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MOBILITY INTENTIONS OF FOREIGN RESEARCHERS: THE ROLE OF NON-ECONOMIC MOTIVATIONS

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Abstract

Recent contributions suggest that non-economic factors could be important motivational drivers of scientific mobility. We investigate this hypothesis in a sample of foreign researchers in Italy and Portugal, examining their willingness to leave the host country. We distinguish between economic factors, non-economic relational factors and non-economic aspirational factors. Controlling for the relevant contextual variables, we find that foreign researchers, unsatisfied with aspirational factors (e.g., level of independence, autonomy, intellectual challenge, social status), are more likely to leave their host country and move to a third country than they are to return to their countries of origin. Relational and economic factors, such as salary and benefits, do not demonstrate any additional impact.

KEYWORDS

International scientific mobility, brain drain, brain circulation, motivation

1. INTRODUCTION

International mobility of highly skilled workers is a growing phenomenon, with important implications for human resource management, innovation and policy. On the one hand, human capital is recognized as a fundamental driver of innovation in organizations and countries (Becker 1964). On the other hand, mobility is an important means of diffusion and transfer of knowledge, and migration flows are essential to countries for accessing external knowledge and innovation (Singh 2005; Song et al. 2003; Zucker et al. 1998; Ackers 2005a; Miguélez & Moreno 2013). Moreover, there is evidence that foreign-born and foreign-educated scientists contribute significantly to research productivity in host countries (Stephan & Levin 2001; Stephan 2012; Gaulé & Piacentini 2013; Franzoni et al. 2012; Libaers 2007). Therefore, attractiveness to highly skilled workers and, in particular, to researchers has become a crucial aspect of the competitiveness of research and innovation systems (Lundvall 1992; Nelson 1993; Hiltrop 1999; Miguélez & Moreno 2014; Lepori et al. 2014). However, the design of appropriate policies to attract highly skilled workers requires an understanding of the motivations behind the movements of different types of professionals (Massey et al. 1993; Lepori et al. 2014; Pezzoni et al. 2012).

Migration flows of highly skilled workers were significant from Europe to United States in the 1960s and from less developed to more developed countries in the 1970s (Brandi 2001). In subsequent decades, flows have continued to grow in volume, dimension and complexity, adding new trajectories and new destinations (Gaillard & Gaillard 1997). International mobility is increasingly part of a broader phenomenon of globalization of the careers of the highly skilled, involving also the expansion of mass higher education, growth in the number of international students, and increasing international collaborations (Freeman, 2010). A large majority of movements are not permanent and involve more than one destination (Newland 2009). If migrants do not remain in the host country, in some cases, they return to their country of origin, and in others, they move to a third country (Van Bouwel 2010). Some scholars have sought to overcome the dichotomy between temporary and permanent migrations, emphasizing the decision processes of individuals working abroad, which can turn movements that were initially temporary into

permanent movements, and vice versa (Baláz et al. 2004; Khoo et al. 2008). Furthermore, there is increasing evidence of the need to distinguish between different professionals in terms of the characteristics, motivations and consequences of their migratory movements (Salt 1997; Mahroum 2000a). In particular, the phenomenon of scientific mobility deserves special attention, given its relevance to innovation systems and its relevant growth. Among different categories of highly skilled workers, scientists are highly mobile at the international level due to the internationalization of the scientific sector. Researchers frequently move to other countries, often temporarily. In contrast to other highly skilled workers, the researchers and scientists do not appear to respond to purely economic incentives (Merton 1979; Mahoney 1979). Qualitative evidence suggests that the reasons for these movements are more strongly related to specific professional considerations (Thorn & Holm-Nielsen 2008; Salt 1997; Mahroum 2000a).

Despite these research results, policy initiatives have not changed significantly in recent years (Lowell 2002). Political debate is often devoted to the issue of national researchers moving out of their respective countries (Davenport 2004). Furthermore, existing policies mainly focus on economic incentives (e.g., tax credits); that is, they remain linked to the characteristics of mobility in the 1960s and 1970s (Meyer 2003). Some scholars suggest that attention should shift to the general attractiveness of national research systems for domestic as well as foreign researchers, leveraging the particular motivations of these professionals (Ackers 2005a; Meyer 2003; Carr et al. 2005). Previous studies have focused on the motivations behind the initial movements of researchers out of their countries of origin (Golub 2002). Other contributions have analyzed the dynamics of temporary movements on a broad population of skilled workers, focusing mainly on their decisions to permanently remain in their adopted countries (Khoo et al. 2008; Dustmann et al. 1996; Dustmann & Weiss 2007). Some of these studies have concluded that economic factors remain, to a large extent, the motivating factors behind these decisions (Khoo et al. 2008). Iammarino and Marinelli (Iammarino & Marinelli 2011) explore the link between interregional mobility and job satisfaction in a large population of Italian graduates. Previous literature contributions have studied the productivity of researchers abroad and their return (Franzoni et al.

