Radar chart with axes: peer review (scale 0–400), intl faculty, intl students, faculty/student, citations/faculty. Legend: Tokyo University, Kyoto University, Tokyo Institute of Technology, Osaka University, Tohoku University, Nagoya University.
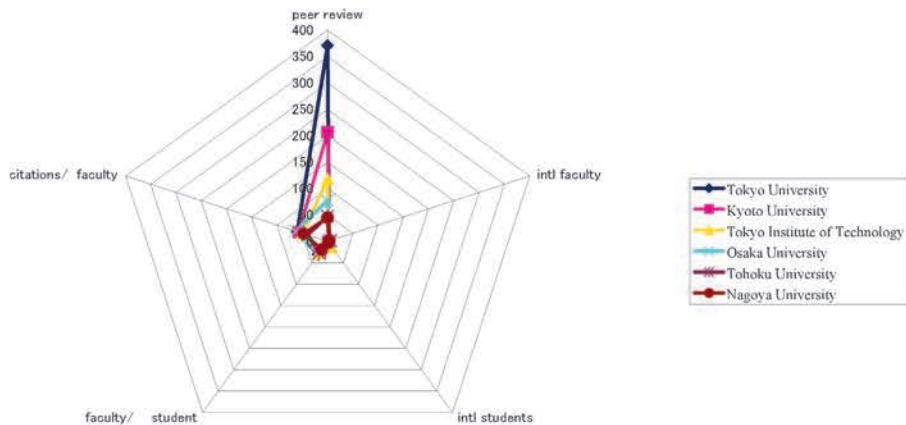
Summary

This concludes our analysis of the *Times* ranking of the world's top 200 universities. The Times ranking is compiled from the five indicators peer reviews, percentage of international faculty, percentage of international students, faculty-student ratio (number of faculty members per student), and number of research citations per faculty member. Among these five indicators, peer reviews are assigned the highest weight and given the greatest emphasis. Our analyses herein also verify that in fact the peer review scores have the greatest influence on the overall ranks of each university. The weights assigned to the two indicators reflecting internationalization—the percentage of international faculty and the percentage of international students—are not very high, but these indicators are seldom used in other rankings, so the *Times* ranking may be said to emphasize them. We also found that the scores for the percentage of international students, the percentage of international staff, and the number of citations per faculty member tend to improve as university size declines. In other words, smaller-scale universities have advantages in these indicators.

Overall, by far the greatest number of universities in the *Times* ranking are located in the U.S. The second largest number of universities ranked are located in the U.K., and the fourth largest number in Australia. The indicators demonstrate a clear predominance of English-speaking countries in the evaluations of education, research, and internationalization, and a definite disadvantage for universities in Asia and especially for universities in other regions such as Latin America and Africa. Establishing new evaluation criteria that would generate more appropriate evaluations for universities in these regions may be considered as an outstanding issue for future global university rankings.

2.2. Shanghai Jiao Tong University Ranking

Outline of the Ranking

In 2004, SJTU published the "Academic Ranking of World Universities" (hereinafter, the "SJTU ranking"). SJTU used international comparable data that is publicly available to rank universities worldwide based on their academic and research performance. According to the university, the ranking was originally implemented for the purpose of identifying gaps between Chinese universities and universities worldwide, especially in terms of academic and research performance.

The SJTU ranking covered a total of 502 universities. Overall, Harvard University was ranked 1st and Stanford University 2nd. Among British universities, University of Cambridge was ranked 3rd and University of Oxford 8th. The University of Tokyo was ranked 14th and Kyoto University 21st. A total of 16 Chinese universities were included in the ranking, but they were all ranked below the top 100.

The SJTU ranking ranks the top 100 universities individually by their overall scores, and divides the universities with lower ranks into groups of 50 (101–152 and 153–202) and then into groups of 100 (202–301, 302–403, and 404–502) without presenting their overall scores.

We computed the overall scores for the universities ranked below the top 100 using the computation method presented on SJTU's website. Figure 16 presents 15 of the universities in the group ranked from 202–301 based on these overall scores, running from University of Nijmegen to University of Reading. The overall scores of these 15 universities are extremely close, ranging from 15.8 to 15.5, but their actual ranks range from 218th for University of Nijmegen to 232nd for University of Reading. So while their scores are very close, there is a rankings differential of 14 ranks. This same characteristic can be seen in the other ranks as well. While SJTU does not explicitly explain this point, it seems that individual rankings were not published for the universities ranked below 100 because their scores are so close that such rankings would be meaningless.

Figure 16   Overall Scores of 15 Universities
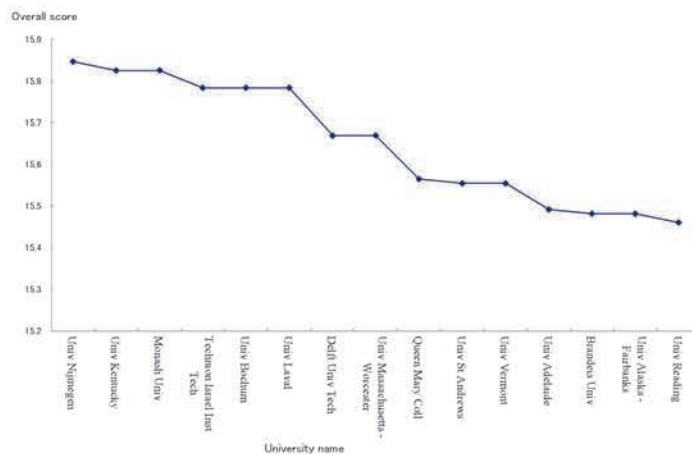
Sample and Ranking Criteria

1) Sample Characteristics

According to SJTU's website, more than 2,000 universities were screened for the ranking. Ranks (including group ranks) were assigned to 502 of these, and published on the university's website. One distinctive characteristic of the ranking is that universities in the U.S. and France were ranked by individual campus. Another characteristic noted on the website is that research centers and branch schools for fields such as medicine were ranked as if they were separate independent universities.

The 502 universities are located in 37 different countries. Overall, 170 of the universities are located in the U.S., accounting for one-third of the total. Figure 17 is a donut graph presenting the top 50, top 100, top 200, and top 500 universities in four concentric circles, all color coded by region. Among the top 50 universities, 37 (74 percent) are located in North America, and 11 (22 percent) are located in Europe. Only 2 (4 percent) of the top 50 universities are located in the Asia-Pacific region. Clearly, North America accounts for the lion's share of the top universities. Next, looking at the regional distribution of the top 100 universities, the percentage of European universities increases to 37 percent. The percentage of universities located in the Asia-Pacific region also increases, but only to 8 percent. By region, it is clear that universities located in the Asia-Pacific region are ranked at the lower end of the top 100 global universities.

The regional distribution of the top 200 universities generally follows the same pattern. While the percentage of Asia-Pacific universities increases slightly, they still account for just one-tenth of the total. Two Latin American universities are also included, accounting for a mere 1 percent of the top 200 schools. Then looking at the country distribution of these top 200 universities (figure 18), the list includes 90 U.S. universities, accounting for nearly half of the total. These are followed by 18 universities in the U.K., 17 in Germany, and 9 in Japan. So the distribution by country

is highly imbalanced.

Figure 17   Regional Distributions of the Top 50, 100, 200, and 500 Universities
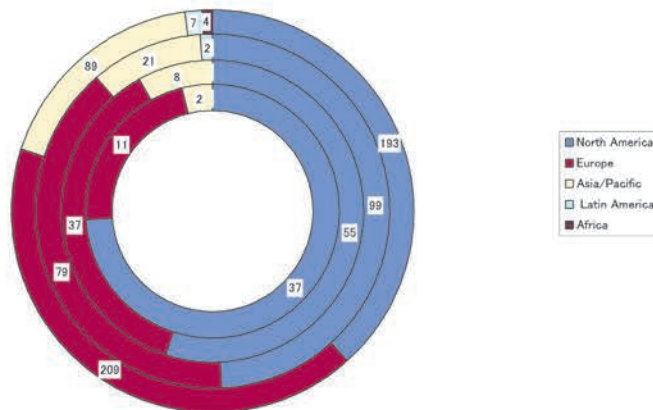
Finally Europe leads the regional distribution of the top 500 universities with 209 universities, followed by North America with 193. The top 500 include 89 universities in the Asia-Pacific accounting for a much higher share than in the smaller lists, but still less than half the number of European schools. Just seven of the universities are located in Latin America, and merely four are located in Africa. As in the previous distributions, the rankings clearly demonstrate the gap between Asian universities and universities from other regions. Nevertheless, the ranking includes 36 universities located in Japan, making Japan the top country in Asia and the fourth overall following the U.S., Germany, and the U.K.

