WHAT DRIVES RESEARCHERS' CAREERS? THE ROLE OF INTERNATIONAL MOBILITY, GENDER AND FAMILY

ANA FERNANDEZ-ZUBIETA

INSTITUTE FOR ADVANCED SOCIAL STUDIES-SPANISH NATIONAL RESEARCH COUNCIL

afernandez-zubieta@iesa.csic.es

ELISABETTA MARINELLI

INSTITUTE FOR PROSPECTIVE TECHNOLOGICAL STUDIES JOINT RESEARCH CENTRE

elisabetta.marinelli@ec.europa.eu

SUSANA ELENA PÉREZ

INSTITUTE FOR PROSPECTIVE TECHNOLOGICAL STUDIES JOINT RESEARCH CENTRE

susana.elena-perez@ec.europa.eu

Abstract: International mobility has become increasingly common in the research profession, partly due to strong policy support. To understand this trend, it is necessary to explore how researchers plan and envisage their career, that is, what drives their decisions. In this exploratory paper we shed light on this issue, comparing career drivers across three mobility categories. Furthermore, we take into account gender and the parental status of the researchers, as both factors remarkably influence career choices. We use data from the Study on International Mobility and Researchers' Career Development Project (SIM-ReC), launched in 2011 by the Institute of Prospective Technological Studies (IPTS) in collaboration with NIFU (Norway), Logotech (Greece) and the University of Athens. The dataset covers researchers working in European universities across ten countries: Belgium, France, Germany, Italy, the Netherlands, Poland, Spain, Sweden, Switzerland and the UK. The results highlight how different mobility patterns reflect different motivations and confirm that gender and parenthood are critical in shaping career decisions.

Key Words: international mobility, researcher's career, gender, family.

Introduction

During the last decades, the number of internationally mobile researchers has increased dramatically (OECD, 2003; Moguerou and Di Pietrogiacomo, 2008; BIS, 2011), reflecting, among other things, extensive policy support at the European Commission (EC) level (EC, 2001; EC, 2006; EC, 2010a and 2010b). As researchers are important elements of national and cross-national research systems, and are at the core of the European Research Area (ERA) (EC, 2012a and 2012b), it is critical to understand this phenomenon in more detail. Furthermore, the persistence of a gender-based vertical discrimination, despite increasing participation of women in the profession (EC, 2013), indicates that it is necessary to pay attention to gender issues when studying the evolution of research careers.

This exploratory paper tackles these aspects by exploring the link between international mobility and career motivation through a three-level taxonomy and through six different domains of career motivation[1], taking into account gender and family aspects.

We focus on established researchers working in universities across ten European countries: Belgium, France, Germany, Italy, the Netherlands, Poland, Spain, Sweden, Switzerland and the United Kingdom. To address our questions we use original data generated by the SIM-ReC project (Study on International Mobility and Researchers' Career Development Project) launched in 2011 by the Institute of Prospective Technological Studies (IPTS) in collaboration with NIFU (Norway), Logotech (Greece) and the University of Athens.

The paper is organized as follows: section 2 provides policy and literature background on the issues of mobility, gender and career drivers in the research profession; section 3 explains the data-collection process used in the SIM-ReC study; section 4 describes the proposed tripartite taxonomy of mobility; section 5 reports the methodology used for the analysis of the link between international mobility and career motivation; section 6 presents the results of our analysis; and section 7 reports our conclusions.

---

[1] The domains are salary, job-security, personal reasons, career development, research development, and country of preference.

Research Mobility, Gender and Motivations

Research Mobility and Gender in the European Union

Research mobility has increased remarkably in the past few years (OECD, 2003; Moguerou and Di Pietrogiacomo, 2008; BIS, 2011). Between 2000 and 2006, the proportion of non-EU27 researchers increased from 1.6% to 2.4% in nine European Member States and the proportion of researchers from another EU27 country rose from 2.2% to 2.9%[2] (Moguerou and Di Pietrogiacomo, 2008). From 1992 to 2003, the number of foreign-born full-time doctoral faculty in research institutions in the United States rose from 25% to 33% (National Science Board [NSB], 2008). This trend has been supported at the European policy level with the EC sponsoring mobility programmes (e.g. Marie Curie Programme) as well as putting mobility at the core of the ERA (EC, 2001; EC, 2006; EC, 2010a and EC, 2010b; EC 2012b). International mobility experiences are sometimes required to access research positions (Ackers and Oliver, 2007) and to progress in scientific careers (Ackers, 2001; Gonzalez and Verges 2012).

Interestingly, whilst male and female researchers show similar rates of mobility during the years doctoral training (Ackers, 1998 and 2004), female participation in mobility schemes declines at the postdoctoral level. Women represent 39% of the applicants to the Training and Mobility of Researchers' at the doctoral level scheme, but this percentage decreases by up to 33% at the post-doctoral level (Ackers, 2001). Such trends occur against a background of increasing female presence in the academic sector accompanied by a low female presence in the highest ranks of the academic ladder EC (2013)[3].

Given these trends, studying international mobility as a key aspect of the research career in Europe also requires taking into account the gender dimension.

---

[2] In the case of the UK, one of the European countries with higher levels of internationalization, 63% of active UK based researchers have worked at non-UK institutions at some point during their career (BIS, 2011). At the student level, there is an increase in the number of international students in countries with strong research systems. In the US, the number of international students has increased by 32% since 2000-2001 (Institute of International Education, 2012). A similar increasing trend can be observed in the UK (Higher Education Statistics Agency [HESA], 2007).

[3] The proportion of female students and graduates surpass that of men, 55% and 59% respectively in 2010 (EU-27) (EC, 2013). However, after obtaining a PhD and as one goes up in the academic ladder, the presence of women in academia starts declining. The proportion of female PhD graduates in 2010 in EU-27 was 46%, yet women represent 44% of grade C academic staff, 37% of grade B and 20% of grade A academic staff (EC, 2013).

