

# Brain Drain or Brain Circulation? The Extent of German Scientists to Work Abroad

Sonia Conchi, Carolin Michels

Fraunhofer Institute for Systems and Innovation Research ISI, Karlsruhe, Germany  
contact: Sonia.Conchi@isi.fraunhofer.de, phone: +49 (0) 721 / 6809 - 191

## Background

**International exchange** between scientists is essential to **drive progress**. Thus, scientists form international networks to promote the **exchange of information** in their research field.

The term **"Brain drain"** was used to refer to **scientists who migrate from one country to another with no intention of returning** (Grubel, 1994) – an action that has **international, economic and political impacts**, especially in developing countries (see, e.g. Lowell 2002).

**"Brain circulation"**, on the other hand, is defined as a research visit abroad with a fixed duration and the **intention to return**. Such exchanges early on in a researcher's career can help him/her to learn more, build up international networks, and acquire inter-cultural competences.

According to Sjaastad (1962) migrations are seen as **individual investments** in human capital which can be divided into costs and benefits. It follows that those countries with a higher income and a lower cost of moving are more attractive for emigrants (Ette, 2010). Also, the more years are left on the labor market, the more likely a person is to move to another country (Ette, 2010). Emigrants build relationships across national boundaries and create a **permanent connection** between home and foreign country that enables further exchange.

**Bibliometric data** can be used to **track scientists** over time. Roberge and Campbell (2012) conducted an analysis of Canadian researcher migration on Scopus data, which reveals a net migration flow on a very low level. Recently, Moed et al. (2013) also showed that it is possible to trace scientists and their mobility using Scopus data. According to their study, countries to which German scientists migrated most frequently were the USA, UK, Switzerland, France, Austria and the Netherlands.

In the study, the following **hypotheses** were tested:

**H1:** The share of scientists publishing abroad is increasing over time.

**H2:** Most scientists return after two years abroad.

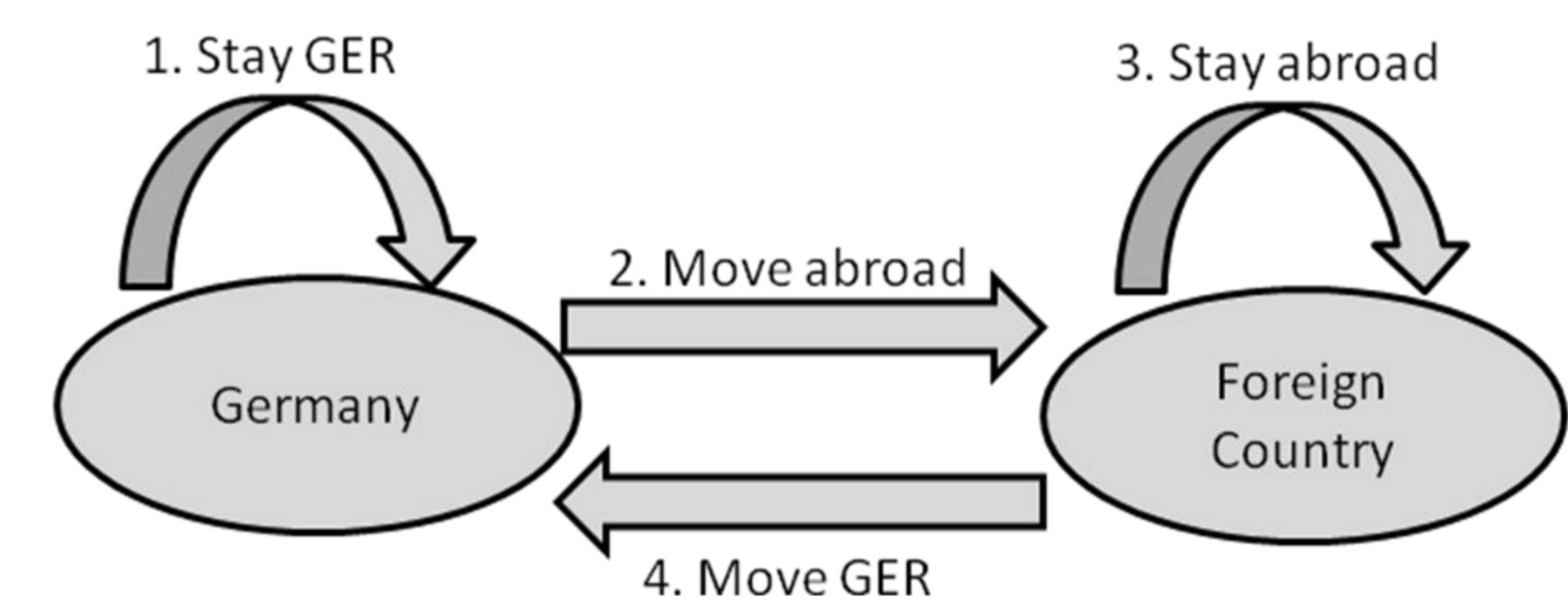
**H3:** The most popular countries are English speaking countries.