Figure 18   Regional Distribution of the Top 200 Universities
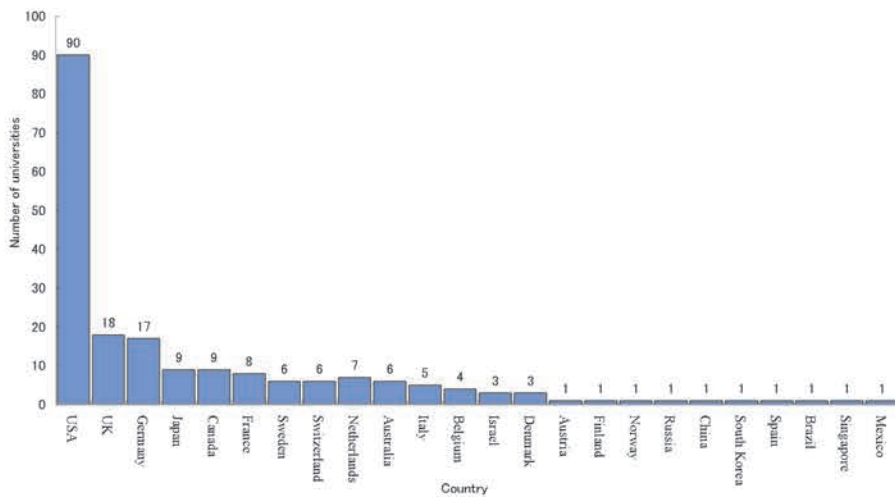
2) Ranking Criteria

The SJTU ranking adopted the following six indicators: (a) Alumni: number of university alumni receiving Nobel Prizes and Fields Medals; (b) Award: number of university staff receiving Nobel Prizes and Fields Medals; (c) HiCi: number of highly cited researchers; (d) N&S: number of faculty articles published in the journals *Nature* and *Science*; (e) SCI: number of articles indexed in the SCI (Science Citation Index Expanded) and the SSCI (Social Science Citation Index); and (f) Size: academic performance with respect to the size of the institution (specifically, the weighted scores of the above five indicators divided by the number of full-time equivalent academic staff).

(a) Alumni: Number of university alumni receiving Nobel Prizes and Fields Medals

The total number of university alumni winning Nobel Prizes and Fields Medals. Alumni are defined as those who obtain bachelor's, master's or doctoral degrees from

the institution. Different weights are set according to the dates when the degrees were obtained. The weights are 100 percent for alumni who obtained degrees in 1991-2000, 90 percent for alumni who obtained degrees in 1981-1990, 80 percent for alumni who obtained degrees in 1971-1980, and continue declining by 10 percent each decade, finally decreasing to 10 percent for alumni who obtained degrees in 1901-1910. When a person obtains more than one degree from an institution, the institution is only counted once for that award.

(b) Award: Number of university staff receiving Nobel Prizes and Fields Medals
The total number of university staff winning Nobel Prizes and Fields Medals. Staff members are defined as those who work at the institution at the time of winning the prize. Different weights are set according to the dates when the prizes were received. The weights are 100 percent for prizes awarded in 2001-2003, 90 percent for prizes awarded in 1991-2000, 80 percent for prizes awarded in 1981-1990, 70 percent for prizes awarded in 1971-1980, and then continue declining by 10 percent each decade, finally decreasing to 10 percent for prizes awarded in 1911-1920. When a staff member is affiliated with more than one institution of higher education, the score is equally divided by the number of institutions. For Nobel Prizes awarded to more than one person, the score is equally divided by the number of recipients.

(c) HiCi: Number of highly cited researchers
The number of highly cited researchers in 21 broad subject categories in life sciences, medicine, physical sciences, engineering, and social sciences from 1981 through 1999. The data are sourced from Thomson Scientific.

(d) N&S: Number of faculty articles published in the journals *Nature* and *Science*
The number of articles written by university faculty members published in the journals *Nature* and *Science* from 1999 through 2003. The following weights are assigned for articles with multiple authors: 50 percent for the first author, 25 percent

for the second author, and 10 percent for the third and subsequent authors (with 50 percent assigned to each author for articles with only two authors). Only academic paper-type articles are considered (in addition to articles, Thomson Scientific's ISI database for *Nature* and *Science* also includes book reviews and bibliographies).

(e) SCI: Number of articles indexed in the SCI (Science Citation Index Expanded) and the SSCI (Social Science Citation Index)

Total number of articles indexed in the SCI (Science Citation Index Expanded) and the SSCI (Social Science Citation Index) in 2003. Here also, only academic paper-type articles are considered.

(f) Size: Academic performance with respect to the size of the institution

The weighted scores of the above five indicators divided by the number of full-time equivalent academic staff. However, since the numbers of full-time equivalent academic staff could only be obtained for universities in such countries as the U.S., China, Italy, the Netherlands, Sweden, and Belgium, for universities in other countries the weighted scores of the above five indicators are used as they are. This is actually one of the major problem points with the SJTU ranking.

3) Overall Score Computation Method

For each indicator, the scores are normalized so that the highest scoring university is assigned a score of 100, and the scores for other universities are calculated as a percentage of the top score. The individual scores for each indicator are then adjusted using the weights presented in table 3 and combined to calculate the overall score, which is used for the ranking.

Table 3   Weights of Each Indicator under the Shanghai Jiao Tong University Ranking

Criteria	Indicator	Weight
Quality of Education	Alumni	10%
	Award	20%
Quality of Faculty	HiCi	20%
Research Output	N&S	20%
	SCI	20%
Size of Institution	Size	10%

Ranking Characteristics and Problem Points

1) Correlations among the Scores

Correlations between the Individual Scores and the Overall Score

We computed the overall scores for the universities ranked below the top 100 using the computation method presented on SJTU's website. The correlations between the individual scores and the overall score are as presented in table 4. The indicator which has the highest correlation with the overall score is N&S, with a correlation coefficient of 0.93. That is to say, the indicator based on the number of faculty member articles published in the journals *Nature* and *Science* from 1999 through 2003 has the highest correlation with the overall score at each university. The indicator showing the lowest correlation with the overall score is Alumni, with a correlation coefficient of 0.80. That is to say, the indicator based on the number of university alumni receiving Nobel Prizes and Fields Medals has the lowest correlation with the overall score. One reason for this is the low weight given to this indicator. Regardless, Table 4 shows rather high correlations with the overall score for every one of the indicators.

Table 4   Correlations among the Indicators in the Shanghai Jiao Tong University Ranking

	Alumni		Award		HiCi		N&S		SCI		Size		Total	
Alumni	1		0.76	**	0.60	**	0.67	**	0.54	**	0.68	**	0.80	**
Award	0.76	**	1		0.65	**	0.70	**	0.50	**	0.73	**	0.84	**
HiCi	0.60	**	0.65	**	1		0.86	**	0.68	**	0.70	**	0.90	**
N&S	0.67	**	0.70	**	0.86	**	1		0.74	**	0.77	**	0.93	**
SCI	0.54	**	0.50	**	0.68	**	0.74	**	1		0.56	**	0.81	**
Size	0.68	**	0.73	**	0.70	**	0.77	**	0.56	**	1		0.83	**
Total	0.80	**	0.84	**	0.90	**	0.93	**	0.81	**	0.83	**	1	

Note: Statistically significant at a level of 10 percent (both sides).