2014; Levin & Stephan 1999; Stephan & Levin 2001; Libaers 2007; Baruffaldi & Landoni 2012). Particular attention has been devoted to traditional destination countries (Pierson & Cotgreave 2000; Finn 2014; Thorn & Holm-Nielsen 2008). In a recent paper, Van Bouwel et al. (2015) show that professional and personal factors as well as previous experiences correlate with the destination choices of European-born mobile researchers.

Less attention has been devoted to the drivers of the mobility of researchers already working abroad, especially as these may relate to different host countries and destinations. In addition, there is still little comprehension of the reasons why certain countries, despite their best efforts, fail to represent a stable destination for mobile researchers. In this work, we move one step in this direction by focusing on the migratory decisions of foreign researchers in two European countries (Italy and Portugal) and analyzing their declared intention to remain or to return to their home countries or to move to third countries. While Italy and Portugal are not counted among the most attractive countries for international researchers, our intention is to provide evidence relevant for these and similar countries that struggle to be attractive for foreign researchers and attempt to consolidate the mobility inflows of those researchers that they are able to attract. For these countries, evidence on the motivations behind the mobility decisions of foreign researchers in similar contexts may be at least complementary to evidence collected from the most attractive ones.

We focus on professional factors and we address the general question of whether non-economic factors, such as independence and level of responsibility, which have been shown to be relevant to the performance of researchers and scientists and their career decisions (Sauer mann & Cohen 2010; Roach & Sauer mann 2010; Azoulay et al. 2011), are also important determinants of their international movements and how these factors compare to economic factors. We examine the satisfaction of researchers in their host countries with respect to a wide range of professional factors, beyond those already explored by the literature on scientists' motivations, including economic, relational and aspirational factors. We analyze the impact of our variables of interest both on the general propensity to leave the host country and on the choice to move back to the

country of origin or to move to a third different country. We build on data and partly on models presented in Baruffaldi and Landoni (2012) that explore the relationship between linkages with the country of origin, the scientific productivity of foreign researchers and their intention to return to the country of origin. We focus on a different research question and we augment the econometric models with additional variables in order to test the new hypotheses presented in this paper. In addition, we look primarily at the propensity to leave the host country and only secondly on the probability of returning to the country of origin.

The paper is organized as follows. We first review the literature on international mobility and the determinants of scientists' motivations for migration. Second, we empirically examine the impact of economic and non-economic factors on scientific migrations, controlling for various factors such as the general characteristics of researchers, the economic conditions of host countries, positions attained by researchers in host countries, researcher productivity levels and the researchers' degree of integration within host countries. We test our hypothesis, using survey data of a population of 452 foreign researchers in Italy and Portugal. Finally, we discuss our results and their policy implications.

2. LITERATURE REVIEW AND RESEARCH HYPOTHESES

Neo-classical economic theory focuses on wages and incomes as motives in individual decision-making and performance. Parallel literature on migration interprets early migration flows of human capital as being based on economic determinants (Borjas 1994) or on political conditions (Iredale 2001). In this perspective, wage differentials across countries or political and social issues, such as discrimination, lead highly skilled workers to leave less productive countries to maximize the returns on their investments in education elsewhere. Indeed, early migration movements were characterized by flows from less developed to more advanced countries. Following in this tradition, despite recent evidence on the specific features of scientific mobility, some scholars argue that researchers are, first of all, individuals with unique social and cultural

backgrounds and characters (Mahoney 1979) and that they leave their home countries out of necessity more than as a professional choice (Morano-Foadi 2005). In addition, there is evidence that “scientific and general migrations converge when driven by the pursuit of basic economic conditions” (Golub 2002). Nonetheless, these models have limited power to explain the consistent and increasing numbers of movements of research professionals among developed countries, the return and circular movements of these professionals and differences across types of professionals.

