

Mobility of researchers and transnational networks formation: indicators for a complex relationship

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Research subject and hypothesis

Transnational mobility of researchers is increasing within the European Research Area. According to the last European Commission's Science Key Figure Report (CEC, 2009), the mobility of professionals in S&T (researchers included) has increased rapidly over the period 2000-2006.

Mobility is complex and multidimensional (Ackers, 2005). It can be categorised in multiple ways (geographical, sectoral, disciplinary, intellectual, and also short-medium-long term) and have a variety of impacts (positive, negative / upon the individual, the group, etc.). In line with this complexity, recent voices are demanding the abandon of a vision of the mobile researcher as an autonomous agent (which derives from the influence of neoclassical economics), stressing his social openness and considering the interdependency among agents (Meyer and Brown, 1999; Meyer, 2001; Vertovec, 2002; Ackers, 2004; Bozeman, 2008). Indeed, mobility of researchers is influenced by the social networks in which they are embedded and creates new ties within the network (Melin, 2004; Woolley and Turpin, 2009). Consequently, in parallel with the growth in international researcher mobility, transnational scientific networks of collaboration are also emerging (Santiago Manual, 2007).

These two observed trends (the increase of both international mobility and of transnational networks formation) are the bases for our interest in how the relationship between mobility and scientific networks works and changes over time: Do scientific networks evolve as a consequence of the international mobilities of their members? Are the features of mobility shaped by the evolving structure of the network? Do the scientific links created by mobility remain over time and what type of effects do they have?

The lack of indicators makes difficult to answer to these questions. Indeed, there is limited availability of statistical information on researchers' mobility at European level jointly with a strenuous demand for a policy on such indicators (CEC, 2000, 2002, 2007).

To cope with the above mentioned lack of data, some social scientists have started to use the researchers' curriculum vitae (CVs) as a rich data source. Since the CV provides longitudinal information, it has opened up new possibilities for the study of three main topical areas (Cañibano and Bozeman, 2009): development of the scientific career trajectories (Gaughan and Bozeman, 2002; Corley et al., 2003; Gauhgan and Robin, 2004; Mangematin, 2006; Sabatier et al. 2006; Gauhgan, 2009), researchers' mobility (Dietz and Bozeman, 2005; Sabatier et. al, 2007; Fontes, 2007; Jonkers and Tijssen, 2008; Cañibano et. al, 2008) and mapping of collective capacity (Bozeman and Corley, 2004; Lee and Bozeman, 2005; Lin and Bozeman, 2006; Jonkers and Tijssen, 2008; Lepory and Probst, 2009; Woolley and Turpin, 2009).

In spite of all these undoubted valuable contributions and of the development that this methodological tool is undergoing, there are however very scarce studies that have used the CV to analyze jointly scientific networks and international mobility; with some exceptions (Fontes, 2007; Jonkers and Tijssen, 2008 and Woolley and Turpin, 2009). The contribution of this paper is precisely to make some progress in this direction: *the main hypothesis to be tested is whether the information contained in researchers CV is useful for the development of reliable indicators which may describe patterns of the relationship between researchers' mobility and their scientific networks.*

The major question addressed in the scope of the results here presented is: *How do mobility-networks relationships (considering international mobility and transnational networks) vary*

according to disciplines and to other researchers' attributes such as returned and non-returned researchers and the most productive ones?

Methodology

The methodology used is Curriculum Vitae analysis (Dietz et. al., 2000). It consists of the coding of a set of variables (corresponding to the analyst's research interests and questions) extracted from a CV collection, and its subsequent statistical treatment and analysis.

In this paper a set of indicators will be built to examine the mobility-network relationships and patterns of a sample of researchers and their eventual connection with return after international mobility and with productivity. The sample is formed by 80 Spanish Molecular Biologists and 80 Physicists with an international postdoctoral mobility of at least 24 months. For the productivity analysis, the sample will be reduced to the molecular biologists due to the huge coding effort.

The researchers of the sample are applicants to the "Ramón y Cajal" Programme launched by the Spanish Ministry of Science and Innovation for the years 2005 and 2006. This programme consists of public financial aids to promote the integration of researchers into the Spanish science system. Applicant researchers must submit their CV in a standardised template, which contains a rich and detailed amount of information. One condition they have to fulfil is to have had a mobility of at least 24 months in an internationally recognized research organization. This guarantees the suitability of the sample for our goals. Besides, the mentioned condition also implies that some researchers have already returned when they apply to the programme while others apply for it precisely as a way to return home¹.

Coding will be manual, since the relationship under study is complex and there is no possibility of any automatic downloading². The variables to code in order to measure the relationship between mobility and networks are those referred to the dates and to the collaborators' names in publications, conferences and grants, combined with the information related to the long (at least 24 months) international mobilities they have. In order to analyse the mobility-networks relationships for the returned and non-returned researchers and for the most productive ones, variables concerning productivity and other researchers' attributes (as if they have returned or not) will be also coded.

Therefore, the methodological steps to be made are the following:

- Data coding and cleaning
- Statistical analysis
- Indicator development

Existing and expected results

The main focus of the paper is methodological. Therefore, the most relevant expected outcome of the analysis will be the assessment of the potentialities of the researchers' CV to study the relationship between the international mobility of researchers and the formation of their scientific networks.

The paper will present a collection of pilot indicators. It is expected to identify different patterns of mobility-network relationships according to discipline, return and productivity. For example, it is expected that returnees exhibit a stronger maintenance of their previous networks than the non-returned. Also, it is expected that the more productive researchers have created denser networks due to their mobility than the less ones. Finally, we have the intuition that there will be differences according to discipline since mobility and productivity patterns vary across disciplines (Zubieta, 2009).

¹ We used the same data set of the Ramón y Cajal Programme CV collection to analyse researcher mobility patterns in Cañibano, Otamendi and Andújar (2008).

² Recent works have tried to avoid manual coding and have moved on to automatic downloading of data from electronic CV databases (Cañibano et. al., 2009).

This paper opens up new possibilities in the use of the researchers' CV to study the formation and development of networks, conceived as social configurations that underlie the production, use and diffusion of scientific knowledge (Cañibano and Bozeman, 2009). In doing so, it contributes to the understanding of important trends in European science dynamics.

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