Correlations Among the Indicators

Looking at table 4, the strongest correlation among the indicators is between HiCi and N&S, with a correlation coefficient of 0.86. In other words, there is a strong correlation between the number of highly cited researchers in 21 broad subject categories and the number of articles published in *Nature* and *Science*. The weakest correlation among the indicators is between Award and SCI, with a correlation coefficient of 0.50. In other words, there is a weak correlation between the number of university staff winning Nobel Prizes and Fields Medals and the number of article citations. The correlation between Alumni and SCI is also relatively weak, with a correlation coefficient of 0.54. In other words, there is a weak correlation between the number of article citations and the number of both university staff and university alumni winning Nobel Prizes and Fields Medals. Nevertheless, on the whole, the correlations among the various indicators are comparatively strong. This may be interpreted as demonstrating that all the indicators measure the same sorts of properties of the characteristics of university research.

2) Differences in Ranks Under Prize and Publications Indicators

Figure 19 is a line graph that presents the rankings of the top 36 universities based on (1) the weighted average of their Alumni and Award scores (the prize indicators) and (2) the weighted average of their HiCi, N&S, and SCI scores (the publications indicators). The graph shows that the ranking of Harvard University remains the same and that the rankings of the University of Cambridge and the other top ten universities

(with the exception of the University of Chicago) do not change all that much using either set of indicators. The University of Chicago is ranked 3rd using the prize indicators and 22nd using the publications indicators. The University of Tokyo shows the greatest differential from a rank of 58th using the prize indicators to a rank of 5th using the publications indicators. While the SJTU ranking indicators are biased in favor of research, these results confirm the value of this approach of using multiple indicators to measure research from different aspects.

Figure 19   Differences in Ranks Using the Prize and Publications Indicators
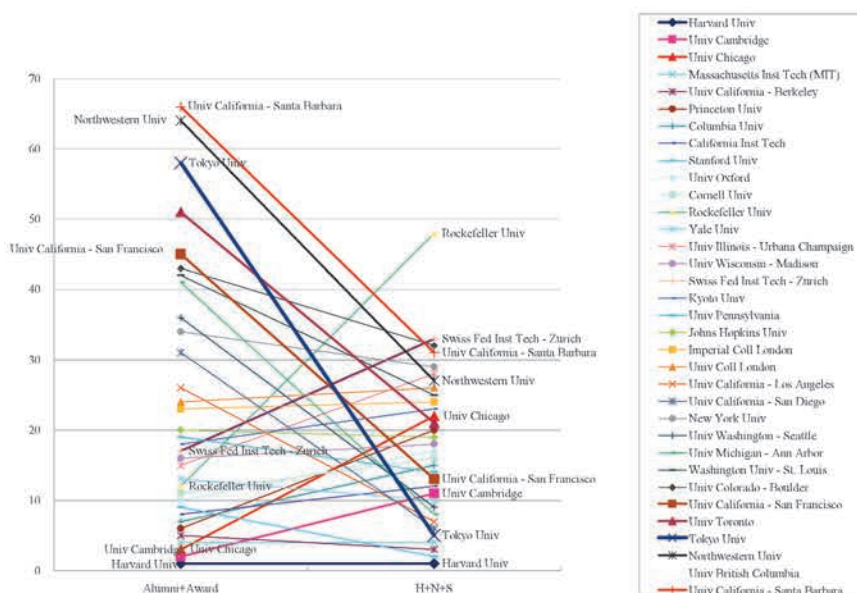
3) Regarding Universities Specializing in Humanities and the Social Sciences

Because only a small number of academic paper-type articles are written in English in the humanities and social sciences fields, a great many well-known universities specializing in the humanities and social sciences are not included in the SJTU ranking, or are assigned relatively low ranks. Moreover, for these universities, the

N&S indicator (the number of articles written by university faculty published in *Nature* and *Science*) is not considered, and the weight of N&S indicator is allocated to the other indicators. The London School of Economics (LSE) is one example. However, SJTU holds that humanities and social sciences universities can still receive high ranks, for example, if their alumni and staff receive Nobel Prizes in economics and if their researchers are frequently quoted in social science journals.

These problems are also noted on the SJTU website.

4) Regarding the Indicators

The distinguishing feature of the SJTU's "Academic Ranking of World Universities" is that its main indicators represent the universities' academic and research strengths. In other words, universities with strong performance in both academics and research are expected to receive high ranks. And in fact, the SJTU rankings do reflect the fact that U.S. universities have relatively high research capabilities.

Nevertheless, university quality cannot be measured solely by research. Education is also an extremely important indicator. The indicators used in the SJTU ranking are all research indicators and include no education indicators. The SJTU ranking is presented as an academic ranking, but there are issues that need to be investigated regarding the validity of viewing rankings compiled from research indicators as comprehensive university rankings.

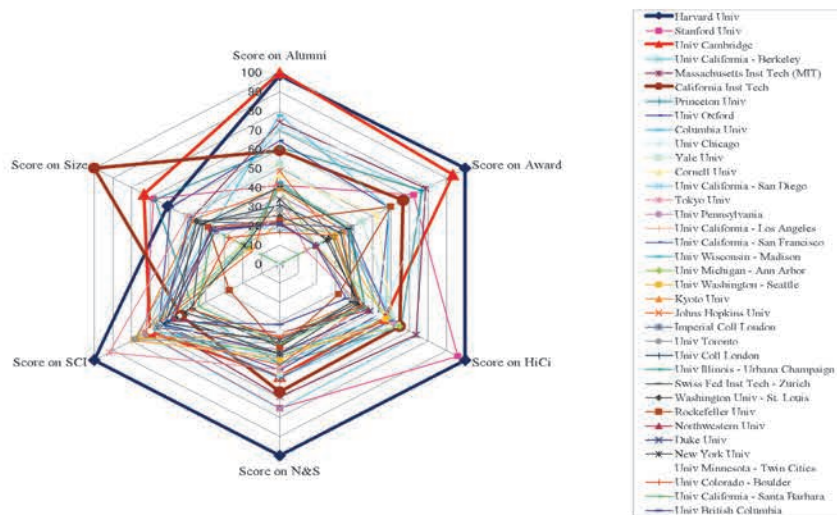### 5) Comparisons of Japanese Universities and Chinese Universities with the World's Top 36 Universities

The World's Top 36 Universities

As mentioned above, 36 Japanese universities are included in the SJTU ranking. For comparison with these Japanese institutions, we prepared a radar graph (figure 20) presenting the indicator scores for the world's top 36 universities. The figure shows

that the distribution of the indicator scores is relatively even. Looking at individual universities, Harvard University, which is ranked no. 1 overall, has high scores for all indicators other than size. The University of Cambridge, which is ranked at no. 3, has high scores for the Alumni and Award indicators. Its scores for the other indicators are not all that high, but still at a certain level. California Institute of Technology, which is ranked 17th, has the highest score for the Size indicator, but its scores for the other indicators are not particularly high.

Figure 20   Indicator Scores Distribution for the World's Top 36 Universities

Japanese Universities

There are five Japanese Universities ranked in the top 100: the University of Tokyo, Kyoto University, Osaka University, Tohoku University, and Nagoya University.

