

Studying scientific migration patterns in Scopus

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Introduction

In a global knowledge society, knowledge is considered to be the major economic production factor, and researchers – in which knowledge is embedded - are expected to move more freely than they did in the past. The market for skills is becoming more and more international, and there is a growing interest in studies of *international* migration patterns of researchers from one country to another. Such studies aim to describe such patterns, and examine their causes and effects. International migration of researchers is also sometimes denoted as scientific nomadism (e.g., Meyer, Kaplan and Charun, 2002); it represents one of the most important types of migration. Another type can be denoted as *sectoral* migration, in which scientists move from one economic sector to another, for instance, from the public to the private sector, or, more specifically, from an academic institution to a private company (e.g., Zellner, 2003). A third type can be labelled as *disciplinary* migration, also denoted as field switching, when scientists move from one research discipline from another. This type of migration is related to the study of cross-disciplinary research (e.g., Bordons, Morillo and Gómez). Finally, *institutional* migration deals with scientists moving from one scientific institution to another.

This paper describes a methodology for a bibliometric analysis of researchers' migration patterns in Scopus, Elsevier's multi-disciplinary database of scientific-scholarly literature. It focuses on international migration, but many elements of the proposed methodology can be applied in the study of other types of migration as well. The scientific migration of authors research tool (SMART) is illustrated with a case study on international migration of Italian researchers.

Data and method

In many research policy studies aggregates of individual researchers and their properties constitute an important research object. One of the limitations of scientific-scholarly literature databases is that the author names of indexed publications are not directly linked to the corresponding individual researchers, mainly because of the homonym-synonym problems in author names. Scopus has implemented an author profiling tool, aimed to group author names and their publications into clusters representing individual researchers (Scopus, 2010). Such a construct will be denoted as a profiled author below. Although this feature is not free of inaccuracy and should be used to draw conclusions on individuals only in conjunction with proper verification and background knowledge, the base assumption underlying SMART is that it is sufficiently accurate to analyse *groups* or *aggregates* of researchers and draw conclusions on the behaviour and properties of such groups, describing statistical relationships

among them. The methodology is based on Zuckerman's notion that, on the one hand, the presence of error does not preclude the possibility of precise measurement and that the net effect of certain sorts of error can be measured, but that on the other hand the crucial issue is whether errors are randomly distributed among all subgroups of scientists, or whether they systematically affect certain subgroups (Zuckerman, 1987, p. 331).

A second feature in Scopus is that each individual author in the author list of an indexed publication is linked to its proper institutional affiliation in the list of affiliations (in as far as indicated in the original heading). Combining this feature with the author profiling facility in Scopus, one is able to identify for a particular profiled author the institutions to which he or she has been affiliated during the scientific career, and, from this, his or her international migration path.

Focusing on international migration, for any pair of years $T1$ and $T2$ ($T1 < T2$) and for profiled authors who publish at least one paper both in $T1$ and in $T2$ one can create a matrix, with countries both in the rows and in the columns, and in the cells the number of profiled authors who are affiliated with the row country in year $T1$ and with the column country in year $T2$. An additional hypothesis one can make is that the affiliation to which a profiled author is linked in his or her earliest publication, represents the institution in which he or she started the scientific career.

Results

As an illustration of this powerful methodology, this section presents the results of a case study aimed to identify researchers who have worked at Italian institutions in the past but who have left Italy and are currently working abroad. The study is based on the set of researchers who have published their very first paper (in their research career as captured by Scopus) from an Italian institution. The total number of researchers migrating from Italy as defined above amounts to 3,700. They moved from about 500 Italian institutions to 1,500 foreign institutions located in more than 80 countries. Figure 1 gives an overview of the countries importing Italian researchers. The USA shows the largest intake in terms of absolute numbers ($n=900$), followed by France ($n=500$), Switzerland ($n=400$) and Germany ($n=350$). Figure 2 gives a breakdown of the migrating Italian researchers by research discipline. *Physics & Astronomy*, *Engineering* and *Biochemistry*, *Genetics & Molecular Biology* are the largest contributors.

Concluding remarks

This extended abstract introduced a methodology for studying scientific migration in Scopus and illustrated this methodology with a case study. In the coming months the methodology will be further explored. New cases will be presented at the conference. We believe that the methodology described in this paper is a powerful tool in the study of a process as policy relevant as scientific migration.

