

Asian University Rankings in International and Development Economics: An Application of Zipf's Law

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Abstract

This paper ranks Asian universities in two related economics fields: international economics and development economics. A key finding is that new latecomers rank atop the two specialty areas of economics. The results of the university ranking also establish that Zipf's law applies to research-based school ranks.

1. Introduction

Recently, various university rankings have been conducted and published. The United States (US) College Board conducts an annual evaluation of colleges and universities in the US for prospective students. *U.S. News and World Report*, *Business Week*, and other magazines also publish different university rankings attracting much attention from the general public. Shanghai Jiaotong University in China also publishes a ranking of world universities based primarily on academic reputations, especially in science and engineering. The economics discipline, however, has long been ranked based on the research published in academic journals. For example, rankings of US economics programs appear in Graves et al. (1982) and Dusansky and Vernon (1998); Asian rankings in Jin and Yau (1999) and Jin and Hong (2008); European rankings in Kalaitzidakis et al. (1999) and Lubrano et al. (2003); and world rankings in Coupe (2003) and Kalaitzidakis et al. (2003). All of these studies provide rankings of economics departments in general, but no such studies have been conducted on specific fields in economics.

This paper thus aims to rank Asian universities in two related economics fields: international economics and development economics, using journal publications of current faculty members in each school.¹ Current faculty members were used rather than counting author affiliations at the time of publication because current faculties are more important than a perceived reputation in the past for determining rankings (similar to gauging the reputation of a sports team). In addition, these two specific fields—international economics and development economics—were counted since most economies in Asia are small open economies and heavily depend on international trade, and hence scholars in Asia may have a comparative advantage in producing papers in both international and development economics.

For international economics, three major journals were counted: *Journal of International Economics (JIE)*, *Review of International Economics (RIE)*, and *Journal of*

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International Money and Finance (JIMF). For development economics, *Journal of Development Economics (JDE)*, *Economic Development and Cultural Change (EDCC)*, and *World Development (WD)* were counted. In this case, general journals, such as *American Economic Review (AER)*, were not included.² *The World Economy (WE)* was, however, additionally counted because most *WE* articles were related to both international and development economics. The pages published were converted to *AER*-equivalent-length pages. For example, three typical pages in each journal, which did not include equations, tables, and figures, were counted the number of words and took an average to reduce variations in quantity. Based upon the average number of words in an *AER* page, the page weights used are: $JIE = 0.765$, $RIE = 0.849$, $JIMF = 0.735$, $JDE = 0.832$, $EDCC = 0.697$, $WD = 1.066$, and $WE = 0.690$. In this way, total pages published were standardized to a size of *AER*.

2. Asian Ranks

Table 1 shows the ranking of Asian universities in international economics based upon page counts of journal articles published by current faculty members in each school over the period 1990–2005. Faculty names were obtained from school websites. City University of Hong Kong is ranked first in Asia. This rank does not change even in a subsample of the most recent five years, 2000–2005. The Hong Kong University of Science and Technology ranks second, followed closely by Hitotsubashi University of Japan and the Chinese University of Hong Kong.³ The four schools tend to publish

Table 1. Asian Ranks in International Economics: *AER*-Equivalent-Length Pages, 1990–2005

Rank	University	Country/ Region	<i>AER</i> -equiv. pages	Number of articles in		
				<i>JIE</i>	<i>RIE</i>	<i>JIMF</i>
1	City U of HK	Hong Kong	142.7	6	12	1
2	HKUST	Hong Kong	118.2	8	1	1
3	Hitotsubashi	Japan	102.8	6	2	0
4	Chinese U of HK	Hong Kong	96.3	8	7	0
5	Tokyo	Japan	73.9	4	0	3
6	Nat'l U of Singapore	Singapore	72.4	3	2	1
7	Korea U	Korea	70.1	3	0	1
8	Osaka	Japan	57.1	3	4	0
9	Kyoto	Japan	47.9	5	2	0
10	Kobe	Japan	38.5	2	2	0
11	Sogang	Korea	36.5	2	1	0
12	Seoul Nat'l	Korea	29.3	1	1	0
13	Singapore Mgt	Singapore	26.8	2	0	0
14	Hanyang	Korea	23.7	1	0	1
15	Nanyang Tech	Singapore	22.3	2	1	0
16	Sungkyunkwan	Korea	21.5	1	1	0
17	Lingnan	Hong Kong	16.2	2	0	0
18	U of Hong Kong	Hong Kong	12.6	3	0	0
19	Nat'l Taiwan	Taiwan	10.3	0	2	1
20	HK Baptist	Hong Kong	9.6	0	0	1

