universities scored 100. Two of these are from Southeast Asia and both have very low research scores, low rankings in QS and no ranking in ARWU.

Institution	Country	THE Rank	QS Rank	ARWU Rank	Citation Score	Research Score
Duy Tan U	Viet Nam	402-500	601-800	NR	100	10.8
U of Peradeniya	Sri Lanka	401-500	1001-1200	Nr	100	8.4

I drilled down into the data. Both universities are part of a series in *Lancet* that included 986 institutions. There is one author on the list from Peradeniya and two from Duy Tan. One of the two only has citations from the mega author publications in *Lancet*.

None of the universities scoring 100 are from the U.S. or China. There are six U.S. top universities in the top 25 and none from China. The highest ranked Chinese University is Southern University of Science and Technology, ranked 33 in citations with a score of 98.5

I continued using THE's research and citation rankings narrowing my search to the subject category Medicine & Dentistry to get a picture of the changes in those rankings between 2021 and 2022 because of increased Covid publications. See **Tables 3A and 3B.**

I then drilled down even further, using proprietary Covid-specific data from Elsevier and Clarivate, a Topic Cluster from Scopus in SciVal which adds "Views" and a micro–Citation Topic for Coronavirus (1.104.1353 in InCites, using Web of Science data. In addition to normalized citation impact, InCites offers Impact Relative to the World. Using a minimum of 100 documents from 2016-2020, Peking Union Medical College and the Chinese Capital Medical University are top two. The same universities are 53 and 59 for Percent of documents cited.

Wuhan University and Huazhong University of Science and Technology were in the top five in a variety of metrics based on Covid publications. See **Table 3C**.

QS uses Citations per Faculty. Nine universities score 100, with six from the US and Indian Institute of Science and Korea's Gwangju Institute of Science and Technology and Ulsan National Institute of Science & Technology. The University of Science and Technology China is 11.

THE and QS use data from Elsevier which has a special category for coronavirus. An option that is provided, instead of citations is "views". See Table **Table 3C.**

Other Options measuring research and citations using Elsevier Data

- Scimago Institutions Rankings (SIR): 50 % Research, including 23% citations
- Webometrics : 50% citations

Other Options using Clarivate Data:

- CWTS Leiden – all bibliometrics; Number of citations and percent for a variety of categories
- USNews Best Global Universities: All bibliometrics; 50% citations with half size-independent
- NTU Rankings Performance rankings of scholarly papers: All research with 50% citations
- UMultirank has three citation metrics, with no weightings per indicator
- Round University Rankings (RUR): Citations are part of research
- University Rankings by Academic Performance (URAP): All bibliometric; 36% citations

Part 3 of my hunt for new metrics will provide updates on changes to methodology for SIR and Webometrics, and introduces other rankings such as sources for social media rankings, Green rankings, and an Academic Freedom Index.