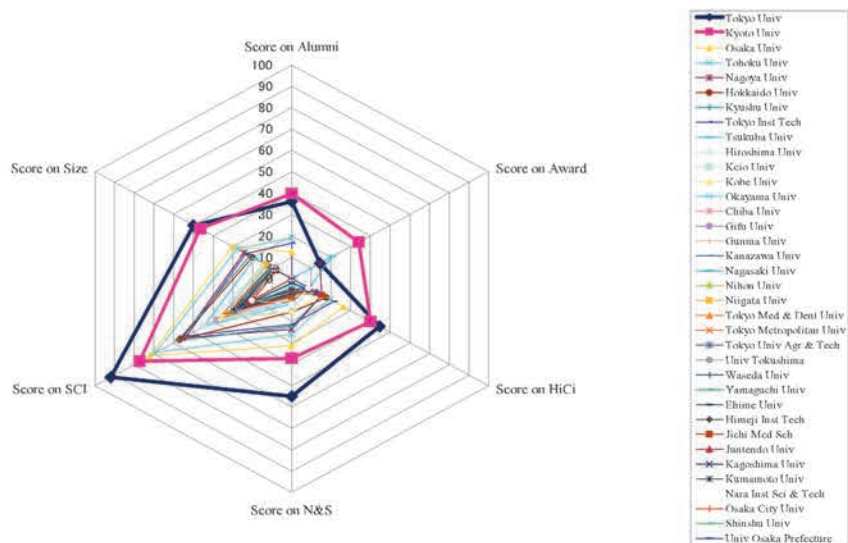Figure 21 is a radar graph of the 36 Japanese universities included in the SJTU ranking. The scores distribution for these Japanese universities shows a clear bias toward SCI. The scores for their other indicators are conspicuously low compared with the radar graph for the world's top 36 universities. The University of Tokyo has the second highest SCI score worldwide, and this is its highest indicator score. The

University of Tokyo also shows relatively high scores for other indicators in comparison with the other Japanese universities. The University of Tokyo is ranked 14th overall, and this is the highest rank of any Japanese university. Compared with the University of Tokyo, Kyoto University has lower scores for SCI and other indicators, but higher ranks for the Alumni and Award indicators. Kyoto University is ranked 21st worldwide.

Figure 21   Indicator Scores Distribution for the Ranked Japanese Universities

Chinese Universities

Figure 22 is a radar graph of the 16 Chinese universities included in the SJTU ranking. Their scores distribution shows a bias toward SCI that is even stronger than that of the ranked Japanese universities. The other indicator scores for these Chinese Universities are markedly low compared with those for the ranked Japanese universities and for the top 36 universities worldwide.

National Taiwan University has the highest overall score among the Chinese universities included in the ranking. Among the Chinese universities, it has the highest score for Alumni, a 0 score for Award, and rather high scores for all the other

indicators.

Among the ranked Chinese universities, National Tsing Hua University has the highest SCI score and a relatively high Alumni score. Its scores for all the other indicators are distinctly low, including 0 scores for both the Award and HiCi indicators.

Peking University's SCI score is slightly lower compared with National Tsing Hua University, but still high among the Chinese universities. However, Peking University has 0 scores for the Alumni, Award, and HiCi indicators.

SJTU itself has a low SCI score among the Chinese Universities, 0 scores for the Alumni, Award, and HiCi indicators, and its scores for the other indicators are lower than those at Peking University and National Tsing Hua University. SJTU's overall rank is low among the ranked Chinese universities.

Figure 22   Indicator Scores Distribution for the **Ranked** Chinese Universities
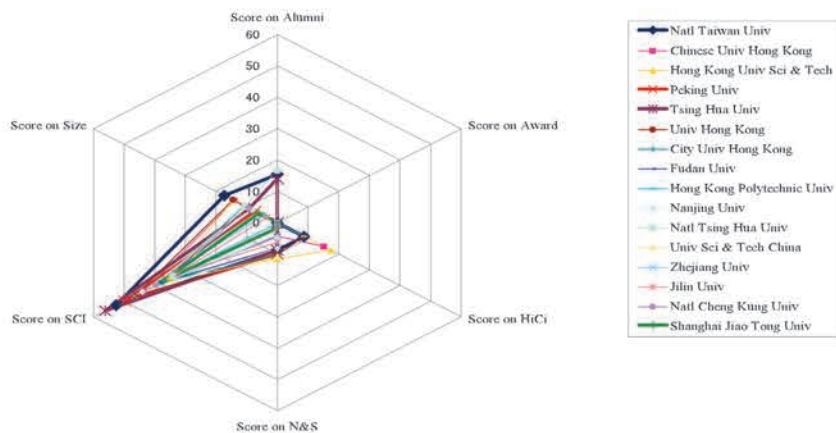
Comparing Japanese and Chinese Universities with the World's Top Universities

This completes our analyses of the indicator score distributions of the world's top 36 universities, the 36 ranked Japanese universities, and the 16 ranked Chinese universities. As noted above, the scores distributions are relatively even for the highly ranked universities and biased toward the SCI indicator for the lower-ranked universities. The analyses also clarified the differences between the Asian universities and the world's top universities, and between the Chinese and Japanese universities within Asia.

Summary

We have now explained and analyzed the global university ranking published by SJTU. SJTU ranks 502 universities worldwide using the six indicators Alumni (number of university alumni receiving Nobel Prizes and Fields Medals), Award (number of university staff members receiving Nobel Prizes and Fields Medals), HiCi (number of highly cited researchers), N&S (number of faculty articles published in the journals *Nature* and *Science*), SCI (number of articles indexed in the SCI and SSCI), and Size (academic performance with respect to the size of the institution). These are all indicators concerning research, so universities with strong research capabilities received high ranks. U.S. universities have comparatively high research capabilities while Asian universities, especially Chinese universities, have comparatively weak research capabilities, and this fact is reflected by the rankings. Our analyses also demonstrated the value of the approach adopted by the SJTU ranking in using multiple indicators to measure research from different aspects.

SJTU states that the primary purpose of the ranking was to identify the gaps between Chinese universities and world-class universities in terms of academic and research performance. The ranking results show conspicuous gaps between the Chinese and top global universities. Nevertheless, as noted above, our analyses confirm that this kind of evaluation which focuses on research and English-language citations is

inevitably disadvantageous for Chinese universities. Thus considerations of how to bridge the gap between Chinese and leading global universities must be based on sufficient understandings of the evaluation methods.

3. Comparison of the Two Global University Rankings

Our analyses thus far have clarified the characteristics of the two comprehensive global university rankings—the *Times* ranking and the SJTU ranking. In this section, we now proceed to compare these rankings with one another.

The two rankings have different numbers of samples. Since the *Times* ranking covers 200 universities and the SJTU ranking covers 502 universities, by necessity we limit the SJTU ranking here to the top 200 institutions for comparison purposes. Also, while the *Times* ranking is fundamentally on an individual university basis, the SJTU gives separate rankings to certain campuses (branches), hospitals, and research centers. For campus rankings, we compare the *Times* ranking with the SJTU ranking for the institution's main campus. For example, we compare the SJTU ranking for the University of Michigan Ann Arbor with the *Times* ranking for the University of Michigan. We do not, however, adopt this approach for university hospitals and research centers. The *Times* ranking also provides rankings by campus for universities in France and for the University of California (UC), for example, for UC Berkeley, UC Los Angeles (UCLA) and UC San Francisco (UCSF), allowing direct comparisons with the SJTU ranking.[8]

Additionally, as explained above, the SJTU uses group rankings, with no individual rankings, for universities ranked below the top 100. Here, we have assigned the following ranks for the lower-ranked universities: 125th for universities ranked

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[8] In some cases, the two rankings use slightly different names to refer to the same institutions, and we confirmed that these are the same institutions using the websites of each university and other reference materials.

100-150, 175th for universities ranked 150-200, 250th for universities ranked 200-300; 350th for universities ranked 300-400; and 450th for universities ranked 400-500. Finally, in place of the rankings, we also compare the overall scores under the two rankings.

Trends among the Universities Listed in the Two Rankings

Appended tables 11 and 12 compare the universities listed by each ranking. The Universities that are included in the *Times* ranking but do not appear in the SJTU ranking are presented in Table 5. Because the SJTU ranking primarily focuses on the natural sciences, it does not include the School of Oriental and African Studies (SOAS) or the University of Paris 1: Panthéon Sorbonne. Nevertheless, there are natural science universities in the *Times* ranking that are not included in the SJTU ranking such as RMIT and the University of Technology, Sydney.

Table 5   Universities in the *Times* Ranking Not Included in the Top 200 Shanghai Jiao Tong University Ranking

Times rank	Institution	Country
44	School of Oriental and African Studies	UK
55	RMIT University	Australia
71	Paris 1 Sorbonne	France
76	Curtin University of Technology	Australia
100	Queen Mary University of London	UK
111	Sains Malaysia University	Malaysia
113	University of Technology Sydney	Australia
144	Toulouse 1 University	France
155	Montpellier 1 University	France

Conversely, table 6 presents the 64 universities and research organs that are included in the top 200 universities under the SJTU ranking but are not included in the *Times* ranking. Among Japanese institutions, University of Tsukuba, Hokkaido University, and Kyushu University are included in the SJTU ranking but not in the *Times* ranking.