Source: *EconLit*. The page weights used are: $JIE = 0.765$, $RIE = 0.849$, $JIMF = 0.735$.

more articles in *JIE* that includes theoretical papers more often than empirical analyses, and fewer articles in *JIMF* that includes mostly empirics in international finance. This suggests that many trade theorists in first-tier schools are active in research.

Table 2 shows Asian ranks in development economics. The Chinese University of Hong Kong appears to rank number one in this field. National University of Singapore ranks second and City University of Hong Kong third. It is also interesting to find that the best three schools in this field publish more articles in *JDE* and fewer in both *EDCC* and *WD* that include more or less non-technical papers. For lower-rank schools, the ranks may change substantially if a star professor in this field is hired. In particular, schools lower than tenth published one or two papers only, and thus the school ranks would dramatically change depending on a recruitment of fine research scholars in this field. This also indicates that development economists in Asia are less prolific in terms of research publication. More direct comparisons will be discussed below in Table 3.

Table 3 shows a comparison of research pattern for five economies in Asia—four little dragons (or tigers) plus a big tiger (i.e. Japan). Hong Kong schools in the sample published 749.1 pages in trade and development, which is more than Japan's page count (455.7 pages); Japan's publication in this area is, however, greater than Singapore's (268.8 pages) and Korea's (245.5 pages). Taiwan (85.6 pages) published the least in the sample. No school in mainland China as yet appears in the list of the 20 most productive universities in these two fields. Although many of the research works in China, Japan, Korea, and Taiwan are published in their native-language journals, they are found less prolific in quality English-language journals. It is also noted that there are hundreds of universities in Japan, Korea, and Taiwan, while there are eight universities in Hong

Table 2. Asian Ranks in Development Economics: AER-Equivalent-Length Pages, 1990–2005

Rank	University	Country/ Region	AER-equiv. pages	Number of articles in		
				<i>JDE</i>	<i>EDCC</i>	<i>WD</i>
1	Chinese U of HK	Hong Kong	141.7	16	1	0
2	Nat'l U of Singapore	Singapore	89.1	6	2	0
3	City U of HK	Hong Kong	76.2	12	0	1
4	Nat'l Taiwan	Taiwan	47.6	2	2	0
5	Kyoto	Japan	46.7	4	0	0
6	U of Hong Kong	Hong Kong	39.2	1	2	1
7	Tokyo	Japan	35.5	3	0	0
8	Osaka	Japan	34.2	1	1	0
9	Nanyang Tech	Singapore	32.8	0	1	3
10	HKUST	Hong Kong	31.8	4	0	0
11	Nat'l Tsing Hua	Taiwan	27.7	0	0	2
12	Yonsei	Korea	23.4	1	0	1
13	Korea U	Korea	16.7	1	0	0
14	HK Polytech	Hong Kong	12.8	0	0	1
15	Singapore Mgt	Singapore	11.6	1	0	0
16	Hallim	Korea	10.8	1	0	0
17	Hitotsubashi	Japan	10.4	1	0	0
18	Nat'l Central	Taiwan	8.3	2	0	0
19	Seoul Nat'l	Korea	6.4	0	0	1
20	Fudan	China	6.0	0	0	1

Source: *EconLit*. The page weights used are: $JDE = 0.832$, $EDCC = 0.697$, $WD = 1.066$.

Table 3. *Research Pattern*

<i>Country/Region</i>	<i>Trade and development</i>	<i>International economics</i>	<i>Development economics</i>
Hong Kong	749.1	395.6 (57%)	301.7 (43%)
Japan	455.7	320.2 (72%)	126.8 (28%)
Singapore	268.8	121.5 (48%)	133.5 (52%)
Korea	245.5	181.1 (76%)	57.3 (24%)
Taiwan	85.6	10.3 (11%)	83.6 (89%)
Total	1804.7	1028.7 (59%)	702.9 (41%)

Source: *EconLit*. Note that *WE* pages are included in the first column but not for the last two columns.