As a general reaction to theories emphasizing economic motives for individual behavior, the psychological literature began to explore different constructs to account for a broader set of motives. A dichotomy between extrinsic and intrinsic motivations was proposed to account both for the actions compelled by external economic outcomes and the actions justified by the inherent satisfaction that arises from engaging in particular activities. The category of intrinsic motivation allows for the differentiation of professionals according to their peculiar interests and aspirations and explains behavior that cannot be explained only on the basis of economic factors (Sauer mann & Cohen 2010). In line with this concept, some authors attribute the driving motivations behind scientific mobility to the specific nature of the scientific profession and to the specific psychological traits of scientists (Busse & Mansfield 1984; Golub 2002). Others note that geographic mobility has always characterized scientists, functioning as a means of spreading and confronting ideas (Gaillard & Gaillard 1997; Gaillard & Gaillard 1998). From an individual point of view, international mobility is part of professional life, as researchers must improve their professional skills, join international knowledge networks and exchange tacit know-how with colleagues (Mahroum 2000b; Ganguli 2011). Furthermore, it is widely recognized that the reward system in science is based more on reputation and recognition (Stephan 1996; Dasgupta & David 1994; Aghion et al. 2008; Azoulay et al. 2011) than on economic-based incentives.

More recently, it has been noted that the distinction between extrinsic and intrinsic motives can be seen as a continuum of motives rather than as a dichotomy (Ryan & Deci 2000; Sauer mann & Cohen 2010). In addition, some authors argue that the needs of individuals can be framed as a

hierarchy of different typologies of needs. For instance, in Maslow et al. (1970) individuals try to satisfy higher levels of needs only when lower categories, such as basic and material requirements, have been met.

Therefore, researchers may value non-economic objectives when a sufficient level of satisfaction of basic needs has been achieved (Avveduto & Brandi 2004). Others note that economic factors are likely to be most important for migratory movements in a context in which basic economic needs are unmet or career opportunities are lacking (Golub 2002; Richardson & McKenna 2003). On the other hand, many researchers emphasize that there are no fixed hierarchies of needs, as needs are highly contextual and differ across different professions, cultures, age groups, etc. (Wahba & Bridwell 1976).

In this work, we identify and test different motivations of foreign scientists who consider leaving their host countries. Table 1 lists the motivations considered in the empirical analysis both as single factors and as categories. Levels of satisfaction with respect to these variables are measured for a population of foreign researchers, as detailed in Table 2 of the methodology and data section.

-- Insert Table 1 about here --

Based on the literature, we identify thirteen needs or motivations of scientists that we distribute into the two broad categories previously introduced: economic factors and non-economic factors.

Furthermore, given our hypothesis regarding the importance of non-economic factors, we highlight two subcategories of this macro-category: relational factors and aspirational factors. These categories are based on the widely acknowledged distinction between i) the individual self, that is, the identity that enables a person to define himself as unique and independent, with his own characteristics and *aspirations*, and ii) a *relational* or interconnected identity that characterizes a person as a partner in relationships or as a member of social groups (Gaertner et al. 2012; Andersen et al. 2002; Chen et al. 2006; Sedikides & Brewer 2001).

To test the impact of the motivations identified in Table 1, as discussed in section 2.1, we study the intentions of foreign researchers working in two European countries (Italy and Portugal) to leave their host countries. Notably, reasons for mobility decisions are highly contextual (Golub 2002). However, as argued above, our hypothesis is that non-economic aspects of the professional sphere of the highly skilled are a strong, and possibly stronger, motivational factor behind mobility than economic factors, especially once economic needs have been met to a reasonable degree.

Furthermore, as discussed in section 2.2, we expect the two non-economic factors identified to affect the decision regarding the destination countries of researchers wishing to leave their host countries.

2.1 Impact of non-economic factors on the decision to leave the host country

Aspirational factors

Aspirational factors, such as Level of responsibility and Degree of independence, may be seen as having a preeminent role in mobility decisions. Researchers have been shown to be intrinsically motivated by specific aspects of their activities and environments, pursuing independence, responsibilities, prestige and recognition for their work and their roles in society. A certain degree of autonomy and independence allows scientists to explore risky but promising research paths, leading to higher creativity and increased productivity (Azoulay et al. 2011).

Researchers pursuing academic careers are characterized by a “taste for science”; they highly esteem independence, intellectual challenge, academic freedom, peer recognition, etc. (Roach & Sauermann 2010). Furthermore, there is evidence that non-economic incentives often motivate researchers’ career choices more than salary and career opportunities (Sauermann & Cohen 2010; Roach & Sauermann 2010). It has also been shown that researchers in the private sector are inclined to give up part of their salary to obtain a higher degree of freedom and independence, in particular for scientific publications (Sauermann & Cohen 2010; Stern 2004).

Given these considerations we can expect that researchers not satisfied with the level of responsibility, degree of independence, etc. in the host country are more willing to seek these opportunities in other countries.

