The Changing Geographic Concentration of Scientific Activity

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We will examine the changing geographic concentration of scientific activity over time using 50 years of publication data. We will focus on three dimensions of concentration: 1) institution-level production, 2) project-level production, and 3) project-level consumption. We describe each in turn.

First, using university-field-year as our unit of analysis and employing Herfindahl-related measures of concentration, our preliminary evidence (taken from the field of evolutionary biology) indicates that although the production of scientific knowledge decentralized over the past half-century, the production of high impact knowledge remains quite concentrated (Figure 1). In other words, while the number of universities producing publications in this field increased significantly during the past half century, a small fraction continued to account for the majority of the most highly cited papers. At the same time, the relative roles of a few institutions changed dramatically over the 50 years. Furthermore, the roles of a few countries also changed significantly.

Second, using paper-field-year as our unit of analysis and employing various distance metrics that reflect the distance between coauthors, we examine the production of scientific output. Our preliminary evidence indicates that although the concentration of production of high impact science remained reasonably concentrated among a small fraction of institutions, the distance between collaborators increased significantly (Figure 2). This seems partially due to a significant increase in collaboration across top tier institutions. However, we also find evidence of increased collaboration between top-middle tier institutions, consistent with Agrawal and Goldfarb (2008).

Third, using paper-field-year as our unit of analysis and employing various citation-based metrics, we examine changes in the pattern of backward citations over time. Our preliminary evidence suggests that projects draw from an increasingly bimodal distribution of prior work (local and distant).

We will offer an interpretation of our findings with respect to the implications of these changes for policies and institutions in the 21st Century.

While we are at the very early (exploratory) stage of this project, we have significant confidence in our ability to execute since we have worked extensively with these data (scientific publications and citation analysis) before (for example: Oettl, 2012; Agrawal and Goldfarb, 2008, Agrawal and Cockburn, 2003).

Figure 1 – Concentration of Knowledge Production Across Universities in Evolutionary Biology (Herfindahl)

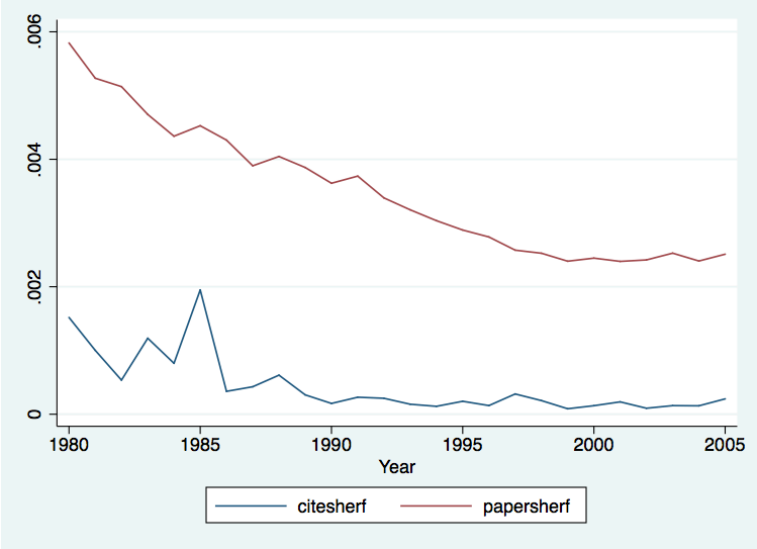
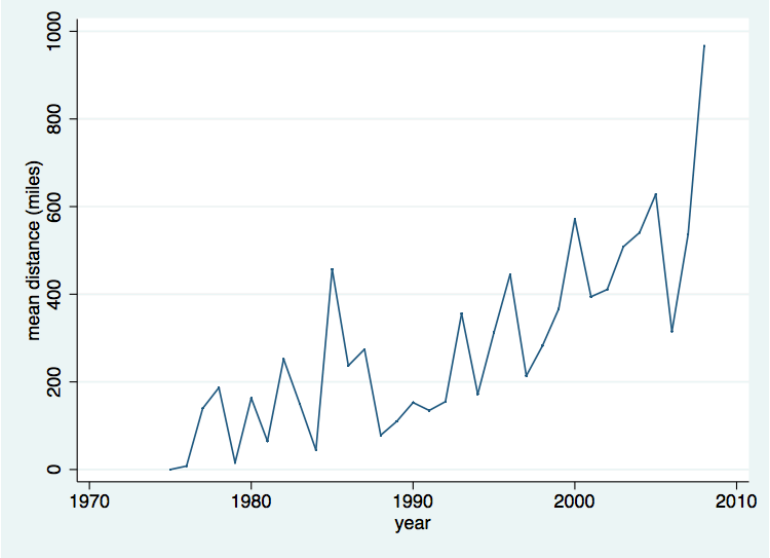


Figure 2 – Distance Between Coauthors in Evolutionary Biology



References:

(1) Agrawal, Ajay and Avi Goldfarb, "Restructuring Research: Communication Costs and the Democratization of University Innovation" *American Economic Review,* Vol. 98(4), 2008, pp. 1578–1590.

(2) Agrawal, Ajay and Iain Cockburn, "The Anchor Tenant Hypothesis: Examining the Role of Large, Local, R&D-Intensive Firms in University Knowledge Transfer" *International Journal of Industrial Organization,* Vol. 21, 2003, pp. 1227-1253.

(3) Oettl, Alexander, "Reconceptualizing Stars: Scientist Helpfulness and Peer Performance," *Management Science*, forthcoming, 2012.