No Chinese universities appear in this table.

Table 6   Universities in the Top 200 Shanghai Jiao Tong University Ranking Not Included in the *Times* Ranking

World Rank	Institution	Country	World Rank	Institution	Country
29	Rockefeller Univ	USA	153-201	Cardiff Univ	UK
36	Univ Texas Southwestern Med Center	USA	153-201	Coll France	France
46	Karolinska Inst Stockholm	Sweden	153-201	Colorado State Univ	USA
48	Univ Paris 11	France	153-201	Florida State Univ	USA
48	Univ Pittsburgh - Pittsburgh	USA	153-201	Free Univ Amsterdam	Netherlands
55	Univ California - Irvine	USA	153-201	Gothenburg Univ	Sweden
67	Univ Florida	USA	153-201	Iowa State Univ	USA
73	Ohio State Univ - Columbus	USA	153-201	Mt Sinai Sch Med	USA
91	Univ Basel	Switzerland	153-201	Oregon Health & Sci Univ	USA
101-152	Arizona State Univ - Tempe	USA	153-201	Queen's Univ	Canada
101-152	Baylor Coll Med	USA	153-201	Univ Calgary	Canada
101-152	Hokkaido Univ	Japan	153-201	Univ Cincinnati - Cincinnati	USA
101-152	Kyushu Univ	Japan	153-201	Univ Connecticut - Storrs	USA
101-152	Oregon State Univ	USA	153-201	Univ Delaware	USA
101-152	Tel Aviv Univ	Israel	153-201	Univ Grenoble 1	France
101-152	Tsukuba Univ	Japan	153-201	Univ Koeln	Germany
101-152	Univ Bern	Switzerland	153-201	Univ Leipzig	Germany
101-152	Univ California - Riverside	USA	153-201	Univ Mainz	Germany
101-152	Univ Geneva	Switzerland	153-201	Univ Marburg	Germany
101-152	Univ Georgia	USA	153-201	Univ Maryland - Baltimore	USA
101-152	Univ Ghent	Belgium	153-201	Univ Montpellier 2	France
101-152	Univ Groningen	Netherlands	153-201	Univ Nebraska - Lincoln	USA
101-152	Univ Hawaii - Manoa	USA	153-201	Univ Notre Dame	USA
101-152	Univ Illinois - Chicago	USA	153-201	Univ Padua	Italy
101-152	Univ Leuven	Belgium	153-201	Univ Sao Paulo	Brazil
101-152	Univ Miami	USA	153-201	Univ Texas Health Sci Center - Houston	USA
101-152	Univ Milan	Italy	153-201	Univ Texas M.D. Anderson Cancer Center	USA
101-152	Univ Muenster	Germany	153-201	Univ Turin	Italy
101-152	Univ Paris 07	France	153-201	Univ Wageningen	Netherlands
101-152	Univ Pisa	Italy	153-201	Virginia Commonwealth Univ	USA
101-152	Univ Tennessee - Knoxville	USA	153-201	Washington State Univ - Pullman	USA
101-152	Univ Tuebingen	Germany			
101-152	Weizmann Inst Sci	Israel			

Trends in the Overall Scores under the Two Rankings

Figure 23 presents the correlations between the overall scores under the *Times* ranking and the SJTU ranking. The correlation coefficient is relatively high at 0.730.

The score differentials among the higher-ranked universities are small, with little change in the ranks. In contrast, the score differentials among the lower-ranked

universities are large with large changes in the ranks. This confirms the properties of rankings as discussed above.

Figure 23   Overall Scores Correlations under the Times and Shanghai Jiao Tong University Rankings
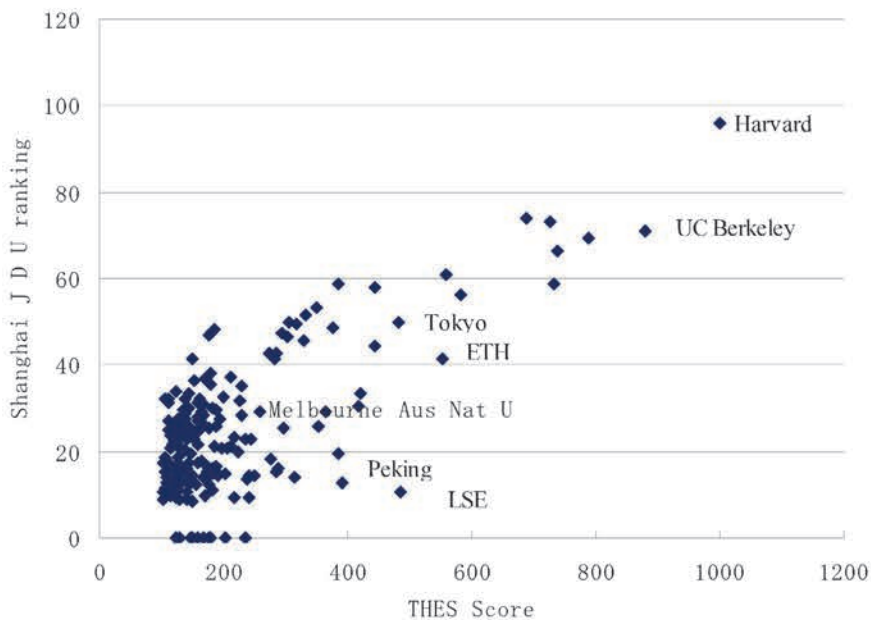
Universities with Vastly Different Ranks

Compared with the *Times* ranking, the ranks of Asian universities outside of Japan, especially of Chinese universities, tend to be low in the SJTU ranking. On the other hand, compared with the SJTU ranking, the *Times* ranking tends to give lower ranks to universities located in Canada and the U.S. such as Washington University and Wisconsin University.

As shown by figure 24, the universities with vastly different overall scores under the two rankings include LSE, Peking University (Beijing University in the *Times*

127

ranking), and ETH Zurich. Other universities with significantly different scores under the two rankings include Indian Institute of Technology, Eindhoven University of Technology, Nanyang Technological University, Macquarie University, and the University of Western Australia.

Figure 24   Comparison of Ranks under the Two Global University Rankings
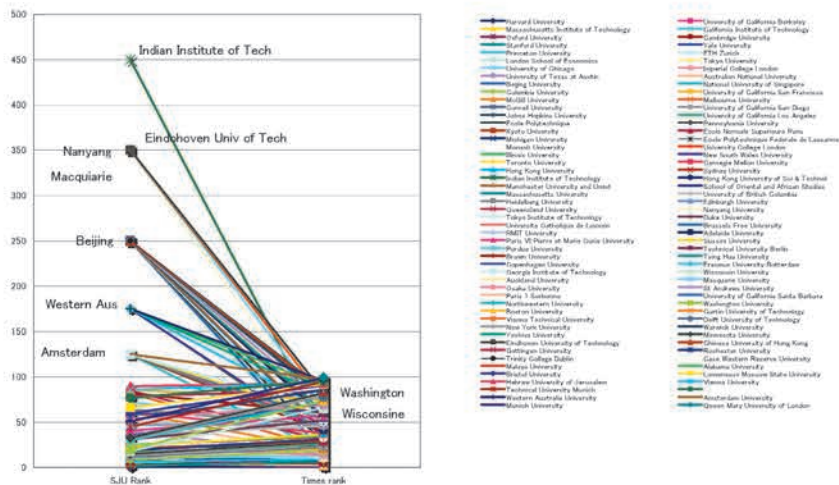
Correlations among the Indicators and Overall Scores under the Two Rankings

Next we examine the correlations among the indicators and overall scores under the two rankings. As shown in table 7, some of the indicators show high correlations, while others show almost no correlations whatsoever. The correlations of the *Times* peer review and citations per faculty indicators with all the SJTU indicators are conspicuously high. In contrast, the *Times* education indicators percentage of international faculty, percentage of international students, and faculty-student ratio show low correlations with the SJTU indicators.