The Implications of Research Mobility and the Need to Understand its Drivers

Policy support of mobility is grounded in its benefits for research systems and, in turn, for industrial competitiveness. Mobility is a mechanism of knowledge diffusion (Bozeman et al., 2001; Crespi et al., 2007; Gagliardi, 2013), especially because of its tacit (Polanyi, 1967) and embedded (Granovetter, 1985; Griliches, 1973) features. When moving, researchers can spread and increase their human (Schultz, 1990; Becker, 1964) and social capital (Bourdieu, 1986; Coleman, 1988). The European Union (EU) lags behind other main R&D performers, such as the US and Japan, in terms of its R&D intensity and its share of researchers (FTE) in the total labour force[4], and mobility is seen as a tool to help fill such gap.

Whilst the benefits of research mobility at the systemic level are clear, its causes and implications at the individual level are more ambiguous. On the one hand, researchers exploit mobility to get access to the best scientific equipment and teams (Martin-Rovert, 2003; Pellens, 2013) and to improve their career prospects, either abroad or in their home countries (Ackers, 2005). Transparent and meritocratic recruitment processes with clear progression systems based on objective evaluation procedures encourage job-mobility (Ackers, 2001; Van de Sande et al., 2005; Sockanathan, 2004 and Fernandez-Zubieta and van Bavel, 2011). Despite these clear motivations, mobility could also reflect the lack of job opportunities for researchers at home (Ehrengerg, 2003; Gaughan and Robin, 2004) and the increase of employment insecurity in the academic working life (Bryson, 2004; Stephan, 2005; Cruz-Castro and Sanz-Menendez, 2005; Smith-Doerr, 2006).

It is thus important to dig further into what drives mobility decisions. The literature on the topic is relatively recent and sparse, therefore we need to resort to other types of migration studies. In general, it is found that those who choose to move are more motivated by professional reasons, whereas those who prefer not to move are driven by personal reasons (EC, 2010c; Ivancheva and Gourova, 2011; Cox, 2008). At the same time motivations appear to be different for men and women and have an important role in students' occupational choices (Graziano et al., 2012) and achievement (Ackerman et al., 2001). The role of family appears to be crucial in the career choices

---

[4] In 2008, the RandD intensity of the European Union (EU-27) was 1.9%, compared to 2.8% in the United States and 3.4% in Japan. In 2008, the share of researchers in the labour force was six per thousand in Europe (EU27), nine per thousand in the US and eleven per thousand in Japan (EC, 2011). It is estimated that the EU will need to create at least 1 million new research jobs in order to reach an RandD intensity of 3 % (EC, 2011).

of a female researcher even though male academics are more likely to have children (Ackers, 2004; Backer and Mocks, 1998). Women's decisions towards mobility are not only related to professional considerations, but are usually related to family considerations (Gonzalez and Verges, 2012). In addition, evidence suggests that international mobility does not necessarily help the promotion prospects of female researchers (Ackers, 2004, 2005 and 2008), as women's career progress is more likely to be slow, non-linear and often interrupted (Haines and Saba, 1999; Hardill, 2004; Lyon and Woodward, 2004; Valenduc at al., 2004; Saltford, 2005). As argued by Nauck and Settles (2001) and Kofman (2004), who cover migration from a different perspective, the decision to migrate is not necessarily a direct response to labour market opportunities, nor is it the product of individual decision making. Rather, it is closely related to, among others, the family-life cycle.

In light of the literature reviewed above, this paper aims at giving a snapshot of the motivation of mobile researchers. Given the importance of gender and family (i.e. the existence of dependents) in determining both mobility and motivation, both aspects are taken into account. As these issues have not been studied extensively in a European context, the paper can only be exploratory and shed light on whether the issues at stake deserve further scholarly and policy attention.

Data Collection: The SIM-ReC Project

We used an original dataset produced by the SIM-ReC Project. This project[5], which was run by JRC-IPTS, in collaboration with NIFU (Norway), Logotech (Greece) and the University of Athens, collected data through an online questionnaire targeting experienced researchers currently working in European universities. In particular, the questionnaire was sent to researchers with at least five years of post-doctoral professional experience and/or a tenured position. By targeting established professionals, we were able to evaluate the middle-to-long term impact of mobility.

SIM-ReC focused on ten European countries: Belgium, France, Germany, Italy, the Netherlands, Poland, Spain, Sweden, Switzerland and the UK. Its aim was to achieve a quasi-representative sample of researchers working in those countries in order to draw conclusions on the role of mobility by comparing those who never moved to those who did.

In the absence of a population frame for researchers, the data collection was based on a two-stage

---

[5] The SIM-ReC Project was developed under the ERAWATCH contract (http://erawatch.jrc.ec.europa.eu/) and it ran from October 2011 to July 2012.

stratified cluster sampling[6]. The two stratification variables were:

a) Country of current position (ten levels, one for each country included in the study)

b) Field of science of the department of work (three levels: physical sciences & engineering, life & health sciences, and social sciences & humanities).

The clusters are thus represented by departments, that is, a cluster will be "Department of University X in Country Y and Field of Science Z".

The departments were selected in the first stage of sampling whilst individual researchers within them were identified in the second stage. The sizes of the clusters were assumed unknown, since such information is unavailable in a large subgroup of the countries.