Thus, we formulate the following hypothesis:

H1a: Low levels of satisfaction with respect to aspirational factors decrease the probability that foreign researchers remain in a host country.

Relational factors

Given our focus on the professional motives of scientists, we emphasize, among relational factors, the importance of networking (Singh 2005; Sala et al. 2011; Wuchty et al. 2007). For scientists, mobility is a tool for reaching culturally diversified environments, broadening international networks and forging relationships (Avveduto & Brandi 2004; Richardson & McKenna 2003). Knowledge networks among researchers, in turn, are a fundamental driver of mobility flows (Ackers 2005b; Mahroum 2000b). In addition, linkages with companies and applied research have been shown to be of interest to many academic researchers and their universities (Thorn & Holm-Nielsen 2008; Van Looy et al. 2011; Libaers 2012).

However, the effect of satisfaction for relational factors on mobility decision can be controversial. On the one hand, given the importance of these relational factors, we can expect that researchers not satisfied with the networks and relationships developed in the host country are more willing to seek these opportunities in other countries. On the other hand, relational factors are less strongly related to country of residence and more closely associated with the ability of researchers to connect with fellow scholars. Even when experience in the host country enables researchers to successfully join relevant networks, it is likely that moving to another country does not undermine these connections once they are established. Indeed, regardless of their working location, researchers have many possibilities for developing and maintaining their research networks through conferences, journal editorial boards, international projects and information and communication technologies. From this perspective, high satisfaction levels with respect to relationships may be less relevant in influencing researchers to remain in countries and in our opinion can even help in finding mobility opportunities.

Thus, we formulate the following hypothesis:

H1b: Low levels of satisfaction with respect to relational factors increase the probability that foreign researchers remain in a host country.

2.2 Impact of non-economic factors on the decision regarding the destination country

We expect the two non-economic factors identified to influence other movement decisions. In particular, they may affect the decision regarding the destination country. Many of the researchers leaving host countries are expected not to return to their countries of origin but to move to third countries (Newland 2009; OECD 2002; Van Bouwel 2010). Therefore, it is of further interest to examine whether levels of satisfaction of different types of professional need are associated with this decision.

Aspirational factors

To the extent that decisions to leave a country (including the home country) are expected to be due to specific professional needs (Morano-Foadi 2005; Mahroum 2000b), one might forecast that return is less likely if these expectations are not met. Researchers who do not attain the desired levels of esteem and recognition may be expected to try to go to other countries to obtain them rather than return to their home countries. In addition, as satisfaction is a subjective assessment, researchers who have achieved significant results may be interested in moving to other countries to attain more esteem and recognition (for instance, working with top scientists or at top universities). Furthermore, as claimed by Morano-Foadi (Morano-Foadi 2005), an “expectation of mobility” is normally present for (especially young) researchers; researchers are frequently requested to gain experience and recognition outside their alma mater and, if possible, abroad, to advance their careers. From this perspective, the new destination will preferably be yet another country, where one may gain greater recognition, and not one’s country of origin.

In line with these considerations, we expect that, among researchers leaving a host country, those unsatisfied with respect to aspirational factors, such as level of responsibility, autonomy and intellectual challenge, will tend to choose to move to a third country.

We summarize our third of hypothesis as follows:

H2a: Low levels of satisfaction with respect to aspirational factors increase the probability that researchers move to a third country rather than return to their country of origin.

Relational factors

The role of relational factors might be again twofold. If researchers are not satisfied with the relationships that they have developed in the host country, they may be more willing to move to a third country to develop such relationships. If they are satisfied with the networks that they have developed, both within the host country and at international level, they may wish to move back to their countries of origin since they may leverage the acquired contacts regardless of their future

destination (Ackers 2005b; Mahroum 2000b). In this sense, as previously noted, relational factors are felt to be more closely related to one's own network development capacities than to the characteristics of the country of residence. However, contacts in the network of researchers satisfied with their professional networks can facilitate the individuation of open positions and stimulate researchers to join colleagues in different countries. In this case, researchers satisfied with relational factors can face a wider set of choices, beyond the possibility to return to the country of origin, leading them to more probably choose a third country as future destination.

We thus summarize our final hypothesis as follows:

H2b: Low levels of satisfaction with respect to relational factors decrease the probability that researchers move to a third country rather than return to their country of origin.

3. METHODOLOGY AND DATA

3.1. Data

To explore our research question and test our hypotheses, we gathered data on a population of foreign researchers working in universities or public research centers in Italy and Portugal between 2006 and 2007. We obtained survey data on 497 foreign researchers in Italy in 2007 and in Portugal in 2006. From these data, we excluded researchers not formally affiliated with local institutions (i.e., visiting professors) and those with missing data for the main variables. The final number of observations used in our analysis is 452: 253 professors, researchers and doctoral students at universities and public research centers in Italy and 199 professors, researchers and doctoral students at universities and public research centers in Portugal.