Table 7   Correlations among the Indicators and Overall Scores under the Two Global University Rankings

| | | times | | | | | | |
		times rank	peer review	intl faculty	intl students	faculty/ student	citations / faculty	Final Score
SJU	SJU Rank	0.404 **	-0.332 **	0.193 **	0.245 **	-0.295 **	-0.464 **	-0.394 **
	Alumni	-0.483 **	0.662 **	-0.047	-0.041	0.434 **	0.426 **	0.678 **
	Award	-0.490 **	0.690 **	-0.046	-0.065	0.377 **	0.556 **	0.739 **
	HiCi	-0.504 **	0.576 **	-0.142 **	-0.256 **	0.329 **	0.679 **	0.662 **
	N&S	-0.498 **	0.636 **	-0.131 **	-0.254 **	0.396 **	0.708 **	0.732 **
	SCI	-0.424 **	0.510 **	-0.238 **	-0.315 **	0.300 **	0.400 **	0.491 **
	Size	-0.476 **	0.551 **	-0.015	-0.094	0.414 **	0.629 **	0.666 **
	Total Score raw	-0.502 **	0.679 **	-0.171 **	-0.341 **	0.422 **	0.671 **	0.730 **

Note: Statistically significant at a level of 10 percent (both sides).

It is interesting that the *Times* peer review indicator has relatively high correlations above 0.5 with all the SJTU indicators, as shown in table 7. Are peer reviews really reliable as university evaluation criteria? There is a high likelihood that peer reviews focus on research, and also depend on the prestige of each university, and thus have a high correlation with awards such as Nobel Prizes and Fields Medals. Moreover, because peer reviews also depend on the universities' past prestige and reputation, they are surprisingly stable.

Comparison of the Citation Indicators of the Two Rankings

So while the *Times* peer review indicator has rather high correlations with all the SJTU indicators, overall there are clear differences between the two rankings because their indicators measure substantially different university characteristics. Next, looking at research citations, which is the one indicator included in both rankings (specifically, the number of citations per faculty member in the *Times* ranking and SCI in the SJTU ranking), the scores are highly dispersed as illustrated by figure 25 and the simple correlation coefficient is not high at 0.400. This is probably because while these are both citations indicators, the *Times* indicator is on a per faculty member basis while the SJTU indicator is based on the absolute number of citations. Thus even though both rankings adopt citations indicators, these two citation indicators are actually measuring substantially different university characteristics.

Figure 25   Comparisons of the Citation Scores under the Two Rankings
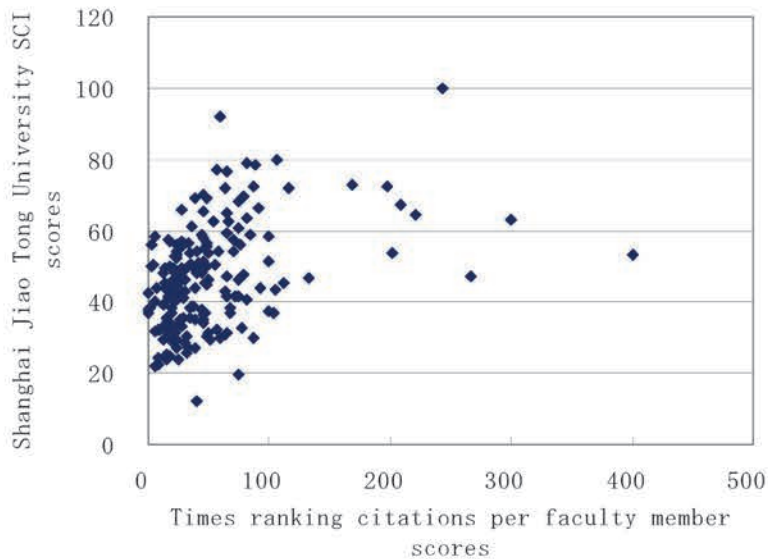
Causes of the Rank Differences in the Two Global Rankings

Our comparisons have shown that there are great differences in the ranks awarded under the two global university rankings. Both of the rankings themselves recognize that there are reasons for such disparities, which may be caused by the following aspects of the rankings criteria.

1) Advantage of the English language

2) Regional bias

3) Differences in individual evaluation criteria and indicators

Regarding peer reviews, as mentioned before the regional breakdown of the reviewers has not been disclosed, and there is a definite possibility of regional bias. As for differences in individual evaluation criteria and indicators, there are certainly major differences between the SJTU ranking, which focuses on research and the natural

sciences and considers the receipt of Nobel Prizes and Fields Medals, and the *Times* ranking, which incorporates peer reviews and education (specifically the percentage of international faculty, the percentage of international students, and the faculty-student ratio). Consequently, it is no surprise that there are substantial discrepancies in the ranks awarded under the two rankings.

4.   Potential for Global University Rankings

We have seen that except for the highest ranks, there are substantial differences in the ranks awarded to the same universities under the two global rankings. This shows how the two rankings embody the general characteristics of rankings based on comprehensive scores. We also observed great differences in the citation scores under the two rankings. This verifies that the *Times* ranking and the SJTU ranking judge universities using substantially different criteria and indicators. In other words, the two measure different university characteristics and then convert those measurements into rankings. There is little point in debating which of these two university rankings is more "correct" from an objective perspective. Rather, the appearance of multiple comprehensive global university rankings, which were previously limited to just the *Gourman Report*, provides an opportunity to examine the relative merits of focusing on different characteristics, and this has important implications for market university evaluations.

As one example, it is interesting that the *Times* has criticized the inclusion of Nobel Prizes and Fields Medals in the SJTU ranking criteria even though the *Times* includes the number of Nobel Prize and other award winners in the introductions to individual universities that it presents together with its own ranking. This publication of the number of prize winners implies that the *Times* does recognize that the receipt of Nobel Prizes and Fields Medals represents certain university characteristics, particularly reputation for research. Also, compared with the *Times* indicator citations per faculty member, the SJTU indicator SCI is advantageous to larger institutions and

may more closely reflect university reputation. Yet the situation is different again for schools focusing on specific fields such as California Institute of Technology and UC San Francisco, as well as for smaller universities. UC San Francisco is highly renowned in the field of medicine, and is certainly a high-level university. Nevertheless, because it is small UC San Francisco is not well-known in general. This example also illustrates the difficulty of comprehensive university rankings, in selecting which characteristics to examine.

The compilers of the two global rankings explicitly recognize and repeatedly note these inherent difficulties of comprehensive university rankings. Nevertheless, it is also a fact that once they are released rankings take on a life of their own. This point cannot be overemphasized. In particular, the *Times* comprehensive ranking was initially released with explanations of the criteria and indicators, though some aspects remained unclear. The subsequent *Times* rankings by field have been published without releasing the specific indicators. Thus the transparency of the rankings is actually declining. This may well be considered a major problem with the *Times* ranking.

Nevertheless, just criticizing comprehensive university rankings is not particularly productive. Market university evaluations are prepared for commercial purposes, and simply taking a negative stance because of this does not contribute to improving the quality of university evaluations. Especially in Japan, market university evaluations have the potential to create a stir in the social evaluation of universities, which to date has essentially been limited to standard deviation scores. University evaluations have been steadily advancing in Japan, especially since the Central Council for Education made such evaluations obligatory in 2002. Whether discussing market university evaluations or institutional university evaluations, there is no point in criticism for its own sake. Rather, what we need are critical examinations based on objective verifications in order to improve the methodology and contents of university evaluations. From that perspective, this paper has examined and compared the *Times*

ranking and the SJTU ranking, which both disclose their evaluation criteria and score weights. Our findings have reconfirmed the great difficulties of comprehensive university rankings. Additional examinations are needed to realize better university evaluations in the future.

4. Rankings Sources

The Times Higher Education Supplement (THES), http://www.thes.co.uk

Shanghai Jiao Tong University "Academic Ranking of World Universities,"
http://ed.sjtu.edu.cn/ranking.htm

5. References

In Japanese

Kaneko, M. 2000. Daigaku hyoka no poritikaru economi [The political economics of university evaluations]. Japanese Association of Higher Education Research (ed.) *Higher Education Research* (Vol.3).