## Data & Methods

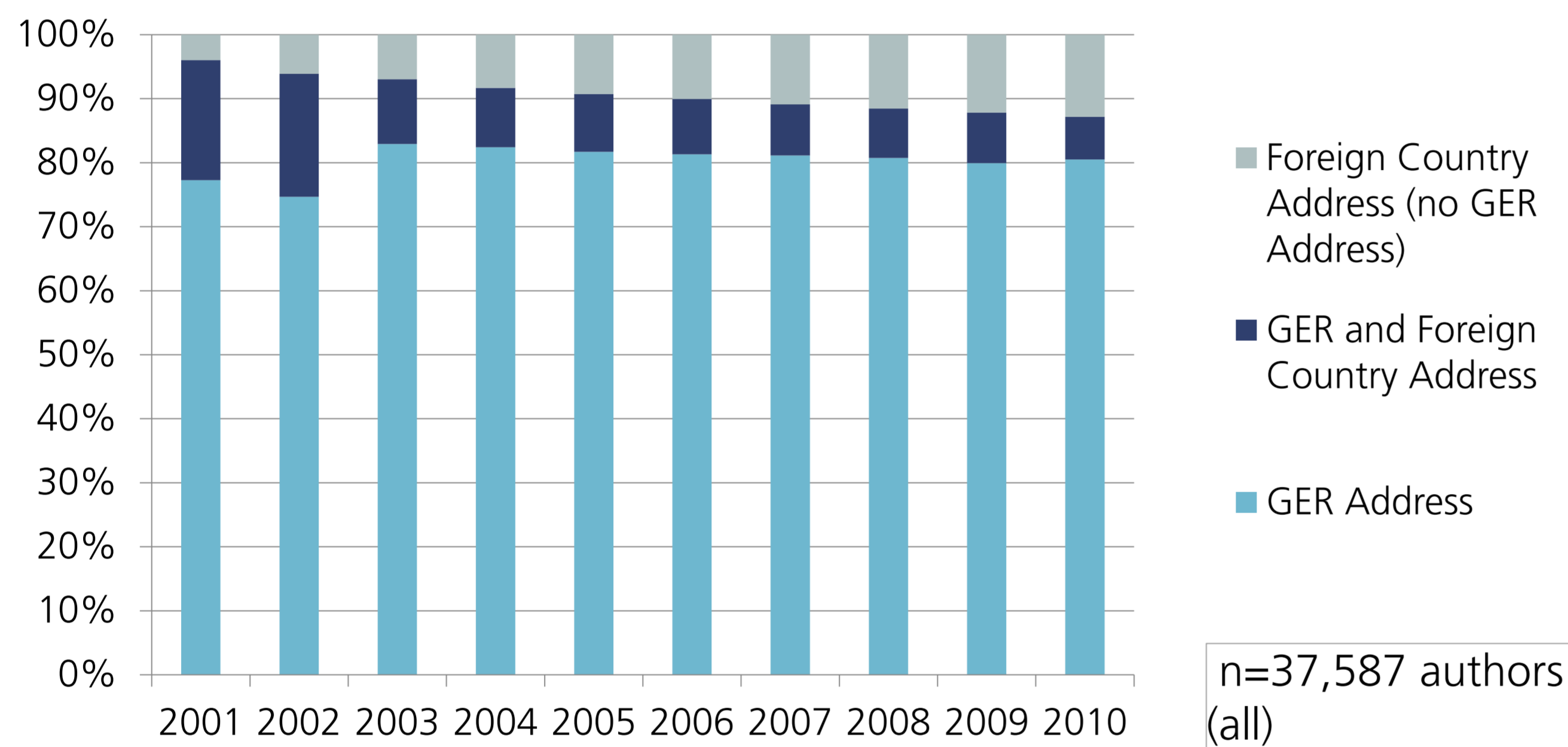
The relevant publication data was extracted from the **Scopus** database.