Kong and only three in Singapore. Therefore, the difference would be even greater if the publications were normalized based upon the number of universities within a country or by the size of population. The results are, in general, consistent with a general belief that research productivity in Hong Kong has increased sharply since the launch of the government's new tertiary educational policy in the early 1990s.

In addition, research publications in international economics and development economics are more or less balanced in Hong Kong (57% vs 43%, respectively), as well as in Singapore (48% vs 52%, respectively). In contrast, Japan and Korea seem to focus more on international economics (72% vs 28% in Japan; 76% vs 24% in Korea), while Taiwan publishes more in development economics (11% vs 89%). The overall research ratio in Asia is approximately 6:4 in international and development economics. Although the sample used here is limited only to the top 20 schools in Asia, the results are, in general, consistent with the proposition that Asian scholars have a comparative advantage in the production of papers in both trade and development because of their own socio-economic characteristics.

3. Zipf's Law

Figure 1 shows 20 most productive universities in Asia in the fields of trade and development. The most productive school publishes 320.9 pages; the second-best school publishes about 70% of the top school; the rank number three publishes about one-half. After that, publication gradually falls, and for lower-rank schools, publication appears to be similar to each other. An interesting question that arises here is whether this distribution obeys Zipf's (1949) law, which states that the population size of a city is inversely proportional to its population rank of the city. In contrast to the enormous literature in urban economics on Zipf's law in the form of rank–size regularity on city populations, there are few applications of this law to other areas of economics. Relationships similar to Zipf's law in economics have been originally documented by Pareto (1896) and Gibrat (1931) on distributions of income and firm sizes, respectively. Recent examples are Mantegna and Stanley (1995) and Ulubasoglu and Hazari (2004), among others. The former analyzes the S&P index and the latter tourism.

In this paper we pose a question: can Zipf's law be applied to research-based school ranks? Does publication exhibit some sort of rank–size regularity? A positive answer to this question would allow us to predict each school's research productivity from the rank of the school. This would provide an excellent guide to predicting research

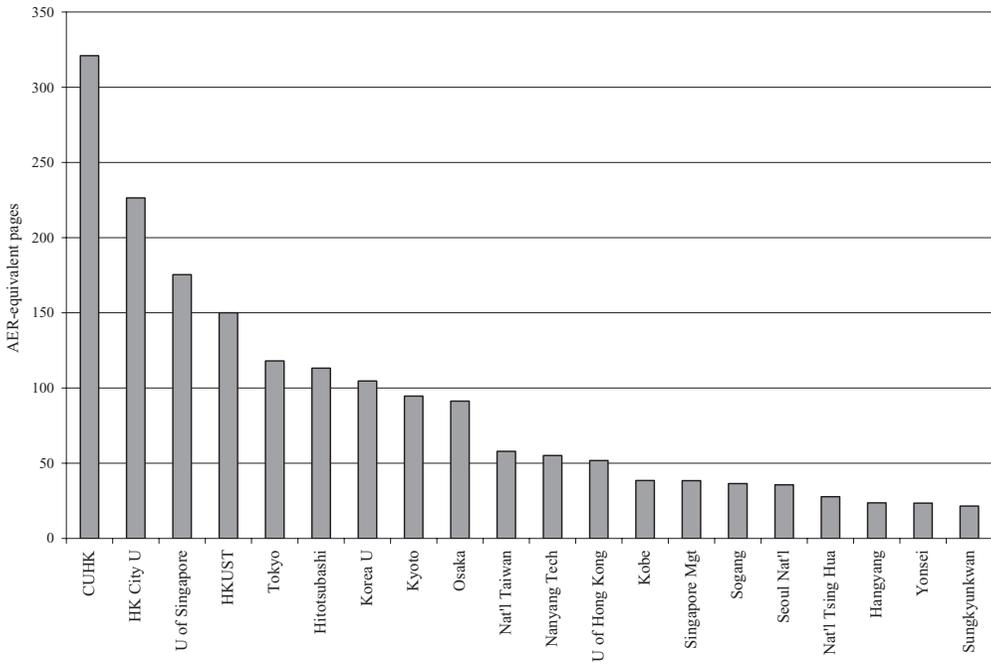


Figure 1. Asian Ranks in Trade and Development, 1990–2005

Source: EconLit.

productivity even without estimating regression-type models that may employ the government’s educational reform, teaching load, professor’s salary, and so on, as explanatory variables. To implement the applicability of Zipf’s law, a logarithm is taken to a reciprocal model in which publication is an inverse of school ranks. On a logarithmic scale, the rank–size distribution will provide a linear line with a negative slope of -1 , which would be a perfect case of Zipf’s law.

