Modeling and analysis of migration and mobility among scholars using bibliometric data

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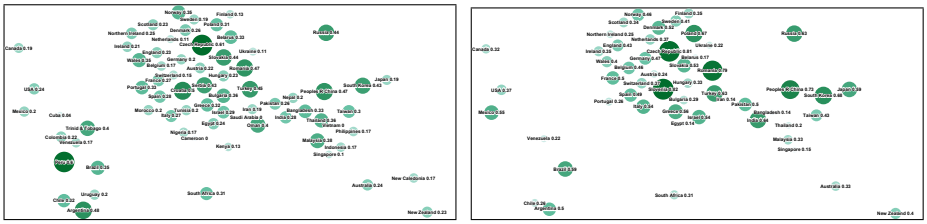
Abstract. Bibliometric data give us unprecedented opportunities for understanding patterns of mobility among scholars, testing existing migration theories and developing new ones. In a series of studies, we leverage large-scale bibliometric data to measure and model the migration of scholars in different contexts and answer fundamental questions in the intersection of high-skilled migration and science of science. This presentation explores three research questions within the scope of migration in academia and analysis of large-scale bibliometric data.

Keywords: high-skilled migration · big data · bibliometric data · scientometrics · science of science.

1 Highly Mobile Researchers

In order to understand the scholarly migration systems, determining the extent to which researchers have worked in more than two countries is essential. We focus on the subgroup of highly mobile researchers whom we refer to as "supermovers." More specifically, we track the international movements of researchers who have published in more than two countries through changes in the main affiliation addresses of over 62 million publications indexed in the Web of Science database over the 1956-2016 period. Among other findings, our results point to the emergence of a global system that includes the USA and China as two large hubs, and England and Germany as two smaller hubs for highly mobile researchers [1].

Figure 1 shows the fractions of return migration (fraction of migrants who return to their origin) among the early-career and the mid-career super-movers for different countries of academic origin, with larger circles and darker shades representing a larger value of return migration.

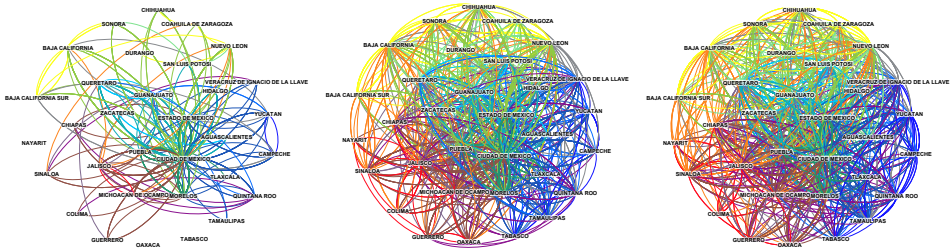


(a) Early-career super-movers (b) Mid-career super-movers

Fig. 1. Return migration among super-movers by country and academic age: (a) early-career and (b) mid-career (see the figure on screen for high resolution).

2 Internal Migration of Researchers in Mexico

Our understanding of internal migration among researchers is quite limited partly due to lack of data aggregated at a suitable sub-national level. We repurpose bibliometric data using a neural network which provides a sub-national level for aggregating affiliation data and tracking changes of affiliations. We analyze internal migration based on over 1.1 million authorship records from the Scopus database to trace the movements of over 250,000 scholars in Mexico and provide measures of internal migration such as net migration rates for all states over the period 1996-2019 [2].



(a) 1997-1998 (b) 2007-2008 (c) 2017-2018

Fig. 2. Networks of internal migration among researchers in Mexico based on selected one-year periods. Directions of edges are clock-wise and their colors are the mix of respective origins and destinations (see the figure on screen for high resolution).

Figure 2 shows the movements of scholars between Mexican states. Overall, the migration networks have not only become more dense but also more diverse over the past two decades. For instance, in more recent years, states along the Pacific coast (red) show a greater exchange (purple edges) with states along the Gulf of Mexico and the Yucatan Peninsula (blue).

3 Academic Brain Drain and Brain Gain in Russia

Debates on international brain circulation often consider scientists and the scientific community as one unit which could be either a net loss (brain drain) or a

net gain (brain gain) for a given country disregarding the fact that international migration rates in academia could vary for different fields of scholarship. We use the topics of scientific publications to quantify the impact of migration on each field of scholarship in Russia as a commonly debated example of brain drain. Our analysis shows that Russia has suffered a net loss in almost all disciplines due to a lack of balance between incoming and outgoing flows of researchers. We analyze origins and destinations of migrant researchers with respect to their fields and performance and compute net migration rates. Our results indicate that while Russia has been a donor country in the late 1990s and early 2000s, it has experienced a relatively symmetric circulation of researchers in more recent years [3].

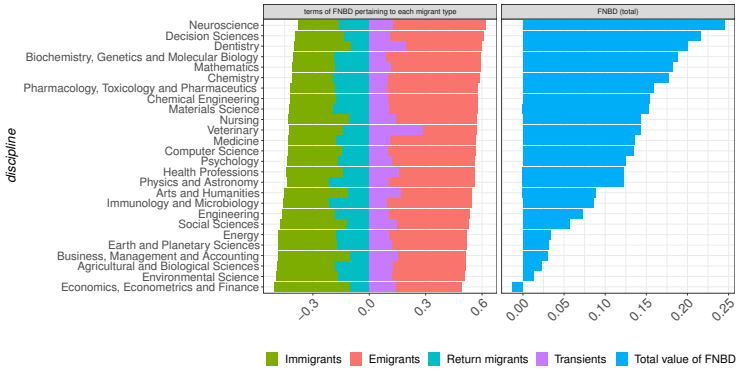


Fig. 3. Field-based net brain drain for all disciplines of scholarship quantified based on movements of different migrant researchers in Russia and their publications

Figure 3 shows values of Field-based Net Brain Drain ($FNBD$) suggesting that Russia has suffered a large loss in disciplines such as neuroscience, decision sciences, dentistry, biochemistry, and mathematics. For almost all other disciplines, $FNBD$ values show a loss, but to a smaller degree.

References

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