The questionnaire was designed to gather information on various aspects of career development, including the perceived role of mobility. In particular the SIM-ReC questionnaire contained 28 macro-questions[7]:

- Basic information (age, academic background, nationality etc.).
- Overview of career (duration of employment, location, economic treatment, title, teaching load, degree of independence in setting up a research agenda, etc.). The same set of questions is asked for (at most) the last five positions.
- Self-assessment of motivation and drivers of each career move, focusing on six different motivational domains (salary, job-security, personal reasons, career development, research development, country of preference).
- Scientific production (publications and inventions)

The response rate of the survey was of 17.6%, for a total of 6,077 observations[8]

---

[6] In cluster sampling the population members are divided into clusters and the sampling process involves sampling the clusters (and not the population members), and then selecting all members within each sampled cluster (single stage clustering) or a sub-sample of members from each cluster (two stage clustering).

[7] Some of the 28 questions were divided in several sub-questions.

[8] Due to missing information in key variables, not all the observations could be used for the present analysis. The pool of observations for our analysis is 2,345.

A Taxonomy of International Job-Mobility of Researchers

To explore our topic we developed a tripartite taxonomy of researchers' international mobility. The taxonomy, based on the SIM-ReC dataset, was inspired by Marinelli (2012) and Marinelli et al. (2012) and classifies researchers as either "stayers", "returners" or "migrants".

It is important to note that our starting point to define the different migratory choices is the country where the PhD was obtained, rather than the country of nationality or the country of first degree. There are two reasons behind this choice: first, we want to focus on job-mobility and, in research, professional life is assumed to start once the doctorate is awarded; secondly, migration occurrences before the PhD would fall in the category of student-mobility which, as shown by Ackers (2004) and Fernandez-Zubieta (2009), has different dynamics[9].

By comparing the country of current and previous employment, as well as the country of PhD award (all provided in the SIM-ReC survey), we can define our categories as follows:

- "Stayers". Researchers are considered "stayers" if they have always worked in the country where they received their PhD.
  For example, a German researcher who received a PhD in Munich and has always worked in Germany would fall in this category, as would a Spanish researcher who obtained his/her PhD in London and worked in the UK ever since. A dummy variable indicating if the research is foreign educated or not allowed us to control for the effect of educational mobility.
- "Returners". Researchers are classified as "returners" if they have held at least one position abroad (i.e. in a country different to where the PhD was awarded) and their current position is in the country where they received their doctorate.
  A German researcher who received a PhD in London, subsequently held a position in Germany, and currently works in the UK would be classified as returner. Similarly, a Spanish researcher who received a PhD in Spain, held a position in The Netherlands, and now works in Spain would fall in this category. A dummy variable indicating if the research is foreign-born or not allowed us to control for the effect of being a foreign born.
- "Migrants" are those researchers that are currently working in a country different from the one in which they obtained their PhD.
  For instance, a Belgian researcher who obtained a PhD in The Netherlands and afterwards

---

[9] See also ESF (2013) for different types of mobility.

landed a position in London would fall in this category.

Methodology

To carry out our exploratory analysis we pursued three steps. In the first step we provided a description of our sample based on gender and mobility categories. In the second step we analysed, through descriptive statistics, the patterns of career motivation across six different domains, job-mobility, gender and parental status (all defined in more detail in Box 1 below). In particular, we provided an analysis of frequencies, complemented by chi-square and Kruskal Wallis tests, as well as other non-parametric tests. The chi-square allows performing a test of independence to assess whether paired observations on two variables are independent from each other. The Kruskal Wallis test is a non-parametric method that performs one-way analysis of variance. It helps determine if more than two samples originate from the same distribution. It is a non-parametric version of ANOVA and tests whether the mean ranks of samples from different populations are the same.

In the third step we ran a set of ordered logit (Greene, 2003) models (one per each domain of motivation) to corroborate our findings. Ordered logit are suited for dependent variables that have more than two categories expressed in sequential order, as is the case for our motivation variable (see box 1). In this step, career motivation was our dependent variable and we had mobility, gender and parental status as our independent variables. We also applied, as controls, partnership status, age and country fixed-effects. The latter, which have been shown to affect international mobility[10], allowed us to better isolate our variables of interest. As we had six motivational dimensions we ran six different regressions. Our six models were all specified in the same way to explore how the same characteristics affect different domains of motivation. The analysis was performed with the software STATA and the following text-box describes how our key variables were operationalised.

---

[10] In particular Auriol (2010) has highlighted the impact of age and partnership, Mouguerou (2006) and Guellec and Cervantes (2002) that of scientific productivity and Gaughan and Robin 2004 that of country effects.

Box 1: Variable Description

Dependent Variable:

Motivation: The SIM-ReC survey asked its respondents to rate the importance of several factors in shaping their latest career choice. Specifically, the following motivational domains were explored:

- salary
- job-security
- personal reasons
- career development
- research development
- country of preference

The responses are expressed in a 5-level Likert scale going from unimportant, to not very important, indifferent, important and highly important.

Explanatory Variables:

Mobility Category: the aforementioned tripartite categorical variable comprising stayers, returners and migrants
Gender: a dummy variable accounting for the gender of the researcher
Parental Status: a dummy variable capturing whether the researcher has children of schooling age.
Gender and Parental Status: a four level categorical variable combining the above two and distinguishing between: males with children, males without children, females with children, females without children.

Control Variables:

Age: the age of the researcher in 2012
Scientific Productivity: continuous variable calculated as the average per year of career of the self-declared number of ISI publication. The variable is included to control for other individual characteristics that may influence motivation, such as, ability.
Country Fixed-Effects

Results

Step 1: A Description of the Sample

As shown in table 1, over half of our sample (53.5%) is composed by stayers. Migrants are just over a quarter (25.7%) and the remaining 20.8% are returners.