The linear relationship has been investigated using a log-linear model in equation (1). The dependent and independent variables are taken as logarithms and thus a heteroskedasticity problem—residuals are relatively large in higher ranks but smaller in lower ranks—may not be serious in this case because the log-linear model normally mitigates a measurement scale of raw data. A simple OLS estimation of the model in which publication is regressed on school ranks gives the following results:

$$\log pub_i = 2.69 - 0.95 \log rank_i \tag{1}$$

(0.06) (0.06)

$$R^2 = 0.92 \quad \sigma = 0.098,$$

where standard deviations are in parentheses. We find a nearly perfect fit, as is the case of Zipf’s. The slope coefficient appears to be close to -1 and statistically significant at the conventional significance levels. Standard error estimates are also very small. The results are in general consistent with Zipf’s law, in which the log of publication in the vertical axis is approximately linearly related to the log of school ranks measured in the horizontal axis.

Figure 2 plots the line fit that corresponds to the regression result in equation (1). The predicted regression line nearly perfectly fits the actual data, except some observations

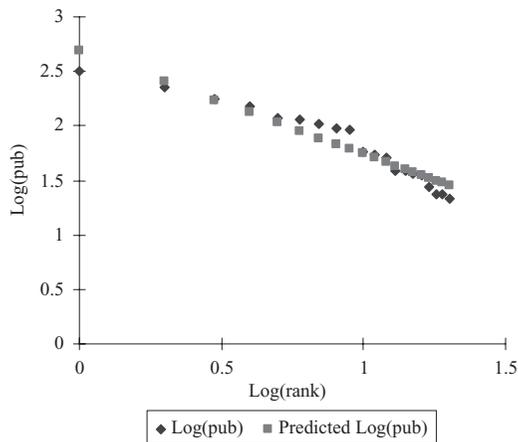


Figure 2. Line Fit Plot

of large error estimates around the mid-ranks. This is, perhaps, because of a sudden drop in publication below ninth. Other than that, the association in lower ranks appears to be approximately linear. The regression result shows that a linear fit on the school-rank data explains 92% of the variations in publication and the regression coefficient, -0.95 , is near to perfect. Our empirical results thus provide evidence that research-based school ranks are broadly consistent with Zipf's law.

4. Concluding Remarks

A salient feature of the Asian ranks found here is that newcomers like City University of Hong Kong ranks atop the field of international economics. The Chinese University of Hong Kong, which is also a latecomer, ranks number one in development economics. This suggests that small but progressive universities, especially new latecomers, can specialize in one or two fields of economics, based upon their comparative advantage in research. The results of the university ranking also establish that Zipf's law applies to another area of economics—research-based school ranks. The ranks, however, have been based on counting specialty journals only; more influential articles in general journals that are related to trade and development could be included. This remains for future research. It should also be noted that the findings in this paper should not be used to infer either rankings of economics departments as a whole or universities overall.

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Notes

1. More than 500 universities were counted in Asia that, in practice, referred almost exclusively to Northeast and Southeast Asia as opposed to South and Southwest Asia—such as Iran, Iraq, Turkey, and the Middle East—which are more usually designated Middle East or Eurasia. The Indian subcontinent was not counted either.
2. It should be noted that economists in Asian universities published few international and development economics papers in top general journals, perhaps with an exception of Edwin Lai (*AER*, 2004) of City University of Hong Kong.
3. The Chinese University of Hong Kong, in particular, published 15 articles, but was ranked below HKUST and Hitotsubashi. This was due to the fact that most of their publications were either shorter in length or had several co-authors. In the case of co-authorship, published pages were equally divided by the number of authors.