Kobayashi, M. 2004. Daigaku rankingu no kozai—Ringo to mikan wa dochiraga iika [The merits and demerits of university rankings—Which are better, apples or oranges?] *Kyoiku Gakujutsu Newspaper.* December 1.

Mabuchi, Y., M. Kobayashi, and N. Otawa. Shijogata daigaku hyoka [Market university evaluations]. Japanese Association of Higher Education Research (ed.) *Higher Education Research* (Vol.5).

The University of Tokyo Center for Research and Development of Higher Education. 2003. Kobetsu daigaku joho no naiyo/keitai ni kansuru kokusai hikaku [International comparison on the contents and formats of individual university information]. *Monograph* 2. (Can be downloaded via www.he.u-tokyo.ac.jp.)

In English

Clotfelter, C. T. 1996. *Buying the best.* Princeton U. P.

Meredith, M. 2004. Why do universities compete in the rating game? *Research in Higher Education.* Vol. 45, No. 5.

Pike, G.R. 2004. Measuring quality. *Research in Higher Education* Vol. 45, No. 5.

UNESCO 2002. *Invitational roundtable on statistical indicators for quality assessment of higher/tertiary education institutions – The methodologies of ranking and league tables.*

Appended Table 1

Regional and Country Distribution of the *Times* Ranking

Region	Regional Distribution	Country	Top50	Top100	Top200	Number of universities
North America	69	US	20	15	27	62
		Canada	3		4	7
Latin America	1	Mexico			1	1
Europe	87	UK	8	6	16	30
		Switzerland	2			2
		Sweden			5	5
		Spain			1	1
		Russia		1		1
		Norway			2	2
		Netherlands		4	4	8
		Italy			2	2
		Ireland			1	1
		Germany	1	4	12	17
		France	2	2	4	8
		Finland			2	2
		Denmark		1	2	3
		Belgium		2		2
		Austria		2	1	3
Asia	26	Malaysia		1	1	2
		Korea			3	3
		Japan	2	2	2	6
		India	1			1
		Hong Kong	2	1	1	4
		China	1	1	3	5
		Taiwan			1	1
		Singapore	2			2
		Israel		1	1	2
Oceania	17	Australia	6	5	3	14
		New Zealand		1	2	3

Appended Table 2

Times Rankings with and without the Peer Review Component

Institution	World Rank	Rank without peer
California Institute of Technology	4	1
ETH Zurich	10	2
University of California San Francisco	20	3
Harvard University	1	4
Massachusetts Institute of Technology	3	5
Stanford University	7	6
University of Texas at Austin	15	7
University of California San Diego	24	8
Ecole Polytechnique Federale de Lausanne	32	9
McGill University	21	10
Yale University	8	11
Johns Hopkins University	25	12
London School of Economics	11	13
Imperial College London	14	14
Australian National University	16	15
University of California Berkeley	2	16
Princeton University	9	17
Ecole Normale Superieure Paris	30	18
University of Chicago	13	19
University College London	34	20

Appended Table 3

Times Ranking Indicator Scores for Chinese Universities

World Rank	Institution	peer review	intl faculty	intl students	faculty/student	citations/faculty	final
17	Beijing University	322	9	11	35	3	391.8
61	Tsing Hua University	140	9	7	24	3	188.9
154	China University Sci & Technol	85	5	1	24	6	125.2
192	Nanjing University	73	4	2	16	7	106.3
195	Fudan University	61	8	13	15	4	104.5

Appended Table 4

Times Ranking Indicator Scores for Japanese Universities

World Rank	Institution	peer review	intl faculty	intl students	faculty/student	citations/faculty	final
12	Tokyo University	371	3	3	30	60	482
29	Kyoto University	207	3	3	25	57	303.7
51	Tokyo Institute of Technology	118	3	13	27	50	217
69	Osaka University	78	3	5	28	63	181.8
153	Tohoku University	48	6	2	27	39	125.7
167	Nagoya University	45	3	3	19	47	120

Appended Table 5

Country Distribution of the Top 200 Universities in the Shanghai Jiao Tong University Ranking

Country	Total
USA	90
UK	18
Germany	17
Japan	9
Canada	9
France	8
Sweden	6
Switzerland	6
Netherlands	7
Australia	6
Italy	5
Belgium	4
Israel	3
Denmark	3
Austria	1
Finland	1
Norway	1
Russia	1
China	1
South Korea	1
Spain	1
Brazil	1
Singapore	1
Mexico	1

Appended Table 6

Regional Distribution of the Top 50, 100, 200, and 500 Universities in the Shanghai Jiao Tong University Ranking

Region	Top 50	Top100	Top 200	Top 500
North America	37	55	99	193
Europe	11	37	79	209
Asia/Pacific	2	8	21	89
Latin America			2	7
Africa				4

Appended Table 7

Ranks Based on the Shanghai Jiao Tong University Prize Indicators (Alumni and Award) and Publications Indicators (HiCi, N&S, and SCI)

World Rank	Institution	Total	Alumni+Award	Rank	H+N+S	Rank
1	Harvard Univ	100.0	29.9	1	60	1
2	Stanford Univ	77.2	18.6	9	48.72	2
3	Univ Cambridge	76.2	28.7	2	37.06	11
4	Univ California - Berkeley	74.2	22.2	5	44.48	3
5	Massachusetts Inst Tech (MIT)	72.4	23.2	4	41.46	4
6	California Inst Tech	69.0	19.2	8	36.94	12
7	Princeton Univ	63.6	21.5	6	32.86	20
8	Univ Oxford	61.4	18.3	10	34.72	17
9	Columbia Univ	61.2	19.5	7	35.44	15
10	Univ Chicago	60.5	23.6	3	31.2	22
11	Yale Univ	58.6	14.1	13	37.06	10
12	Cornell Univ	55.5	15.1	11	34.78	16
13	Univ California - San Diego	53.7	8.7	31	38.04	6
14	Tokyo Univ	51.9	6.5	58	38.28	5
15	Univ Pennsylvania	51.8	10.6	19	35.68	14
16	Univ California - Los Angeles	51.6	9.3	26	37.7	7
17	Univ California - San Francisco	50.8	7.5	45	36.34	13
18	Univ Wisconsin - Madison	50.0	11.6	16	34.5	18
19	Univ Michigan - Ann Arbor	49.3	7.8	41	37.44	8
20	Univ Washington - Seattle	49.1	8.3	36	37.14	9
21	Kyoto Univ	48.3	10.8	18	30.86	23
22	Johns Hopkins Univ	47.5	10.5	20	33.6	19
23	Imperial Coll London	46.3	9.7	23	30.28	24
24	Univ Toronto	44.6	6.8	51	31.74	21
25	Univ Coll London	44.3	9.7	24	28.62	26
26	Univ Illinois - Urbana Champaign	43.3	11.7	15	28.08	28
27	Swiss Fed Inst Tech - Zurich	43.2	11.4	17	25.88	33
28	Washington Univ - St. Louis	43.1	7.8	42	28.98	25
29	Rockefeller Univ	40.2	14.2	12	20.44	48
30	Northwestern Univ	39.5	6.0	64	28.18	27
32	New York Univ	38.7	8.4	34	26.78	29
34	Univ Colorado - Boulder	37.8	7.6	43	25.9	32
35	Univ California - Santa Barbara	37.0	5.7	66	26.16	31
36	Univ British Columbia	36.3	6.0	65	25.42	34

Appended Table 8

Indicator Scores for the Top 36 Global Universities in the Shanghai Jiao Tong University Ranking

