RESEARCH

Mobility Patterns of Top Israeli Researchers

Gali Halevi
Icahn School of Medicine at Mount Sinai (SSO), US
gali.halevi@mssm.edu

Israel is a small country with only a handful of universities and research institutions. However, it is well known for its advanced research in various disciplines such as information technology, medicine, biochemistry, physics and more. Israeli scientists collaborate with colleagues around the world and many spend significant time abroad. This study sought to discover in which countries the most prolific Israeli scientists spent time. In addition, it examined which countries were the most popular destinations for various disciplinary collaborations.

Keywords: mobility; internationalization; scientific output

Introduction

Scientific mobility and its impact on productivity has been studied for quite some time now. Mobility in the context of the scientific endeavor pertains to researchers spending time working and collaborating with colleagues outside their native countries and then either returning to their home countries or continuing working abroad. Most research has concluded that mobility has direct impact on both output productivity and impact that come into fruition in forms of higher number of articles and citations (Ejermo et al., 2019; Halevi et al., 2016; Halevi & Moed, 2012; Yemini, 2019). This phenomenon probably relates to increased co-authorship, which is a natural product of such collaborations (Fellesson & Mählck, 2017; Kato & Ando, 2017; Wagner et al., 2017). Shared expertise and resources which manifest in international co-authorships are on the rise and are a part of the overall trend of scientific internationalization which has proven to result in highly innovative research and breakthroughs (Cohen et al., 2014; Hunter & Leahey, 2008; Parish et al., 2018; Woldegiyorgis et al., 2018; Yemini, 2019; Zimmerman et al., 2008). Finally, the literature also demonstrated the link between highly productive researchers and collaboration The literature on top performers frequently mentions the issue of collaboration and indicates that prolific scientists are also highly collaborative (Henriksen, 2018; Hunter & Leahey, 2008).

Israel is a unique case of a small country that made significant scientific and technological progress in its young existence and became a hub of innovations across disciplines. Israel’s geo-political location presents a set of challenges that might have hindered extensive international collaborations and mobility. Therefore, discovering whether highly published Israeli scientists benefit from the advantages of international collaboration and mobility was significant, especially considering the country’s circumstances.

Method and Data Collection

In this study, we utilized the method described by Halevi & Moed (Halevi & Moed, 2015) to collect mobility data through publications. This method utilizes the author information available on Scopus’ pre-populated profiles. Scopus’ authors’ profiles contain their publications through the years including their affiliations. By aggregating the affiliations’ names from previous publications, Scopus displays a list of affiliations including the country, the institution and the years the author published while there (see Figure 1).

Using the information available on the affiliation history in the author’s profile, the top three affiliations’ information for each of the authors included in this study was manually collected. This method can only be performed when collecting data for a relatively small amount of authors since it requires a manual procedure to complete. Therefore, this study examined the top 50 most prolific authors in the major Israeli universities: (1) Bar-Ilan University (2) Tel-Aviv University (3) Haifa University (4) Ben-Gurion University and (5) The Hebrew University of Jerusalem amounting to 250 such profiles to be analyzed.
The process of collecting the data was mostly manual and included the following:

Step 1: Search for each university in Scopus using the affiliation field.
Step 2: Each affiliation profile on Scopus offers a list of authors sorted by the highest number of papers.
Step 3: Chose the top 50 most prolific authors (by number of papers).
Step 4: For each author examine the affiliation history and manually record the most recent three affiliations;
countries. In the vast majority of cases, the recent affiliation is the Israeli university to which they belong now while
the second and third listed affiliations are associated to foreign countries and institutions they visited and worked
in in the past.
Step 5: For each author the major discipline as it appears on their Scopus profile was recorded manually.
The dataset, therefore, consisted of 250 researchers and 15 major disciplines.

This methodology does require a subscription to Scopus or any other database that lists the current and former
affiliations of an author. As our institution subscribes to Scopus, it has been the most efficient database to use
for the purpose of this analysis.