Table 1: Mobility Categories

MOBILITY	Freq.	%
Stayers	1530	53.5
Returners	593	20.8
Migrants	735	25.7
Total	2858	100

Table 2 reports the distribution of frequencies of researchers by gender and mobility categories. Females represent 35.7% of the *stayers*, followed by *migrants* (30.6%) and *returners (*24.8%). A chi-square test shows that there is a statistically significant relationship between gender and mobility (X^2 (2) =21.10 p<0.01) indicating that the two are not independently distributed[11].

Table 2: Gender and Job Mobility

	JOB MOBILITY		
GENDER	Stayers	Returners	Migrants
Male	830.0	392.0	450.0
%	64.3	75.2	69.4
Female	460.0	129.0	198.0
%	35.7	24.8	30.6
Total	1290.0	521.0	648.0
%	100	100	100

Table 3 below reports the contingency table between mobility and parental status. Interestingly, in each mobility category the proportion of those with and without children is similar, as confirmed by a non-significant chi2 (X^2 (2) =0.6346 p=0.728).

Table 3: Parental Status and Job Mobility

	JOB MOBILITY

---

[11] In table A.1 in the appendix we look at the patterns of educational mobility by gender. The results are in line with previous literature (Ackers, 1998 and 2004; Teichler and Maiworm, 1997; Jallade and Gordon, 1997) and show that female researchers are equally or more mobile than men when they are young, yet their mobility decreases after obtaining a PhD.

PARENTAL STATUS	Stayers	Returners	Migrants
No Children	660	258	324
%	51.2	49.3	50.0
Children	628	265	324
%	48.8	50.7	50.0
Total	628	523	648
%	100.0	100.0	100.0

Remarkably, the unreported contingency table of parental status and gender in relation to mobility shows again a significant chi^2, suggesting that children affect mobility choices more for female than for male researchers.

Step 2: Descriptive Statistics on Motivation, Mobility, Gender and Parental Status

Table 4 reports the proportion of researchers (by mobility category) who rated each of the six domains of motivation as either highly important or unimportant. The table indicates that migrants are more motivated than the rest by economic reasons: 15.1% declared to be highly motivated by salary as compared to 8.4% of stayers and 9.2% of returners.

Security is most important for returners, with 41.7% of them rating it as very important. Personal reasons are more relevant for migrants (36.2% rate them as highly important) and least relevant for returners (5.8% rate them as unimportant). As for career progression, returners are the group with both the highest percentage of people considering it highly important and unimportant (50% and 10.1%), followed by migrants (45% and 9.3%) and stayers (40.2% and 6.9%). Pursuing a specific research agenda is most relevant for returners (53.5% of them rate it as highly important). The proportion of those rating it as unimportant is similar across mobility categories, though it is lowest for migrants (1.5% vs. 1.9%). Finally, migrants are especially motivated by a desire to live in a given country. Only 21.4% said that country was not important (as compared to 30.1% for stayers and 36.5% for returners), whilst 16.0% said it was highly important (as compared to 6.8% for returners and 7.4% for stayers).

Table 4: Motivation by Job Mobility Category

	Stayers %	Returners %	Migrants %
Salary- Unimportant	7.0	8.1	5.7
Salary- Highly important	8.4	9.2	15.1
Security-Unimportant	3.6	4.3	6.2
Security-Highly important	32.8	41.7	37.2
Personal-Unimportant	4.8	5.8	5.3
Personal-Highly important	33.7	29.9	36.2
Career-Unimportant	6.9	10.1	9.3
Career-Highly important	40.2	50	45.0
Research-Unimportant	1.9	1.9	1.5
Research-Highly important	46.8	53.5	50.3
Country-Unimportant	30.1	36.5	21.4
Country-Highly important	7.4	6.8	16.0

Table 5 gives an overview of how gender and parenthood affect motivation. We look at the proportion of researchers that rated each domain either important or very important.

Male researchers with children are the largest group in the sample (35.2% of the sample), followed by male researchers without children (32.8%), female researchers without children 17.8% and female researchers with children (14.3%).

Male researchers with children are most frequently motivated by salary (62.8%), followed by females with children (59.9%), males without children (57.4%) and females without children (55.0%). Females with children, on the other hand, are the most motivated by security (88.9%), followed, unsurprisingly, by males with children (85.6%), females without children and males without children (83.4% and 78.5% respectively). A similar trend emerges with respect to personal motivations, with 83.8% of females with children rating it as important or highly important. Career progression is also important mostly to females with children (87.2%), followed by females without children (82.6%), males with children (81.5%) and males without children (76.4%). The four groups rate research development as a motivation in a fairly similar way: 91.4% of males with children and females without children consider it important, as compared to 90.2% of males without children and 89.8% of females with children. Country preferences are also fairly similar across the four groups, with females without children being the largest group rating it as important or highly important (92.2%) and females with children being the smallest (87.1%).

Table 5: Motivation by gender and parental status

Gender and Parental status	Percent sample	Important and Highly important					
		Salary %	Security %	Personal %	Career %	Research %	Country %
Male no child	32.8	57.4	78.5	72.6	76.4	90.2	89.6
Male child	35.2	62.8	85.6	80.3	81.5	91.4	90.7
Female no child	17.8	55.0	83.4	74.1	82.6	91.4	92.2
Female child	14.3	59.9	88.9	83.8	87.2	89.8	87.1
Total	100						

These descriptive statistics confirm that geographical job-mobility, gender and parental status influence motivation in distinctive ways encouraging further investigation.