World Rank	Institution	Alumni	Award	HiCi	N&S	SCI	Size
1	Harvard Univ	98.6	100.0	100.0	100.0	100.0	60.6
2	Stanford Univ	41.2	72.2	96.1	75.2	72.3	68.1
3	Univ Cambridge	100.0	93.4	56.6	58.5	70.2	73.2
4	Univ California - Berkeley	70.0	76.0	74.1	75.6	72.7	45.1
5	Massachusetts Inst Tech (MIT)	74.1	78.9	73.6	69.1	64.6	47.5
6	California Inst Tech	59.3	66.5	64.8	66.7	53.2	100.0
7	Princeton Univ	61.0	76.8	65.4	52.1	46.8	67.3
8	Univ Oxford	64.4	59.1	53.1	55.3	65.2	59.0
9	Columbia Univ	77.8	58.8	57.3	51.6	68.3	37.0
10	Univ Chicago	72.2	81.9	55.3	46.6	54.1	32.7
11	Yale Univ	52.2	44.5	63.6	58.1	63.6	50.4
12	Cornell Univ	46.6	52.4	60.5	47.2	66.2	33.6
13	Univ California - San Diego	17.8	34.7	63.6	59.4	67.2	47.9
14	Tokyo Univ	36.1	14.4	44.5	55.0	91.9	49.8
15	Univ Pennsylvania	35.6	35.1	61.2	44.6	72.6	34.0
16	Univ California - Los Angeles	27.4	32.8	60.5	48.1	79.9	24.8
17	Univ California - San Francisco	0.0	37.6	59.3	59.5	62.9	48.8
18	Univ Wisconsin - Madison	43.1	36.3	55.3	48.0	69.2	19.0
19	Univ Michigan - Ann Arbor	39.8	19.3	64.8	45.7	76.7	20.1
20	Univ Washington - Seattle	22.7	30.2	57.3	49.6	78.8	16.2
21	Kyoto Univ	39.8	34.1	40.0	37.2	77.1	46.4
22	Johns Hopkins Univ	48.7	28.3	43.7	52.6	71.7	14.2
23	Imperial Coll London	20.9	38.1	46.2	39.4	65.8	44.5
24	Univ Toronto	28.1	19.7	39.1	41.2	78.4	42.8
25	Univ Coll London	30.8	32.9	41.0	41.0	61.1	42.6
25	Univ Illinois - Urbana Champaign	41.7	37.4	46.2	36.0	58.2	17.8
27	Swiss Fed Inst Tech - Zurich	40.3	37.0	39.1	43.2	47.1	41.5
28	Washington Univ - St. Louis	25.1	26.6	41.9	46.8	56.2	44.9
29	Rockefeller Univ	22.7	59.8	31.5	43.6	27.1	38.6
30	Northwestern Univ	21.8	19.3	47.9	35.8	57.2	37.0
31	Duke Univ	20.9	0.0	48.6	46.8	62.7	36.2
32	New York Univ	33.9	25.0	43.7	39.3	50.9	19.1
33	Univ Minnesota - Twin Cities	36.1	0.0	53.9	35.9	69.6	12.8
34	Univ Colorado - Boulder	16.6	29.8	43.7	38.3	47.5	27.4
35	Univ California - Santa Barbara	0.0	28.5	45.4	41.4	44.0	36.2
36	Univ British Columbia	20.9	19.3	36.0	31.6	59.5	34.9

Appended Table 9

Indicator Scores for the 16 Chinese Universities in the Shanghai Jiao Tong University Ranking

Institution	Alumni	Award	HiCi	N&S	SCI	Size
Natl Taiwan Univ	15.4	0.0	8.7	8.8	52.6	17.3
Chinese Univ Hong Kong	0.0	0.0	15.1	4.3	43.7	14.0
Hong Kong Univ Sci & Tech	0.0	0.0	17.5	11.5	35.2	14.3
Peking Univ	0.0	0.0	0.0	10.0	49.8	7.2
Tsing Hua Univ	14.1	0.0	0.0	8.8	56.1	9.2
Univ Hong Kong	0.0	0.0	8.7	10.1	46.4	14.5
City Univ Hong Kong	0.0	0.0	0.0	10.2	37.9	10.7
Fudan Univ	0.0	0.0	0.0	8.0	38.3	8.1
Hong Kong Polytechnic Univ	0.0	0.0	8.7	0.0	39.3	10.7
Nanjing Univ	0.0	0.0	0.0	8.2	43.9	8.1
Natl Tsing Hua Univ	16.6	0.0	0.0	5.0	34.0	10.5
Univ Sci & Tech China	0.0	0.0	0.0	10.8	40.1	9.8
Zhejiang Univ	0.0	0.0	0.0	3.9	46.6	4.4
Jilin Univ	0.0	0.0	0.0	6.2	32.3	3.4
Natl Cheng Kung Univ	0.0	0.0	0.0	1.6	39.8	9.2
Shanghai Jiao Tong Univ	0.0	0.0	0.0	1.6	37.0	6.0

Appended Table 10

Indicator Scores for the 36 Japanese Universities in the Shanghai Jiao
Tong University Ranking

World Rank	Institution	Alumni	Award	HiCi	N&S	SCI	Size
14	Tokyo Univ	36.1	14.4	44.5	55.0	91.9	49.8
21	Kyoto Univ	39.8	34.1	40.0	37.2	77.1	46.4
54	Osaka Univ	12.6	0.0	26.2	31.2	72.1	30.2
69	Tohoku Univ	18.9	0.0	19.5	26.1	69.3	27.7
97	Nagoya Univ	0.0	14.4	15.1	23.7	55.3	24.2
101-152	Hokkaido Univ	0.0	0.0	17.5	15.5	56.7	20.0
101-152	Kyushu Univ	0.0	0.0	15.1	22.3	57.7	21.2
101-152	Tokyo Inst Tech	16.6	0.0	21.4	21.4	53.5	23.3
101-152	Tsukuba Univ	0.0	20.4	8.7	11.7	44.6	19.0
202-301	Hiroshima Univ	0.0	0.0	8.7	9.1	44.4	13.8
202-301	Keio Univ	0.0	0.0	8.7	15.7	38.0	13.9
202-301	Kobe Univ	0.0	0.0	15.1	15.5	35.7	14.8
202-301	Okayama Univ	0.0	0.0	8.7	10.7	38.6	12.9
302-403	Chiba Univ	0.0	0.0	0.0	8.4	38.3	10.4
302-403	Gifu Univ	0.0	0.0	8.7	5.3	28.3	9.4
302-403	Gunma Univ	0.0	0.0	8.7	9.1	27.6	10.1
302-403	Kanazawa Univ	0.0	0.0	8.7	8.1	32.7	11.0
302-403	Nagasaki Univ	0.0	0.0	12.4	1.6	28.7	9.5
302-403	Nihon Univ	0.0	0.0	8.7	5.1	29.8	9.7
302-403	Niigata Univ	0.0	0.0	15.1	7.1	32.9	12.3
302-403	Tokyo Med & Dent U.	0.0	0.0	8.7	8.8	30.3	10.6
302-403	Tokyo Metropolitan U	0.0	0.0	8.7	10.7	27.0	10.3
302-403	Tokyo Univ Agr & Te	0.0	0.0	8.7	7.8	27.8	9.9
302-403	Univ Tokushima	0.0	0.0	12.4	5.1	28.4	10.2
302-403	Waseda Univ	0.0	0.0	12.4	6.6	29.5	10.8
302-403	Yamaguchi Univ	0.0	0.0	17.5	5.1	27.0	11.0
404-502	Ehime Univ	0.0	0.0	8.7	7.4	24.9	9.1
404-502	Himeji Inst Tech	0.0	0.0	8.7	5.1	22.2	8.0
404-502	Jichi Med Sch	0.0	0.0	15.1	0.0	19.7	7.8
404-502	Juntendo Univ	0.0	0.0	12.4	6.0	21.6	8.9
404-502	Kagoshima Univ	0.0	0.0	8.7	5.3	25.7	8.9
404-502	Kumamoto Univ	0.0	0.0	0.0	8.1	29.4	8.3
404-502	Nara Inst Sci & Tech	0.0	0.0	8.7	12.1	20.2	9.1
404-502	Osaka City Univ	0.0	0.0	0.0	8.3	32.7	9.1
404-502	Shinshu Univ	0.0	0.0	0.0	4.1	30.9	7.8
404-502	Univ Osaka Prefectur	0.0	0.0	12.4	2.3	26.7	9.2