

China and USA produce more impactful AI research when collaborating together

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Extended Abstract

Artificial intelligence (AI) has become a disruptive technology with far-reaching economic, social, political, and regulatory implications. The United States and China remain the biggest players in the race to develop and lead in AI, dedicating the most resources to AI research and development (R&D). In 2019, U.S. was the world's leader (\$656 billion) followed by China (\$526 billion), with their AI R&D expenditures representing 27% and 22% of the global amount, implying that nearly half of the world's AI R&D that year was performed by the U.S. and China alone [1]. The competition to attain "AI supremacy" has intensified the already fierce geopolitical and historical tensions between the U.S. and China, often leading to stringent policy changes. Examples include (i) the China Initiative launched in 2018 by the U.S. Department of Justice to counter Chinese national security threats [2], (ii) the investigation of hundreds of scientists by the National Institutes of Health in 2018 [3], and (iii) the Evaluation of Representative Outcomes (ERO) released by the Chinese government's Ministry of Science and Technology in 2020 [4] encouraging scholars in China to publish in domestic journals, disparaging the importance of international journals. Such policies and interventions are often indiscriminating, and downplay the utility and impact of cross-border collaborations. Past research has shown that cross-border collaborations are in fact associated with greater impact, and higher citation rate for scientists from different countries [5,6]. Yet, the collaborations between the AI scientists from the U.S. and China have not been examined to date. To fill this research gap, we conduct a comprehensive analysis of the impact of AI research collaborations between the U.S. and China over the past two decades. More concretely, we analyze AI research collaborations to *quantify the impact of collaborative research between the U.S. and China in AI in comparison to other local and international collaborations (RQ1)*, and *understand the interplay between the migration of AI scientists between the two countries and the observed effect in research impact (RQ2)*.

To explore our questions, we use Microsoft Academic Graph (MAG), one of the largest knowledge graphs of scientific publication records with more than 263 million publications. We quantify the cross-border collaboration benefit for the scientists in the U.S. and in China separately: If the last author on a paper is affiliated with an institute from the U.S., and the paper has at least one co-author with an affiliation in China, we classify it as a US-based paper in collaboration with China, or a "US-China" collaboration for short. Similarly, if the last author is affiliated with an institute from China, and the paper has at least one co-author with an affiliation in the U.S., we classify it as a "China-US" collaboration. To be able to answer RQ1, we conduct a matching experiment and construct a comparable set of collaborations, or controls. We match the US-China papers to other US-based papers in collaboration with non-China countries, and similarly match the China-US papers with other China-based papers in collaboration with non-US countries. We do so while controlling for: (i) publication year; (ii) number of authors; (iii) location of the last author; and (iv) affiliation of the last author. At the end of the matching process, we retain 29,695 US-China papers, and 23,308 China-US papers. We quantify the average percentage increase in impact for papers published between 2005 and 2019 for each year separately as shown in Figure 1. We find a statistically significant increase in impact with an average percentage increase of 49.76% for US-China collaborations, and 53.85% for China-US collaborations, for the last 5 years.

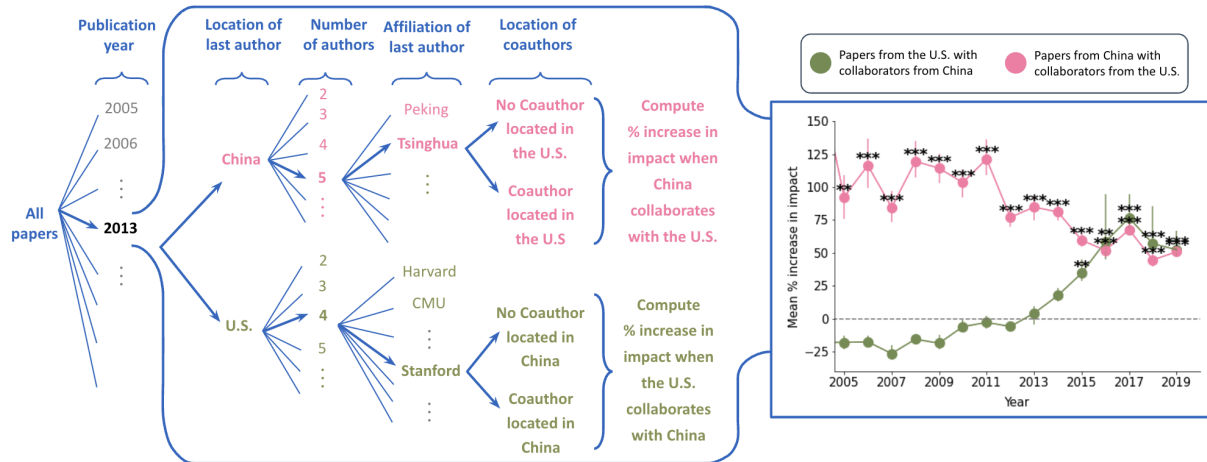


Figure 1 Average percentage increase in impact when U.S. based scientists collaborate with scientists in China (green), and when China based scientists collaborate with scientists in the U.S. (pink). Error bars represent bootstrapped 95% confidence intervals; *** p<.001. Our matching experiment is explained on the left in terms of the confounding variables.

We tap further into these collaborations to understand the effect of migration to and from the U.S. and China on the observed increase in impact, as seen above, when the two nations collaborate (RQ2). Our hypothesis is that when scientists migrate from one country to another, they increase the collaboration premium between the two countries, resulting in heavy gains in productivity and impact for both countries. To understand this, we match the AI scientists who migrated from the U.S. to China (similarly from China to the U.S.) with AI scientists who never transited through the U.S. (similarly, China) in their career on the following confounders: (i) academic age, (ii) productivity in the year of migration, and (iii) citations by the year of migration. We compare the percentage difference in the number of cross-border collaborations produced by the two groups of scientists post-migration year. We find a staggering and statistically significant difference where scientists who migrate from the U.S. to China collaborate with the U.S. scientists 1,636% more than those who never transit through the U.S. Similarly scientists who migrate from China to the U.S. collaborate 3,707% more than those who never transit through China. These findings suggest that the exchange of AI scientists between the U.S. and China can bring about prolific collaborations that both nations can benefit from.

Overall, our findings have important policy implications, and substantiate the assertion that instead of viewing international AI research collaborations as a threat and a matter of national prestige, these collaborations can be viewed from a perspective that transcends political agendas—a global perspective where the emphasis is on the advancement of science for the benefit of all.

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