Table 6 shows the distribution of motivations by gender and geographical job mobility. It includes the number of observations (N) and mean rank values and the percentage of researchers that consider the different motivations as important or very important (%) by gender and mobility type. We use the Kruskal-Wallis test to check if mean ranks are significantly different across different mobility types (the penultimate row shows significance levels) and pairwise comparisons to check group differences between returners and stayers (the fifth row indicates significance levels) and migrants and stayers (the eighth row shows significance levels). Males and females similarly rank their salary preferences across mobility types. Male and female migrants give more importance to salary, followed by stayers and returners; however, the differences of the degree of importance of salary across geographical job mobility types are only significant for women (Kruskal-Wallis, X^2=11.638, p<0.01). These differences indicate that female returners are less motivated by salary (34.6% of the female returners consider that salary is important or very important followed by female stayers (50.5%) and female migrants (52.2%)). Pairwise comparisons show significant differences between female returners when compared to female stayers[12]. This could indicate that female returners are willing or in need to give up a higher salary to come back to their home countries.

Female and male researchers also similarly rank the importance of security motivations across mobility types. Nevertheless, in this case, stayers showed the highest mean ranks, followed by

---

[12] As our main aim is checking the difference of stayers and job mobile (returner and migrants), we only check the significance of the differences of job mobile against non-mobile researchers.

migrants and returners. It also appears that security is more important for women than for men. A total of 76% of female stayers consider security as important or very important followed by female migrants (66.2%) and female returners (60.5%). Men show much lower percentages across job mobility types when considering the importance of mobility (71.7%, 58% and 48.2%, respectively). Differences in the degree of importance of security by type of mobility are significant for females and males (respectively, X^2=9.309, p<0.01 and X^2=37.68, p<0.01). Pairwise comparisons show that the differences are significant for mobile male and female researchers when compared to male and female stayers. The level of significance is lower when comparing female mobility groups.

Male and female researchers also ranked their personal motivations across mobility types in the same order. Female and male stayers give more importance to personal reasons, followed by migrants and returnees. It also appears that female personal motivations change more than those of men's across mobility types. 77.4% of female stayers recognise that personal reasons were important or very important, followed by female migrants (70.9%) and female returners (61.3%). The same percentages for men are more similar across mobility types (76.9%, 70.7% and 67.9%, respectively). Differences in the degree of importance of personal motivations by type of mobility are significant for females and males (respectively, X^2=7.938, p<0.05 and X^2=6.246, p<0.05). Pairwise comparisons show that the differences are significant for mobile male researchers when compared to male stayers. In the case of women, pairwise comparisons are only significant for female returners when compared to female stayers.

The order of importance for career development motivations does not change across gender. Males and females rank their career development reasons across geographical job mobility types in the same order, with stayers showing the highest ranks followed by migrants and returners. Again, female researchers appear to give more importance to career development issues. A total of 78% of female stayers think that career development reasons are important or very important, followed by female migrants (63.7%) and female returners (58.67%). Men show lower percentages (73.6%, 59.1% and 47.4%, respectively). Differences of the degree of importance of career development reasons by type of mobility are significant for females and males (respectively, X^2=16.74, p<0.01 and X^2=52.681, p<0.01). Pairwise comparisons show that the differences between migrants and returners are significantly different when compared to stayers for men and women.

The distribution of frequencies for research preferences across mobility types by gender shows interesting results. Male and female researchers rank differently their research preferences across mobility types. Male migrants show the highest rank, followed by male stayers and male returners,

while female stayers show the highest rank, followed by returners and migrants. Nevertheless, these differences are only significant for men (X^2 (2)=7.082, p<0.05).

It is also interesting to see that males and females rank differently the degree of importance of country preferences by mobility types. Female returners show the highest rank followed by migrants and stayers, while male migrants show the highest rank followed by returners and stayers. The differences in mobility type are significant for women and men (respectively, X^2 (2)=14.381, p<0.01, X^2 (2)=14.381, p<0.01). Pairwise comparisons show that the differences of returners and migrants when compared with stayers are significant for men and for women. It appears that male researchers give more importance to where to go while female researchers give more importance to where to return.

Table 6: Motivation by Type of Job Mobility and Gender

		Salary Male	Salary Female		Security Male	Security Female		Personal Reasons Male	Personal Reasons Female		Career Development Male	Career Development Female		Research Preferences Male	Research Preferences Female		Country Preferences Male	Country Preferences Female	
Stayers (c)	N	684	384		683	383		683	381		674	377		682	383		679	379	
	Mean Rank	583.17	301.76		625.41	309.8		598.84	305.21		625.77	310.59		578.87	303.81		550.3	276.12	
	%	49.4	50.5		71.7	76.0		76.9	77.4		73.6	78.0		84.8	86.7		33.7	33.0	
Returners	N	188	78		191	76		193	75		192	75		191	75		183	74	
	Mean Rank	549.17	246.87 ***		497.15 ***	262.99 **		551.88 **	260.48 **		469.62 ***	256.29 ***		554.83	292.14		597.81 **	333.5 ***	
	%	42.6	34.6		48.2	60.5		67.9	61.3		47.4	58.7		80.1	81.3		36.6	43.2	
Migrants	N	290	136		293	136		290	134		291	135		289	136		292	135	
	Mean Rank	598.53	323.32		544.09 ***	284.35 **		568.42 **	287.49		542.83 ***	268.63 ***		605.32	282.7		628.02 ***	324.72 ***	
	%	49.7	52.2		58.0	66.2		70.7	70.9		59.1	63.7		89.3	79.4		39.0	46.7	
N		1162	598		1167	595		1166	590		1157	587		1162	594		1154	588	
	Chi-squared	2.943	11.638 ***		37.68 ***	9.309 ***		6.246 **	7.938 **		52.681 ***	16.74 ***		7.082 **	4.014		13.52 ***	14.381 ***	
	%	48.4	48.8		64.4	71.8		73.8	73.9		65.6	72.2		85.1	84.3		35.5	37.4	

*** p<0.01, ** p<0.05, * p<0.1.

Step 3: Ordered Logit Regressions

Table 7 below presents additional results on motivational variables. We use ordered logit models to check the consistency of our findings, including mobility, and the combination between parental status and gender as explanatory variables and the aforementioned controls.