Analysis

The analysis focused on two affiliations prior to the current one found in each profile. This was necessary because the latest
affiliation in each profile showed the current Israeli affiliation to which the researcher belongs. Since we searched for the
most prolific authors in each Israeli University, the most current one was in Israel, as should be. Therefore, identifying
foreign affiliations in which researchers worked prior, required examining the list of affiliations associated with each profile.

Findings

The analysis of each researcher’s two prior affiliations identified 42 unique countries where Israeli researchers have
worked in. The most popular destination is The United States with 132 instances of affiliations associated with the
country (see Table 1). Not surprisingly, half of the countries (21) are European, probably due to the geographic
closest to Israel compared to the others identified in our dataset. However, it is worth noting that Canada, Japan and China
were also visited by prolific Israeli researchers through the years.

Table 1: Countries visited by Israeli Scientists.

| Country         | USA | France | Slovenia | Czech Republic | Lithuania | Australia | South Korea | Norway | China | India | South Africa | Mexico | France | Poland | Malaysia | Luxembourg |
|-----------------|-----|--------|----------|----------------|-----------|-----------|-------------|--------|-------|-------|-------------|--------|--------|--------|----------|------------|
|                 | 132 | 8      | 8        | 3              | 2         | 6         | 2           | 2      | 13    | 12    | 2           | 1      | 4      | 2      | 1        | 1          |

Figure 1: Snapshot of Scopus Affiliations list from Author Profile.
**Mobility by Discipline**

The main discipline identified in the authors' profiles was analyzed in order to identify the countries associated with each specialty. This type of analysis enables the mapping of disciplines and expertise to countries where scientists seek to specialize. This analysis focused on the top disciplines identified in the profiles and included (1) Biochemistry, Genetics and Molecular Biology (2) Chemistry (3) Medicine and (4) Physics and Astronomy.

**Biochemistry, Genetics and Molecular Biology**

The area of Biochemistry, Genetics and Molecular Biology is very popular in Israeli research. There are approximately 160 biotech companies currently operating in Israel with revenue averaging $800 million a year. Examining the most visited countries Israeli researchers worked in we found that The United States, Japan, Germany, Denmark, The Czech Republic and The United Kingdom were the top ones. (See **Figure 2**). **Table 2** lists the major universities visited by Israeli universities.

---

**Figure 2:** Countries visited by Biochemistry, Genetics and Molecular Biology scientists.

**Table 2:** Main institutions in Biochemistry, Genetics and Molecular Biology.

| Country       | Institutions                                      |
|---------------|---------------------------------------------------|
| United States | The National Institutes of Health                  |
|               | Massachusetts Institute of Technology             |
|               | Harvard Medical School                             |
|               | National Cancer Institute                         |
|               | University of California System                   |
| Japan         | University of Tokyo                               |
|               | Kyoto University                                  |
|               | Osaka University                                  |
|               | Tohoku University                                 |
| Germany       | Ludwig Maximilians-Universität München            |
|               | German Cancer Research Center                      |
|               | Universität Heidelberg                            |
|               | Charité – Universitätsmedizin Berlin               |
|               | Universität Freiburg im Breisgau.                 |
Chemistry
Israel is known for its' research in chemistry, with a notable four Nobel Winners in the field in the past ten years alone. Examining the most visited countries Israeli researchers worked in we found that The United States, Germany and The United Kingdom are among the top destinations of Israeli Researchers. Other countries include Italy, Spain, Switzerland, Poland and Slovenia in Europe; China, Singapore and India in Asia and Canada in North America (see Figure 3). Table 3 lists the major universities visited by Israeli universities.

