

Trade and Development: East Asian Ranks and Zipf's Law

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School rankings often make people in academics a mingled feeling of joy and sorrow. Especially, university ranks based on research output may make research-active scholars self-confident and feel rewarded but a group of people who are less prolific in journal publication will instead be frustrated and like to hide themselves behind the ranks. Although there is a debate on controversial issues on the ranks of tertiary education, many universities receive a fresh impetus more from research-based ranks. More specifically, Jin and Yau (1999) ranked universities in East Asia based on faculty members' publication in economics journals. This sort of ranking based on research performance was seen as intimidating at that time but inspiring these days for economics profession in Asia. For example, many Asian universities have been compelled to change their attitude toward school reputation, particularly research publication in internationally-recognized journals. More recently, Coupe (2003) and Kakitidakis et al. (2003) provided world ranks that included hundreds of economics departments worldwide, from which many Asian schools were interested in finding themselves where they stand in international academic communities and how favorable comparisons can be bearable with other East Asian universities and even with top schools in the world. All these studies, however, rank economics departments in general, but no specific fields of economics have been ranked.

This paper thus aims to rank East Asian universities in two related economics fields, trade and development, using journal publications of current faculty members in each school. Current faculty members were used rather than counting school affiliations at the time of publication. This is similar to a reputation of sports team; more important would be

current team members rather than a perceived reputation in the past. In addition, two specific fields—international economics and development economics—were counted since most economies in East Asia are small open economies and heavily depend on international trade, and hence scholars in East Asia may have a comparative advantage in producing papers in both international and development economics.

For international economics, three major field journals were included: *Journal of International Economics (JIE)*, *Review of International Economics (RIE)*, and *Journal of 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. *World Economy (WE)* was additionally counted because most *WE* articles were related to both international and development economics. Total pages published in these field journals were converted to *American Economic Review (AER)*-equivalent length pages. 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, page weights were computed as a ratio of word counts of a journal to AER. 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.

Table 1 shows East Asian ranks in trade and development based upon page counts of journal articles published by most recent faculty members in each school over the period 1990-2005. Faculty names were obtained from school websites. Chinese University of

Hong Kong is ranked top, with a research ratio of 4:6 in international economics and development economics, respectively. City University of Hong Kong ranks number two, with the ratio of approximately 6:4 in each field, and it appears to be number one in the field of international economics. This is a sharp contrast to Chinese University of Hong Kong which ranks top in development economics. Two immediate followers are National University of Singapore (NUS) and Hong Kong University of Science and Technology (HKUST). Again, NUS ranks number two in development economics and HKUST ranks second in international economics. For the rest of schools, the ranks in each field, however, noticeably change.

It is also interesting to find that Hong Kong schools in the sample publishes 749.1 pages in total, which is more than Japan (455.7 pages); Japan's publication is, however, greater than in Singapore (268.8 pages) and in Korea (245.5 pages); and Taiwan (85.6 pages) publishes least in the sample. No schools in Mainland China appear in the list of twenty most productive universities in East Asia. Although many of 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 and Korea, while eight universities exist in Hong Kong and only three in Singapore. Therefore, the difference would be even greater if the publications were normalized to the size of population or the number of universities within a country. The results are, in general, consistent with a belief that research productivity in Hong Kong has been increased sharply since the launch of the government's new educational policy in early 1990s.

In addition, research publications in international economics and development economics are more or less balanced in Hong Kong (56% vs. 44%, respectively) and Singapore (48% vs. 52%, respectively). In contrast, Japan and Korea seem to focus more on international economics (72% vs. 28% in Japan; 80% vs. 20% in Korea), while Taiwan publishes more in development economics (12% vs. 88%). The overall research ratio is approximately 6:4 in international and development economics, respectively. Although the sample used here is limited only to best-20 schools in East Asia, the results are, in general, consistent with the proposition that East Asian scholars may have a comparative advantage in the production of papers in both trade and development because of their socio-economic characteristics in East Asia. Most productive areas would be mathematical economics and econometrics.

Figure 1 shows twenty most productive universities in East 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 a 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 graph 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 analyses 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 productivity without estimating models that employed the government's educational reform, teaching load, professor's salary, and so on, as explanatory variables. To implement the applicability of the Zipf's law, a reciprocal model, in which publication is an inverse of school ranks, takes logarithm. On a logarithmic scale, the rank-size distribution provides a linear line with a negative slope of -1, which is a perfect case of the 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 heteroscedasticity problem — residuals are relatively large in higher-ranks and 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 regression of publication on school ranks gives the following results:

$$\log pub_i = 2.69 - 0.95 \log rank_i \quad (1)$$

(0.06) (0.06)

$$R^2 = 0.92 \quad s = 0.098$$

In this case, we find a fit nearly perfect, as is the case of Zipf's, suggesting that the Zipf's law can be applied to research productivity. The slope coefficient also 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 the 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). As noted earlier, the predicted regression line nearly perfectly fit the actual data. However, large error estimates are observed in the mid-ranks, perhaps due to a sudden drop of publications below the ninth. Other than that, the association in lower ranks appears to be approximately linear. Our empirical results thus establish that Zipf's Law strikes another area of economics—research-based school ranks. The regression result shows that a linear fit on the school-rank data explains 92% of the variations in publication and the regression coefficient is -0.95, near to perfect.