Table 6: Ordered Logit Models

	Salary	Security	Personal Reasons	Career Development	Research Preferences	Country Preferences
Returner	-0.0985	0.289***	-0.124	0.220**	0.208*	-0.0928
	(-0.97)	(2.77)	(-1.22)	(2.08)	(1.93)	(-0.92)
Migrants	0.345***	-0.0719	0.0941	-0.0642	0.143	0.859***
	(3.49)	(-0.72)	(0.96)	(-0.64)	(1.41)	(8.89)

Male_child	0.319***	0.253**	0.192*	-0.00777	-0.0467	0.00116
	(3.20)	(2.50)	(1.94)	(-0.08)	(-0.45)	(0.01)
Female_no_child	-0.0523	0.104	0.130	0.223*	0.171	0.354***
	(-0.45)	(0.87)	(1.12)	(1.87)	(1.40)	(3.10)
Female_child	0.252**	0.461***	0.497***	0.264**	-0.0976	0.0527
	(1.97)	(3.53)	(3.84)	(2.00)	(-0.73)	(0.43)
Single	0.0193	-0.0457	-0.422***	-0.211*	-0.133	0.0334
	(0.18)	(-0.41)	(-3.90)	(-1.91)	(-1.18)	(0.31)
Age	0.00502	-0.0148***	0.00693	-0.0421***	0.0187***	0.00622
	(1.12)	(-3.21)	(1.55)	(-9.10)	(3.95)	(1.43)
Scientific Prod	0.0352*	-0.0155	-0.00181	-0.0151	0.0932***	-0.0316*
	(1.66)	(-0.72)	(-0.09)	(-0.69)	(4.17)	(-1.74)
France	-0.952***	-0.456***	-0.134	-0.137	0.579***	1.047***
	(-6.75)	(-3.07)	(-0.93)	(-0.92)	(3.79)	(7.38)
Germany	-0.155	-0.474***	-0.380**	-0.102	0.109	0.210
	(-0.90)	(-2.71)	(-2.26)	(-0.58)	(0.61)	(1.23)
Italy	-0.337***	-0.671***	0.580***	-0.0209	0.586***	1.562***
	(-2.75)	(-5.44)	(4.78)	(-0.17)	(4.62)	(12.93)
Netherlands	-0.647***	-1.091***	0.195	-0.445***	0.140	0.402**
	(-3.98)	(-6.53)	(1.21)	(-2.74)	(0.83)	(2.56)
Belgium	-0.440*	-0.162	-0.276	0.209	0.151	0.163
	(-1.87)	(-0.64)	(-1.12)	(0.83)	(0.61)	(0.68)
Spain	0.134	-0.290*	0.596***	0.163	0.0495	1.130***
	(0.84)	(-1.81)	(3.84)	(1.01)	(0.31)	(7.45)
Sweden	0.197	0.189	0.0318	0.138	-0.183	0.217
	(1.12)	(1.05)	(0.18)	(0.79)	(-0.99)	(1.28)
Switzerland	0.198	-0.394*	0.429**	0.000181	0.170	0.176
	(0.95)	(-1.95)	(2.22)	(0.00)	(0.84)	(0.92)
Poland	-0.226	-0.994***	0.0268	-0.673**	0.0977	1.033***
	(-0.79)	(-3.48)	(0.09)	(-2.48)	(0.33)	(3.85)
cut1	-2.423***	-4.177***	-2.423***	-4.557***	-2.839***	0.175
	(-9.11)	(-14.75)	(-9.08)	(-16.26)	(-9.25)	(0.70)
cut2	-0.959***	-3.277***	-1.576***	-4.154***	-1.910***	0.867***
	(-3.72)	(-12.03)	(-6.10)	(-15.03)	(-6.80)	(3.49)
cut3	-0.145	-2.643***	-0.691***	-3.512***	-1.041***	1.946***
	(-0.56)	(-9.84)	(-2.71)	(-12.90)	(-3.83)	(7.75)
cut4	2.483***	-0.345	1.291***	-1.738***	1.337***	3.558***
	(9.40)	(-1.32)	(5.03)	(-6.58)	(4.94)	(13.70)
N	2342	2345	2340	2319	2336	2316
Pseudo R^2	0.0178	0.0239	0.0167	0.0257	0.0137	0.0389

*** p<0.01, ** p<0.05, * p<0.1

The results in table 7 confirm that mobility affects motivation. Migrants appear as the group most driven by economic treatment as well as country of preference (their coefficient is positive and highly significant in the two models). Returners, on the other hand, are significantly motivated by security, career development and research preferences.

When looking at the combination of gender and parenthood we see that males and females with children are more likely to be motivated by economic treatment (salary), security and personal reasons than the rest (the coefficients for Male_child and Female_child are positive and significant in the first three models). Interestingly, the magnitude of the coefficient for males with children is higher for salary, and lower for security and personal reasons than the one for females with children. This suggests that family roles follow traditional gender-based patterns in the research profession, with males feeling more responsible for the economy of the household and females for its security.

Interestingly, female researchers with and without children are more driven than their peers by career development. This may reflect the fact that they perceive barriers that male colleagues do not. Finally, we see that males and females, with or without children, are similarly motivated by research opportunities (no coefficient is significant), and that females without children are more driven than their peers by country preferences.

Looking at the control variables we see that older researchers are less concerned by security and career progression, but significantly more driven by research considerations, reflecting the fact that they are likely to be more established in their professions. The more productive a researcher is the more he/she values research development in career choices, as well as salary. On the other hand, he/she is less interested in living in a specific country.