![Figure 3: Countries visited by chemistry scientists.](image)

**Table 3:** Main institutions in Chemistry.

| United States                      | The National Institutes of Health |
|------------------------------------|-----------------------------------|
|                                    | Massachusetts Institute of Technology |
|                                    | Harvard Medical School            |
|                                    | National Cancer Institute         |
|                                    | University of California System   |
| United Kingdom                     | University of Cambridge           |
|                                    | University of Oxford              |
|                                    | Imperial College London           |
|                                    | King's College London             |
| Germany                            | Ludwig-Maximilians-Universität München |
|                                    | German Cancer Research Center     |
|                                    | Universität Heidelberg            |
|                                    | Charité – Universitätmedizin Berlin |
|                                    | Technical University of Munich    |
**Medicine**
Examining the most visited countries Israeli researchers worked in we found that The United States is by far the most traveled to destination. The United Kingdom, Denmark and France in Europe and Canada in North America are among countries visited by Israeli researchers (see Figure 4).

Table 4 lists the major universities visited by Israeli universities.

![Map showing countries visited by medicine scientists.](image)

**Figure 4:** Countries visited by medicine scientists.

| United States                  | Harvard Medical School                     |
|-------------------------------|--------------------------------------------|
|                               | National Institutes of Health              |
|                               | Columbia University in the City of New York|
|                               | Massachusetts General Hospital             |
|                               | University of California, San Francisco    |
| United Kingdom                | University of Oxford                       |
|                               | Imperial College London                    |
| Denmark                       | Københavns Universitet, Rigshospitalet      |
|                               | Aarhus Universitetshospital                |
|                               | Universität Heidelberg                     |

**Physics and Astronomy**
Israel is known for its matter and energy research, topics in this area include particle and nuclear physics, mathematical physics, quantum physics and theoretical physics. The countries most visited by Israeli researchers were The United States, Bulgaria, Japan, Germany, Italy and China (see Figure 5). Other countries include Denmark, Finland, France, The United Kingdom, Switzerland, Ireland and the Netherlands in Europe; India, Singapore and Malaysia in Asia; Russia and Ukraine. Table 5 lists the major universities visited by Israeli universities.
Discussion
Despite of the relatively small sample of the top 250 performing Israeli researchers across all universities, it is clear that all spent some time abroad, working and collaborating. Two other phenomenon were detected; the high prestige of the institutions where Israeli researchers worked and the fact that they mostly visited the same institutions. When looking at the institutions visited by Israeli researchers in the United States the National Institutes of Health (NIH), Massachusetts Institute of Technology (MIT), Harvard Medical School, National Cancer Institute (NCI), Columbia University in the City of New York and University of California System were most prominent. In the United Kingdom University of Cambridge, University of Oxford, Imperial College London, King's College London, and The University of Manchester were the most prominent. When looking at Germany Ludwig-Maximilians-Universität München, German Cancer Research Center, Universität Heidelberg, Charité – Universitätsmedizin Berlin and Universität Freiburg im Breisgau are also seen as prominent destinations.
These institutions are no doubt well known and some of the most prestigious in the world. This is certainly a credit to the high research and academic achievements of these researchers. It is interesting that most of the prominent researchers do visit the same institutions, regardless of their discipline aiming for the top ones in each country they visit.

Conclusions
Using Scopus’ author profile it is possible to collect affiliations data going as far back as the first article they publish. Tracking affiliations across someone’s career can reveal their former affiliations whether in their home country or abroad. Unless the data is somehow bought from Elsevier, the data collection is mostly manual and therefore quite difficult to do in a large-scale setting. In this article, the top 50 most prolific authors across all Israeli Universities were selected totaling 250. The analysis shows that the United States is the most popular destination for Israeli researchers followed by a variety of European countries. Yet, the data also shows visits to Asia in the Biochemistry, genetics and Molecular Biology, Physics and Astronomy arenas. The results of this study agree with previous studies which found that there is a correlation between the level of international collaboration and scientific output (Abramo et al., 2011; Decramer et al., 2013).

Competing Interests
The author has no competing interests to declare.