Figure 1: Countries importing Italian researchers

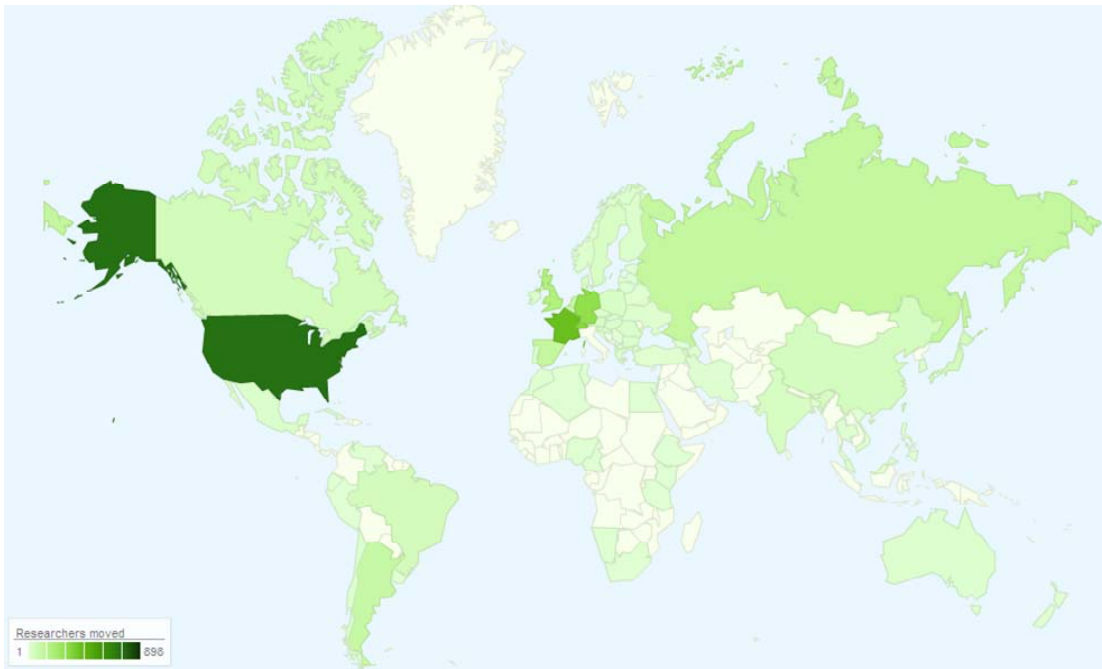
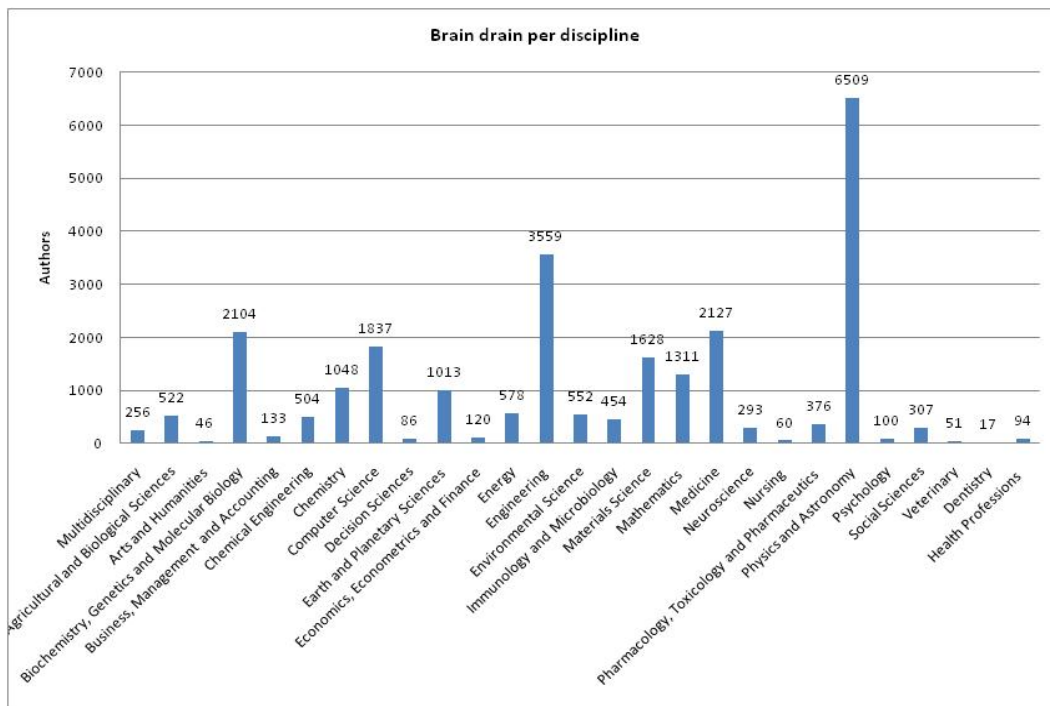


Figure 2: Number of migrating Italian researchers by research discipline



References

Bordons, M., Morillo, F., and Gómez, I. (2004). Analysis of cross-disciplinary research through bibliometric tools. In: Moed, H.F., Glänzel, W., and Schmoch, U. (2004) (eds.). Handbook of quantitative science and technology research. The use of publication and patent statistics in studies of S&T systems. Dordrecht (the Netherlands): Kluwer Academic Publishers, 437–456.

Meyer, J.B., Kaplan, D. And Charum, J. (2001). Scientific Nomadism and the New Geopolitics of Knowledge. *International Social Science Journal*, 53, 309–321.

Scopus (2010). Author profile. <http://www.info.sciverse.com/scopus/scopus-in-detail/tools/authorprofile>

Zellner, C. (2003). The economic effects of basic research: evidence for embodied knowledge transfer via scientists' migration. *Research Policy*, 32, 1881–1895.

Zuckerman, H. (1987). Citation analysis and the complex problem of intellectual influence. *Scientometrics*, 12, 329–338.