The phenomenon of international mobility of researchers presents several common characteristics for Italy and Portugal that motivate our interest for these countries. Both countries are sometimes identified as countries that experience outflows of national researchers (Ackers 2005b; Fontes 2007; Pelizon 2002). Several scholars have underlined the need for these countries to increase the

attractiveness for researchers working abroad. Different studies found that the percentage of foreign researchers in Italy is particularly low (Beltrame 2007; Colussi et al. 2009; Franco & Paganelli 2007). OECD data (Dumont 2008) show that the number of foreigners among doctorate holders in Italy was about 4% in 2008. On the contrary, the percentage of foreign researcher in Portugal is relatively high, being about 5% (5% in 2003 with an increase from 2001 higher than the increase of the total population of researchers in the country) (Delicado 2007; Pereira et al. 2007). Both countries have seen an increase in foreign PhD students and researchers, and the consolidation of these trends is considered important for the competitiveness of their national research systems (Beltrame 2007; Colussi et al. 2009; Franco & Paganelli 2007). Nonetheless, stay rates are low and the overall number of foreigners remains limited compared to that of more attractive countries (Auriol 2007). These and similar countries lament competitive economic disadvantages in the research sector. It is thus of interest to understand the motives of foreign researchers in leaving these countries and in particular to what extent these motives may be of a non-economic character. Our analyses are directly relevant for these and similar countries that need to increase their attractiveness.

A questionnaire was sent to foreign researchers in universities and public research centers in Italy and Portugal. The questionnaire was initially designed on the basis of the “Careers of doctorate holders (CDH) project,” developed by UNESCO, the OECD and EUROSTAT (Auriol et al. 2010; Auriol 2007). In Portugal, the survey was conducted, in 2006, as part of the project “*Imigrantes em Portugal, Economia, Sociedade, Pessoas e Territorios*” (Pereira et al. 2007) financed by the Fundação para a Ciência e a Tecnologia (FCT).

The availability of a comprehensive dataset of researchers in the country allowed us to directly send the questionnaire to nearly the entire target population. In October 2007, the survey was extended by the authors to Italy, where it was necessary to contact the hosting institutions to obtain lists of their foreign researchers. The data and complete answers suitable for this study correspond to roughly 18,5% of the target population of foreign researchers at universities and research centers in the two countries, where the percentage was slightly higher in Portugal (19%)

than in Italy (18%). The representativeness of the Portuguese sample has been analyzed, considering the distribution in terms of location, age, gender, country of origin and area of research. The sample largely reflects the distribution of the target population, apart from a slight overrepresentation of researchers coming from South America. For the Italian case, the general characteristics of the sample, at the institutions for which information was available, reflect those of the target population. In particular, the general characteristics of the entire Italian sample are consistent with those of other recent analyses (Avveduto & Brandi 2004; Colussi et al. 2009; Franco & Paganelli 2007).

Through the survey, we collected personal information and relevant data pertaining to professional trajectory, integration into the host country, satisfaction with one's present professional situation, mobility choices (especially regarding future mobility movements), etc. In particular, we analyzed levels of satisfaction with respect to the various categories of professional motivation identified and discussed above. We sought to assess the probability that a scientist will leave one's host country, given reported satisfaction levels. The main variables we used in the analyses are summarized in table 2.

-- Insert Table 2 about here --

An important concern relates with the use of declared intentions to proxy actual mobility. To the extent that individuals may eventually behave differently from what they declare (for instance due to unexpected constraints) the mismatch between the two can be substantial. In order to provide an indication of the correlation between intention and actual move we have collected up to date curriculum information on the mobility of almost half of our sample of researchers – 188 researchers - (unfortunately the other researchers opted for anonymity). We found that 85% of the researchers who indicated the intention to leave permanently were not in the same university in July 2015 and 90% of them were abroad. On the contrary, 78% of researchers who indicated the intention to stay were still in the host country. This result provides some confidence that the analysis on the intentions to leave, for the characteristics of our sample, is meaningful.

3.2.Descriptives

We summarize the main characteristics of the researchers in our sample. The average age was 35 in Italy and 38 in Portugal. The period of stay at the moment of the survey (based on the first year of entry in the host country) was about 6.5 years in Portugal compared to 5.7 years in Italy. Geographic zones of origin are reported in Table 3. The geographic zones most strongly represented are Western and Eastern Europe and South America in both countries, while in Italy there were also a high number of researchers from Asia. In both countries, the research areas mostly represented are natural sciences and engineering, while in Italy, it is high also the number of researchers in the social sciences.