Address information in Scopus was used to derive the **countries of residence of the authors**. For each year, all countries from the affiliations of an author were associated with his **Scopus author ID**. The basis set was selected as those **scientists, who published in 1998-2000 with a German address**. In that way, it was ascertained that the majority of them was originally from Germany. Not all authors had continuous publication and thus country data. By assuming that the author stayed in the same country of his last known residence if no other information was available, **missing country information of a year was filled with the information from the previous year**. However, to avoid cases where the information was filled out even though the author was no longer actively publishing, the basic set was reduced to those authors that had **at least 1 publication in 2010**. Also, there had to be **at least 5 publications in the time period 2000 to 2010**.

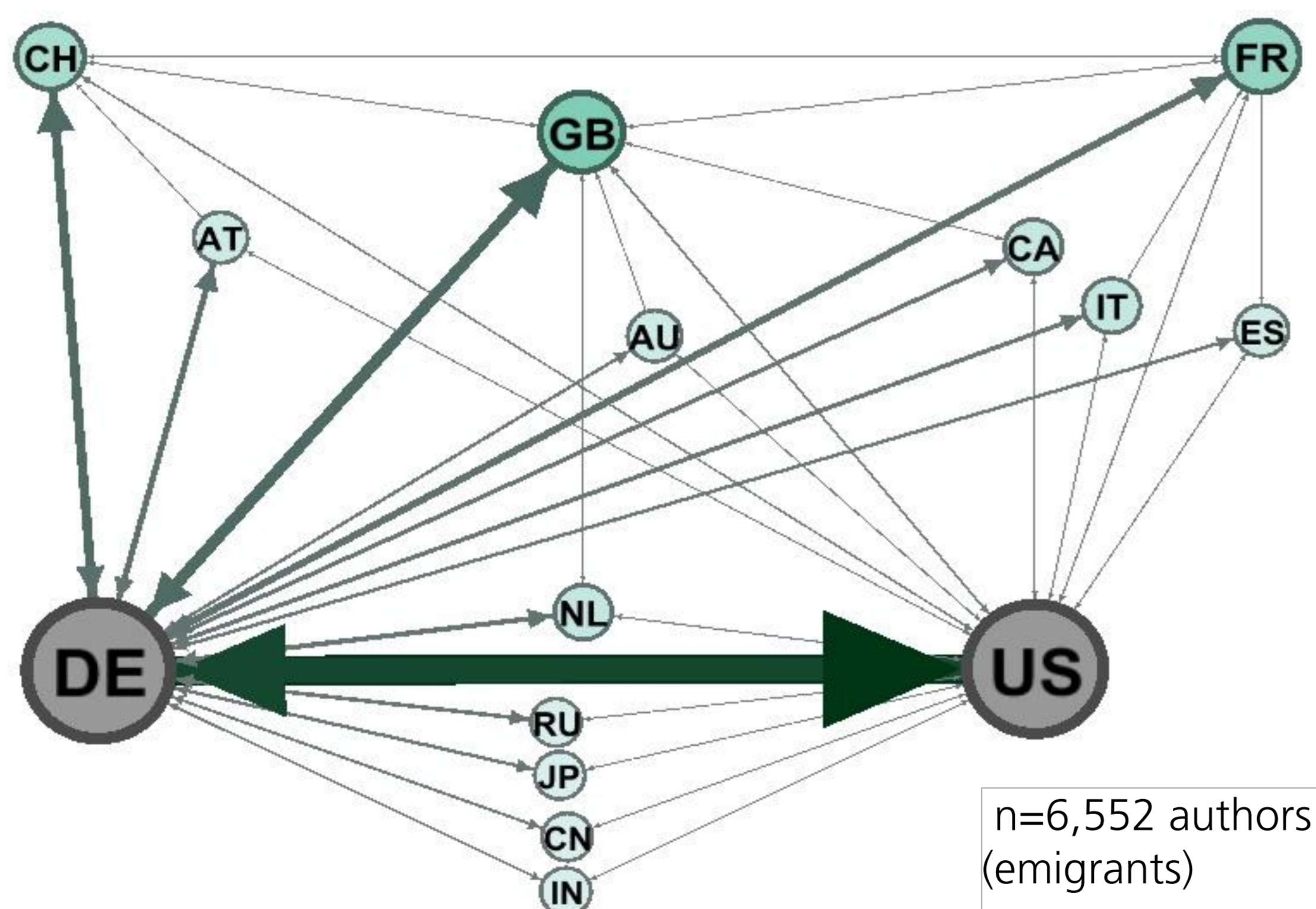
The aim of this study is to assess **scientific migration in Germany**. A data set of a **cohort of German scientists and their movements for a period of 10 years** was created based on Scopus. This paper provides a descriptive analysis of the observed mobility.