The pseudo-R^2 of all the models are fairly low, though the models overall confirm that the relationship between motivation, mobility, gender and parental status is worth exploring further.

Conclusions and Ways Forward

The article has explored the link between international mobility of researchers and career motivation, taking into account gender and family aspects. The study used the SIM-ReC dataset developed at the JRC-IPTS in 2011/2012.

Female and male researchers, across mobility types, similarly rank salary, personal and career development as motivations, but differ when considering research and country preferences.

The results highlight how different mobility patterns reflect different career drivers, with migrants being more likely to be motivated by economic reasons, and returners more driven by the opportunity to pursue specific research agendas or broader career progression goals.

The results also confirm that gender and parenthood matter. Whilst having children shifts priorities towards economics, security and personal aspects, females are more driven by the latter two and men by the former. Interestingly, the study also shows that female researchers are more driven by career progression goals, perhaps because they perceive more obstacles to their development.

All in all this first exploratory study shows that mobility, gender and parenthood are linked to career motivation and encourage further research. The latter, addressing some limitations of this study, should uncover how the three factors interact across time and different career stages. This would provide relevant insight on how to shape policy measures to different segments of the research workforce.

Note

Disclaimer: the views expressed in the paper represent those of the authors and not those of the European Commission

Reference

Ackerman, P.L., Bowen, K.R., Beier, M.E. and Kanfer, R. (2001). Determinants of individual differences and gender differences in knowledge, *Journal of Educational Psychology*, 93, 4, 797-825.

Ackers, H.L. (1998). *Shifting spaces. Women, citizenship and migration within the EU*. Bristol: Policy Press.

Ackers, L. (2001). *The participation of women researches in TMR Programme of the European Commission: An Evaluation*. Brussels: European Commission.

Ackers, L. (2004). Managing work and family life in peripatetic careers: The experiences of mobile women scientists in the European Union, *Women's Studies International Forum*, 27, 3, 189-201.

Ackers, L. (2005). Moving people and knowledge, the mobility of scientists within the European Union, *International Migration*, 43, 99-129.

Ackers, L. (2008). Internationalisation, mobility and metrics: A new form of indirect discrimination?, *Minerva*, 46, 411-435.

Ackers, H.L. and Oliver, E. (2007). From flexicurity to flexsecquality? The impact of the fixed-term contract provisions on employment in science research, *International Studies of Management and Organization*, 37, 1, 53-79.

Auriol, L. (2010). Careers of Doctorate Holders: employment and mobility patterns. OECD Science, *Technolgy and Industry Working Papers*, 4.

Becker, G. S. (1964). *Human capital. A theoretical and empirical analysis, special reference to education*. New York: National Bureau of Economic Research.

BIS Business, Innovation and Skills (2011). *International comparative performance of the UK research base*.

https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/32489/11-p123-international-comparative-performance-uk-research-base-2011.pdf

Bourdieu, P. (1986). The forms of social capital. In. J.G. Richardson, (Ed.) *Handbook of theory and research for the sociology of education*. New York: Greenwood.

Bozeman, B., Dietz, J.S. and Gaughan, M. (2001). Scientific and technical human capital: an alternative approach to R&D evaluation, *International Journal of Technology Management*, 22, 8, 716–740.

Bryson, C. (2004). The Consequences for Women in the Academic Profession of the Widespread Use of Fixed Term Contracts, *Gender, Work and Organization*, 11, 2, 187-206.

Coleman, J.C. (1988). Social capital in the creation human capital, *American Journal of Sociology*, 94, 95–120.

Cox, D. (2008). *Evidence of the main factors inhibiting mobility and career development of researchers*. Rindicate. Final Report to the European Commission, Contract DG-RTD-2005-M-02-01.

Crespi, A.G., Geuna, A., and Nesta, J.J.L. (2007). The mobility of university inventors in Europe, *Journal of Technology Transfer*, 32, 195-215.

Cruz-Castro, L., and Sanz-Menedez, L. (2005). The employment of PhD. in firms: trajectories, mobility and innovation, *Research Evaluation*, 14, 1, 57-69.

Ehrenberg, R.G. (2003). Studying ourselves: The academic labour market, *Journal of Labor Economics*, 21, 2, 267-287.

European Commission (2001). *High-level Expert Group on improving mobility of researchers*. Luxembourg: Publications Office of the European Union.

European Commission (2006). *Mobility of researchers between academia and industry.* Luxembourg: Publications Office of the European Union.

European Commission (2010a). Europe 2020. *A European strategy for smart, sustainable and inclusive growth*. Luxembourg: Publications Office of the European Union.

European Commission (2010b). *Europe 2020 Flagship Initiative Innovation Union*. SEC(2010) 1161. Luxembourg: Publications Office of the European Union.

European Commission (2010c). *MORE. Study on mobility patterns and career paths of EU researchers*. Luxembourg: Publications Office of the European Union.

European Commission (2011). *Innovation Union competitiveness report*. Luxembourg: Publications Office of the European Union.

European Commission (2012a). *Excellence, equality and entrepreneurialism building sustainable research careers in the European Research Area*. Luxembourg: Publications Office of the European Union.

European Commission (2012b). *Communication from the Commission to the European Parliament, the Council, the European Economic and Social Committee and The Committee of the Regions. A Reinforced European Research Area Partnership for Excellence and Growth*. COM(2012) 392 final.

European Commission (2013). *She Figures 2012. Gender in research and innovation*. Luxembourg: Publications Office of the European Union.

European Science Foundation (2013). *New Concepts of Researcher Mobility' Science Policy Briefing*. April.

Fernandez-Zubieta, A. (2009). Recognition and weak ties. Is there a positive effect of postdoctoral positions in academic performance and career development?, *Research Evaluation*, 18, 2, 105-115.