-- Insert Table 3 about here --

Researchers' professional situations in host countries were categorized as follows: PhD student, temporary professor/researcher, or tenured professor/researcher. A higher percentage of doctoral students were found in Italy (49%), most originating from Asia, Eastern Europe and South America. Foreign researchers in a permanent position in Italy were 27% and in a temporary position 24%. In Portugal, the majority of foreign researchers was in temporary positions (49%) or was tenured professors or researchers (34%), against a lower percentage of PhD students (17%).

A large number of researchers in Italy reported moving to Italy to complete their studies (41.7%), while a considerable percentage had moved to the country for personal reasons (38.6%). This result may relate to the large number of PhD students in Italy. The majority of researchers in Portugal declared that they moved out of their country of origin due to personal factors (62.7); other reasons follow: job opportunities (44.5%) and academic factors (47.5%). A relatively limited number of researchers in both countries indicated economic or political reasons (12% in Italy and 19.1% in Portugal).

Especially in light of the research questions we address in this paper, it is interesting to note that more than half (58% among all researchers, 67% among researchers not at the beginning of their career) had already had a professional experience abroad, thus confirming the high level of mobility of these professionals. Furthermore, approximately 45% of researchers in both countries planned to leave (temporarily or permanently). However, researchers who planned to return to their countries of origin at the time of the survey were just 18% of the sample. Interestingly, 55% of the researchers who intended to leave permanently and 71% of the researchers who intended to leave temporarily stated that they would not return to their country of origin. The preferred destination among these researchers was northern Europe and the US (the most cited single country). A large number of researchers in Italy had not yet decided whether to move again or not (39.8%).

4. ANALYSES AND RESULTS

4.1. FACTOR ANALYSIS

In this section, we test our hypotheses, examining the relationship between decisions to leave a host country, the destination country (home country or third country) and levels of satisfaction in the host country with respect to the items discussed above. We first discuss correlations between the satisfaction items to verify that the categories presented are meaningful and to take these correlations into account in the regressions that follow. The correlation matrix (Appendix A1) and an exploratory factor analysis (Appendix A2) show strong correlations among the satisfaction variables. The correlations largely reflect the categories of professional needs discussed above.

Satisfaction on such aspirational items as intellectual challenge, responsibility, independence and contribution to society are highly correlated and determine the first aggregate factor¹ identified in the factor analysis (f_aspirational). Economic factors such as salary, benefits and job security, as

¹ The term “aggregate factor” is used to indicate the factors resulting from the factor analysis to improve their recognition and thus readability throughout the text.

well as (more weakly) working conditions and opportunities of advancement, determine the second aggregate factor (f_economic). Finally, relational items - satisfaction with the level of involvement in international, local and university-industry networks – are highly correlated and compose the third aggregate factor (f_relational).

Working conditions, opportunity for advancement and social status remain more ambiguous and are correlated with both economic factors and aspirational factors. Social status in particular appears to be slightly more highly correlated with economic factors than with aspirational factors, contrary to expectations. In the following analysis, we focus on the effects of satisfaction with respect to the items identified and the control variables on decisions to leave a host country and on decisions to return to one's home country or move to a third country, once the decision to leave has been made.

4.2. REGRESSION RESULTS

Taking into account the correlations among satisfaction items, three different specifications are used in both analyses: in the first specification, only one item per category is considered²; in the second specification, we include averages over all items per category (m_economic, m_relational, m_aspirational); finally, in the third specification, we include the factors obtained from the factor analysis.

In all models in both analyses, we include the control variables specifying key characteristics of the researcher: country of residence (Italy or Portugal), age, gender, period of stay in the host country, geographic zone of origin, GDP per capita of the country of origin, area of research, professional situation and scientific area of research. In alternative specifications (not reported here but available upon request) we tested the robustness of our results to two main concerns

² For robustness purposes, the analysis was performed both keeping these variables as described (on a scale of 1 to 4) and as binary variables equal to 0 for values smaller or equal to 2 and 1 for values larger than 2. The results were similar.

related with the limitations of these control variables, as available in our data. First, we adopted indicators of the attractiveness of the countries of origin alternative to the GDP per capita³, more closely related with the job opportunities of researchers. Second, we verified the robustness of our results to more detailed research areas. Since a lower level classification of research areas was not available in our data, we made use of other variables⁴ to construct a new set of controls corresponding to a total of 10 different categories (Appendix A3 reports descriptive statistics on these categories). Results adopting these alternative controls were equivalent to those presented.