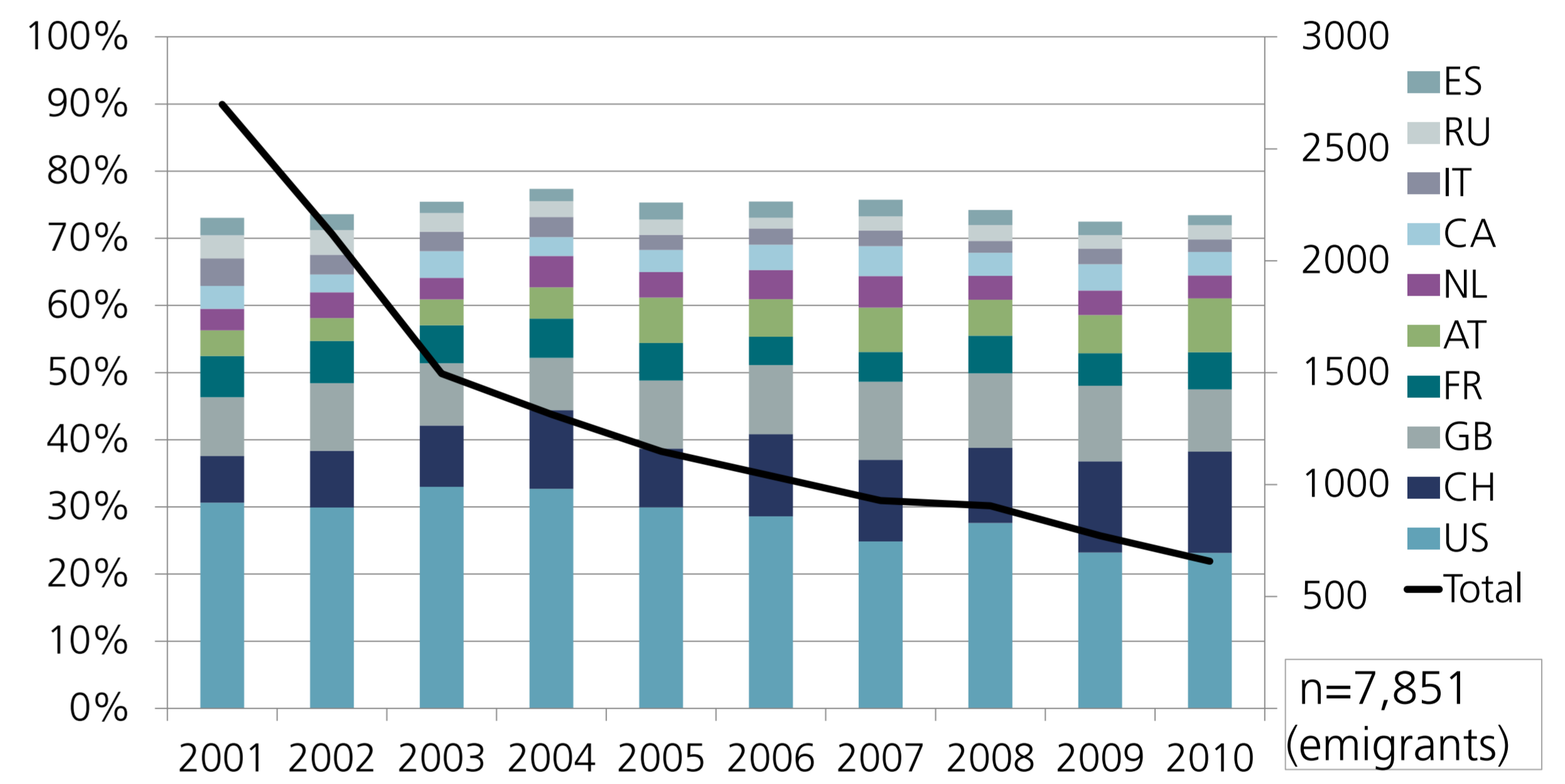
## Results



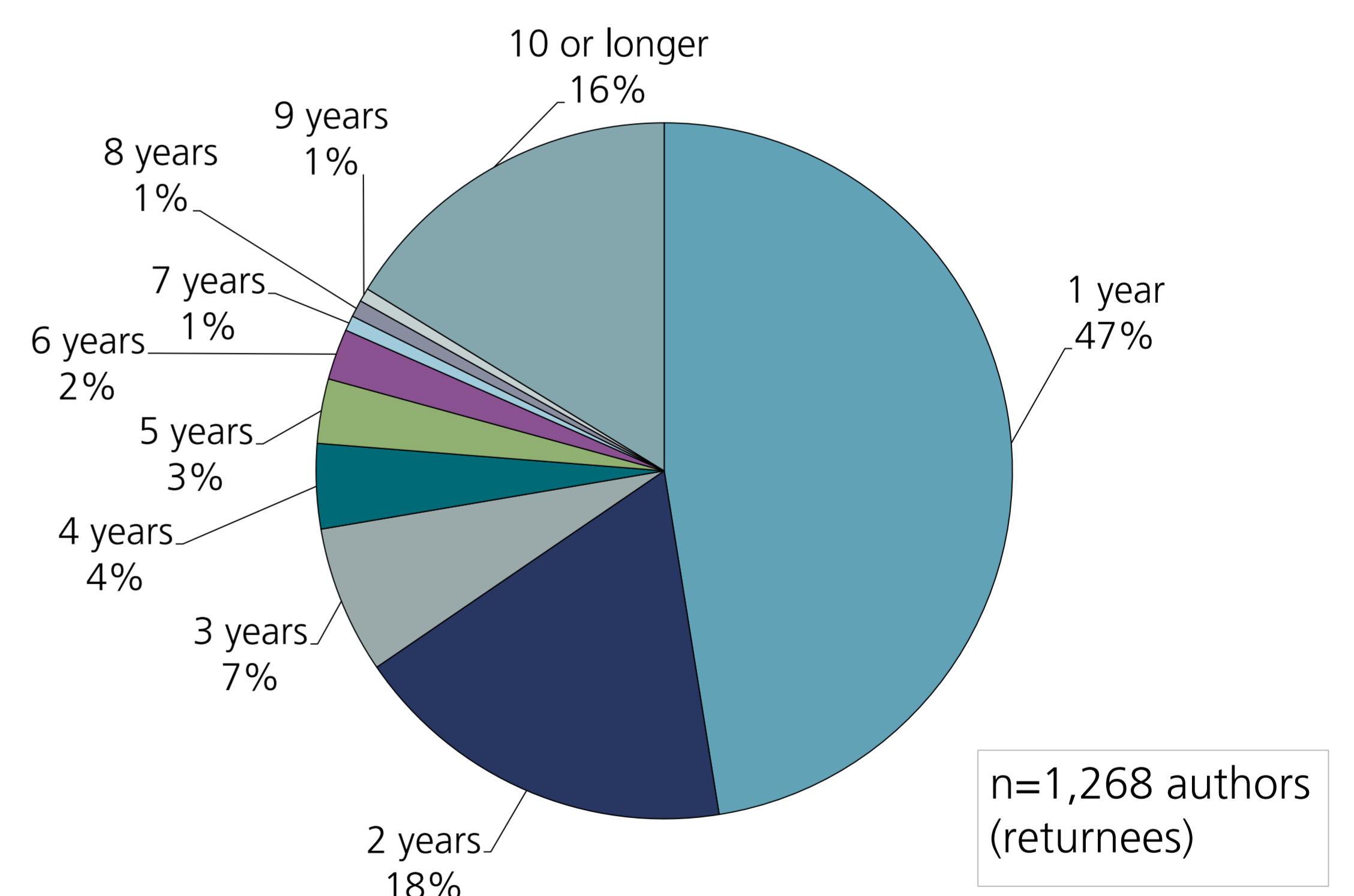
**Publication Address:** Within the data sets, the proportion of authors publishing with double-addresses decrease with time, at the same time, the proportion of foreign addresses increases. The share of scientists publishing abroad is increasing over time.



