

# Are the Scaling Properties of Research Universities More Like Cities or Corporations?

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## **Extended Abstract**

Urban areas are more productive than less dense environments due the serendipitous exchange of ideas when people meet in the course of their daily lives (Bettencourt et al., 2007; Jacobs, 1969, 1984). These serendipitous exchanges of ideas are also known as “externalities” and “knowledge spillovers” (Glaeser et al., 1992; Lehrer, 2012). It is a trend in corporations and academic institutions (Lange, 2016) to attempt to engineer knowledge spillovers by concentrating knowledge workers in environments designed to enhance the frequency of random encounters (*see also* the Stata center at MIT (Campbell, 2007) and Apple’s new corporate headquarters (Suich, 2016)). Using university impact data for universities in the United States from the 2016 and 2017 Leiden Ranking (Centre for Science and Technology Studies (CWTS), 2016, 2017), the author has demonstrated that there is a mid-level correlation between university impact and the population size and density in which the university is embedded. The correlation coefficient is around .4 for population (based on metropolitan statistical area) and .5 for population density of the incorporated city in which the university is embedded (Hook, 2017) for some size-independent Leiden impact indicators (Waltman et al., 2012). This demonstrates that knowledge spillovers are another contributing source to university impact in addition to the Matthew Effect (Merton, 1968) (preferential attachment)—highly ranked universities hiring the best researchers and obtaining high impact results.

This work is a continuation of the author’s findings above. The specific research question is: does the size of an academic institution correlate with normalized measures of collective university impact? In this study, size is measured by the number of full time faculty and researchers employed by the university. The methodological tool for this analysis is regression and correlation analysis. As to the collective impact of the academic institution, this work relies on existing rankings of academic institutions (Leiden Ranking) and does not reinvent or improve upon these. As shown above, the size/density of the greater population in which the academic institution is situated suggests that external knowledge spillovers occur and enhance university impact. The size of the institution itself might suggest and correlate with internal knowledge

spillovers. Alternatively, universities might be more similar to corporations in terms of their productivity and scaling properties. As corporations become larger, their productivity (as measured in the amount of profit per employee), declines (Lehrer, 2012). “[Companies] scale sublinearly as functions of their size ... [with a scaling exponent of] around .9” (West, 2017, p. 32).

This study will also run multiple regression analysis to disentangle some of the various inputs as to university impact—spillover effects (both internal and external) and the Matthew effect. To test for the Matthew effect, the author will use the U.S. News and World Report ranking (U.S. News & World Report, 2016) that is, in part, based on reputation (Morse et al., 2016).

## Citations

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