To control for the potential selection of researchers, in either Italy or Portugal, with specific needs or preferences, we include as controls the reason(s) the subjects indicate for moving to the host country. Additional important controls, as they may be correlated with levels of satisfaction among the various satisfaction items and as they might also affect propensities to move and decisions about where to move, are proficiency in the language of the host country and the productivity and quality of the researcher, where the latter is measured as the number of papers published per year during the researcher's stay in the host country. Finally, we include judgments of the researchers with respect to various political issues that are expected to affect their integration into the host country and their opportunities to remain: policies of the host institution, national research policies and immigration policies.

We first examine the report results regarding intentions to leave the host country (Table 4). For each specification, both the coefficients (Coef.) and the marginal effects with respect to the probability of not staying in the country of origin (Mfx.) are presented. The dependent variable is treated as an ordinal variable indicating propensity to leave the host country: 1: Stay in the host

³ In alternative to the GDP per capita we considered the Gross domestic expenditure in R&D and the Higher education sector expenditure in R&D by main field of science, both in absolute value and as percentage of GDP (data from the OECD Science and Technology Indicators database: <http://stats.oecd.org>). The use of these data determined a drop in the number of observations due to missing values for several countries. This, in some cases, determined a lower significance of the results. However, overall, the main results presented were robust to the inclusion of these additional control variables.

⁴ We introduced new categories within Natural Science and Engineering (the areas mostly represented in our sample). In particular we distinguished researchers in universities from researchers in public research centers and researchers involved from researchers not involved in collaborations with industry. We have not done the same for other research areas because no or very few researchers in these other areas were affiliated in Public Research Centers or were involved in collaborations with industry.

country; 2: No decision taken; 3: Move out temporarily; 4: Move out permanently⁵. Therefore we apply an ordered probit model with robust standard errors clustered at the level of hosting institution of the researcher. A positive coefficient indicates a propensity to leave increasing in the value of the variable. Marginal effects are calculated for the probability of the outcome “leaving the host country permanently”, allowing for quantification of the magnitude of the effect on the main outcome of interest⁶. As expected, the probability of leaving the country is lower for researchers and professors in tenured positions and decreases with the period of stay in the host country. Interestingly, productivity (Paper_year) is associated to a higher propensity to leave, indicating that more productive researchers tend leave the host countries, Italy and Portugal. This result might be specific to the context of our analysis, in that stronger researchers may be attracted to and selected by more competitive research systems. Nonetheless, it is consistent with other recent evidence on research productivity differentials among mobile researchers abroad and returnees (Franzoni et al. 2014). The variables related to the views about immigration policies and national research policies (jPol_NationalRes; jPol_Immigration) are not significant. It is reasonable to expect that foreign researchers’ decisions regarding whether to stay are not particularly sensitive to research policies at the broad national level, while the non-significance of views about immigration policies is more surprising. We suspect, based on open-ended comments of researchers on the questionnaire, that immigration policies do not show an effect because they represent more of a barrier to enter a country rather than to remain once the researcher is settled in the country. Furthermore, in numerous cases, the researchers interviewed commented that a negative view of immigration policies was due to serious obstacles to leaving

⁵ The survey did not allow distinguishing more precisely the intended period of mobility in case researchers indicated temporary mobility. Similarly, we have little information on the actual intentions of researchers indicating to not having taken a decision yet. Therefore we do not detail further the dependent variable in this direction. In order to address the concern that the ambiguity of these answers drive our results we estimated our models also assigning these two categories either to researchers intending to leave or researcher intending to stay, with similar results. Alternatively, excluding researchers indicating one of these categories from the sample also provides similar results. Finally, we run a logit for each one of the thresholds in the ordered probit regression. Results are consistent with the ones shown but are not always significant for each type of variable and for each dependent variable.

⁶ Similar figures to those discussed would be obtained through an analysis of the marginal effects of decisions regarding whether to leave the home country (both temporarily and permanently).

the host country to make visits abroad. A positive judgment of institution policies (jPol_Institute) is negatively correlated with intentions to leave, although in the analysis presented, it is weakly significant and only in Model 1. This result is, in any case, interesting in light of a series of comments from researchers: a lack of initiative on the part of institutions to facilitate integration of respondents (e.g., language courses, availability of specific information) as well as minimal assistance with respect to bureaucratic procedures were often mentioned when negative judgments of institution policies were expressed. Accordingly, with this qualitative evidence, an F-test on the joint significance of the jPol_institute and the Language variable rejects the null hypothesis at the 10% level in all models.