Fernández-Zubieta, A., and van Bavel, R. (2011). *Barriers and bottlenecks to making research careers more attractive and promoting mobility*. Luxembourg: Publications Office of the European Union.

Gagliardi, L. (2013). *Does skilled migration foster innovative performance? Evidence from British local areas*. *CESifo Seminar Series*. Cambridge: the MIT Press.

Gaughan, M., and Robin, S. (2004). National science training policy and early scientific careers in France and the United States, *Research Policy*, 33, 4, 109-122.

Granovetter, M.S. (1985). Economic action and social structure: the problem of embeddedness, *American Journal of Sociology*, 91: 481-510.

Graziano, W.G., Habashi, M.M., Evangelou, D. and Ngmbeki, I. (2012). Are you a "people person," a "thing person," or both?, *Motivation and Emotion*, 36, 4, 465-477.

Greene W. (2003). *Econometric Analysis*. 5th Edition. Upper Saddle River, NJ, Prentice Hall.

Griliches, Z. (1973). *Research expenditures and growth accounting. In B. R. Williams, ed. Science and technology in economic growth*. London: Macmillan, 59–95.

Gonzalez Ramos, A.M. and Verges Bosch, N. (2012). International mobility of women in Science and Technology careers: shaping plans for personal and professional purposes, *Gender Place and Culture*, 10.1080/0966369X.2012.701198.

Guellec, D. and Cervantes, M. (2002). "International mobility of highly skilled workers: from statistical analysis to policy formulation". In OECD, *Internatinal mobility of the highly skilled*. Paris: OECD, 71-98.

Haines, V. Y. and Saba, T. (1999). International mobility policies and practices: are there gender differences in importance ratings?, *Career Development International*, 4, 4, 206-211.

HESA(2007). *Higher Education Statistics Agency.* www.hesa.ac.uk.

Hardill, I. (2004). Transnational living and moving experiences: intensified mobility and dual-career households, *Population, Space and Place*, 10, 5, 375-389.

Ivancheva, L. and Gourova, E. (2011). Challenges for career and mobility of researchers in Europe, *Science and Public Policy*, 38, 3, 185-198.

Jallade, J. and Gordon, J. (1997). *Student mobility within the European Union: A statistical snalysis*, report for DGXXII of the European Commission.

Kofman, E. (2004). Family-related migration: a critical review of European studies, *Journal of Ethnic and Migration Studies*, 30, 2, 243–262.

Lyon, D. and Woodward, A.E. (2004). Gender and time at the top: cultural construction of time in high-level careers and homes, *European Journal of Women's Studies*, 11, 2, 205-221.

Marinelli, E. (2012). Sub-national Graduate Mobility and Knowledge Flows: An Exploratory Analysis of Onward- and Return-Migrants in Italy, *Regional Studies*, 10.1080/00343404.2012.709608.

Marinelli, E., Fernandez-Zubieta, A. and Elena, S. (2012). *International Mobility and Career Consolidation of European Researchers*. Paper presented at CESifo Venice Summer Institute 2012 Workshop on Cross-Border Mobility of Students and Researchers: Financing and Implications for Economic Efficiency and Growth.

Martin-Rovet, D. (2003). *Opportunites for outstanding young scientists in Europe to create an independent research team*. Strasbourg: European Science Foundation.

Moguerou, P. (2006). *The brain drain of PhD.s from Europe to the United States: what we know and what we would like to know*. EUI Working Paper 2006/11, 1-42.

Moguerou, P., and Di Pietrogiacomo, P. (2008). *Stock, career and mobility of researchers in the EU*. Luxembourg: Office for Official Publications of the European Communities.

National Science Board (2008). *Science and Engineering Indicators 2008*. Arlington, VA: National Science Foundation.

Nauck, B. and Settles, B. (2001). Immigrant and ethnic minority families: an introduction, *Journal of Comparative Family Studies*, 32, 4, 461–3.

OECD (2003). *The international mobility of researchers: recent trends and policy initiatives*. Paris: OECD.

Pellens, M. (2013). *The motivations of scientists and drivers of international mobility*. CESifo Seminar Series. Cambridge: the MIT Press.

Polanyi, M. (1967). *The Tacit Dimension*. New York: Anchor Books.

Schultz, T. (1990). *Restoring economic equilibrium: human capital in the modernizing economy*. Oxford: Backwell.

Smith-Doerr. L. (2006). Stuck in the middle: doctoral education ranking and career outcomes for

life scientists, *Bulletin of Science, Technology and Society*, 26, 3, 243-255.

Sockanathan, A. (2004). *Conceptualising and rewarding excellence in the UK: the role of research assessment*. CSLPE Research Report 2004-17, University of Leeds.

Saltford, H. (2005). Parenting, Care and Mobility in the EU: Issues facing migrant scientists, *Innovation*, 18, 3, 361-180

Stephan, P. (2005). *Job market effects on scientific productivity*. Paper presented at the Conference the future of science. Venice, September.

Teichler, U. and Maiworm, F. (1997). *The ERASMUS Experience. Major findings of the ERASMUS Evaluation Research Project*. Brussels: CEC.

Valenduc, G., Vendramin, P., Guffens, C., Ponzellini, A.M., Lebano, A., D'Ouville, L., Collet, Wagner, I., Birbaumer, A., Tolar, T., and Webster, J. (2004). *Wideninz women's work in Information and Communication Technology*, Synthesis report of the European project www-ICT, IST-2001-34520, European Commission -Fondation Travail, Université ASBL, Work and Technology Research Centre.

Van de Sande, D. (2005). *Impact assessment of the Marie Curie Fellowships under the 4th and 5th Framework Programmes of Research and Technological development of the EU (1994-2002)*. Brussels: European Commission.