Finally, the university ranks have been based on counting field journals only in trade and development. More influential articles in general journals that are related to trade and development could be included; this is left for our future project. It is also noted that the ranks in two specialized fields of economics are difficult to generalize to the rank of economics departments as a whole or to a university-wide ranking.

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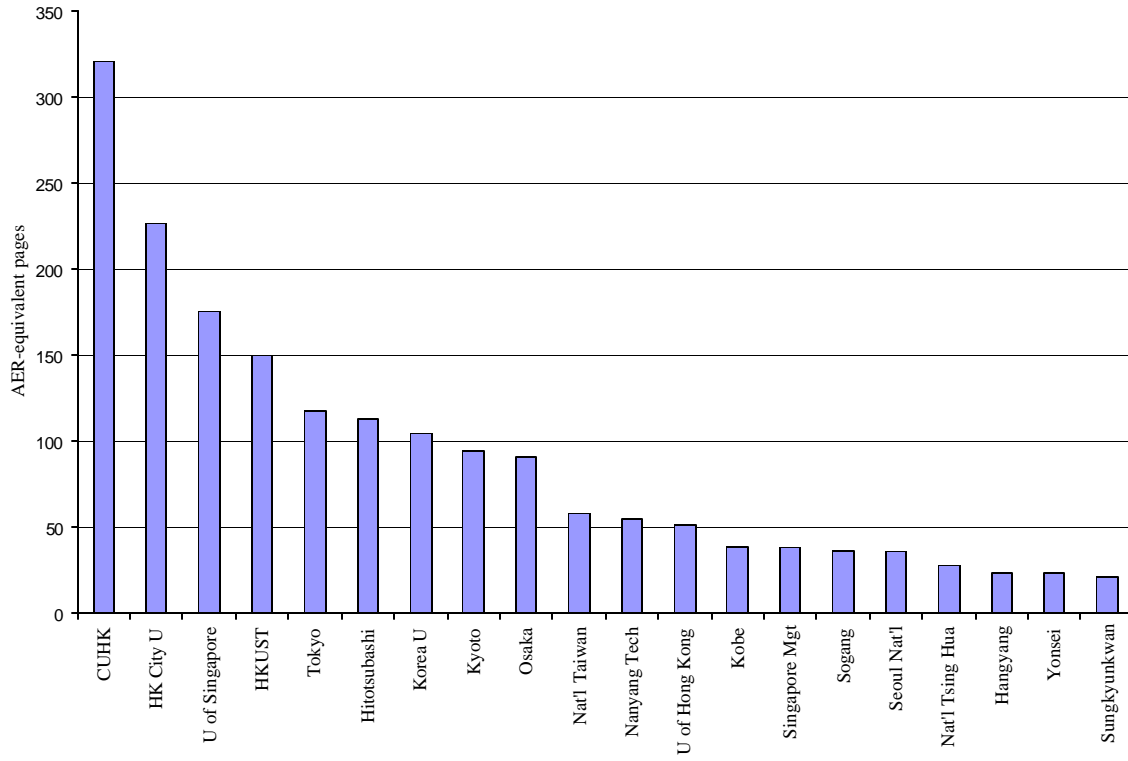
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Table 1: East Asian Ranks in Trade and Development: AER-equivalent length pages, 1990-2005

Rank	University	Country	AER-equiv Pages	International Economics	Development Economics
1	Chinese U of HK	Hong Kong	320.9	96.3	141.7
2	City U of HK	Hong Kong	226.4	142.7	76.2
3	Nat'l U of Singapore	Singapore	175.3	72.4	89.1
4	HKUST	Hong Kong	150.0	118.2	31.8
5	Tokyo	Japan	118.1	73.9	35.5
6	Hitotsubashi	Japan	113.2	102.8	10.4
7	Korea U	Korea	104.7	70.1	16.7
8	Kyoto	Japan	94.6	47.9	46.7
9	Osaka	Japan	91.3	57.1	34.2
10	Nat'l Taiwan	Taiwan	57.9	10.3	47.6
11	Nanyang Tech	Singapore	55.1	22.3	32.8
12	U of Hong Kong	Hong Kong	51.8	12.6	39.2
13	Kobe	Japan	38.5	38.5	--
14	Singapore Mgt	Singapore	38.4	26.8	11.6
15	Sogang	Korea	36.5	36.5	--
16	Seoul Nat'l	Korea	35.7	29.3	6.4
17	Nat'l Tsing Hua	Taiwan	27.7	--	27.7
18	Hanyang	Korea	23.7	23.7	--
19	Yonsei	Korea	23.4	--	23.4
20	Sungkyunkwan	Korea	21.5	21.5	--

Source: EconLit. 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. Note that a difference between last two columns indicates WE pages in each school.

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



Source: EconLit.

Figure 2. Line Fit Plot