**Author Circulation:** Many scientists tend to move from one country to another in the time period 2000-2010. In most cases the U.S. is involved, but also Great Britain, France and Switzerland are popular hubs (only most popular destinations are included in the graph).



**Publication Country:** The most popular countries are the US, Switzerland and Great Britain. Countries that share a border with Germany are ranked high according to shares of receiving emigrants. Also English speaking countries are especially popular.



**Longest Stay Abroad:** Emigrants tend to return after 1 to 3 years. For 16% we can assume that they left for good.

## Conclusions

On average **18% of German scientists** take part on **international mobility** according to the Scopus data. To detect whether a brain drain is taking place, it was necessary to look at those scientists who **give up their German addresses and never come back**. This holds for **8%** of all migrations between 2000 and 2010. However, only a "finite" data set could allow deductions for a permanent foreign residency. In this data set, German scientists were defined as those who published 1998 to 2000 in Germany, but this could also apply to foreign scientists who move back to their home countries afterwards.

On the other hand, **brain circulation is much more present than brain drain**, as researchers seem to be constantly on the move and change their research affiliation frequently. The **majority of emigrants returns to Germany** during the observation period. Therefore, knowledge transfer and intercultural exchange between countries are fostered, whereof (national) research is likely to benefit.

The **next steps include an online survey** based on the email addresses provided in Scopus. The survey's aim is to examine the motivations of scientists, especially those involved when selecting the targets for staying or moving abroad. **Differences in research fields** might be detectable. At the same time, the **Scopus data can be validated on a larger scale** using the answers in the survey.

## References

- Ette, A., Sauer, L. (2010): Auswanderung aus Deutschland. Daten und Analysen zur internationalen Migration deutscher Staatsbürger. VS Verlag für Sozialwissenschaften. pp. 24ff
- Grubel, H.G. (1994): "Brain Drain, Economics of", in T. Husen and T. Neville Postlethwaite (eds.), The International Encyclopedia of Education, 1, pp. 554-561.
- Lowell, B.L. (2002): Skilled Labour Migration from Developing Countries: Annotated bibliography. International Migration Papers, 56.
- Moed, H.F., Aisati, M., Plume, A. (2013): Studying scientific migration in Scopus. Scientometrics, 94 (3), pp. 929-942.
- Roberge, G., Campbell, D. (2012): Canadian Researchers Migration Analysis based on Scopus Author IDs. STI 2012 - 17th International Conference on Science and Technology Indicators. Montréal. pp. 884-885. [http://sticonference.org/Proceedings/vol2/Roberge\\_Canadian\\_884.pdf](http://sticonference.org/Proceedings/vol2/Roberge_Canadian_884.pdf)
- Sjaastad, L.A. (1962): The costs and returns of human migration. Journal of Political Economy. 70(5 Pt 2), pp. 80-93.