Consistently with our research hypothesis H1a, we find evidence that higher levels of satisfaction with respect to aspirational factors correspond with a lower propensity to leave. Model 1 shows a significant effect of level of satisfaction with respect to independence, with equivalent results (not reported) obtained for level of responsibility, intellectual challenge, social status and working conditions. A less significant result is obtained for satisfaction with respect to the contribution to society⁷. The results for Model 2 and Model 3⁸ confirm that aspirational factors exert significant effects on motivations to move. The probability of permanently leaving a host country decreases by approximately 8% for a one unit increase in the average level of satisfaction with respect to aspirational objectives (with values ranging from 1 to 4), corresponding to an approximately 4% per unit standard deviation (equal to 0.52) increase above the mean. This result is thus equivalent in magnitude to the result obtained for Model 3 for the corresponding aggregate factor (about a 3.8% per unit standard deviation increase above the mean⁹). Economic factors, by contrast, are

⁷ The inclusion of more than one item per category leads to weak results due to quasi-collinearity among the satisfaction variables. In Model 1 we present the results for the categories that show a higher impact. However, the differences encountered between factors of the same category are only indicative: we do not claim that one factor can be considered more relevant than another factor within the same category since this would require to consider them within the same model. In other words, in Model 1, the factors included are conceptually representative of the entire category to which they belong.

⁸ The decrease in the number of observations is due to very few missing values in the satisfaction variables for each dropped observation, impeding computation of the factor variables. In Model 2, the arithmetic means are computed using the variables available, ignoring missing values and allowing for consideration of the entire sample.

⁹ The standard deviation for the factor variables is fixed to 1.

not significant. We also observe that only non-economic factors categorized as aspirational factors are significant, while relational factors are not significant, a result that does not support our hypothesis H1b.

-- Insert Table 4 about here --

In Table 5, we analyze the decision to stay in the host country relatively to the alternatives to return to the country of origin or to move to a third different country. We model the probability of choosing one of the three alternatives using a multinomial regression model for categorical values, with robust standard errors clustered at the level of hosting institution of the researcher¹⁰. The same control variables and satisfaction variables as above are included. In Table 5 we report the marginal effects on the probability of choosing either to return or to move to a third country, compared to the decision to stay in the host country. For the sake of brevity we do not report the coefficients, which however are also significant and coherent with the results discussed. Most of the results confirm the general conclusions of a similar analysis in Baruffaldi and Landoni (Baruffaldi & Landoni 2012): researchers are more likely to return to their home countries if they are in temporary positions as researchers or professors (and less likely if they are PhD students and tenured professors) and if they are linked with their countries of origin. Compared with the baseline variable (natural science), researchers in engineering and agricultural sciences show a higher propensity to return to their home countries. Similar results relative to the areas of research are found in studies on the stay rates of foreign PhD students in the United States (Finn 2014). Interestingly, productivity appears to have no significant effect on the destinations of researchers. In other words, productivity is mostly correlated with the intention to leave the host country, regardless of the destination. A possible explanation is that productivity increases job opportunities homogeneously abroad, both in third countries and in the country of origin. Return is less likely if researchers have strong knowledge of the language of the host country. This result most likely reflect the fact that researchers well integrated into the host country are less attached

¹⁰ As an alternative to this specification we estimated a probit model, on the subsample of researchers indicating the intention to leave the host country, where the dependent variable indicated the decision to return to the country of origin or move to a third country. Results were equivalent to those here discussed.

to their countries of origin and less constrained with respect to future movements when they decide to leave the host country. We also observe that if one's reasons for moving to the host country relate to better job opportunities (R_To_Job) researchers are less likely to return to their countries of origin.

Finally, in accordance with our hypothesis H2a, satisfaction with respect to aspirational objectives leads to a higher probability of moving to a third country, relatively to the probability of staying in the host country. In parallel, none of the professional satisfaction factors identified affects the probability to return to the country of origin. Altogether (that is, in both Model 2 and Model 3), aspirational motivations decrease the probability of moving to a third country approximately of 16% per unit increase in the average level of satisfaction (with values ranging from 1 to 4), corresponding to an approximately 8% per standard deviation increase above the mean (standard deviation equal to 0.52). The result is quite close in magnitude to that obtained using the corresponding aggregate factor computed by the factor analysis (about a 7% decrease per standard deviation increase above the mean). Again, this finding does not support our hypothesis regarding the effect of relational factors on the choice of destination country (HP2b).

-- Insert Table 5 about here --

In terms of science policy implications a key issue could be whether different motivations relate to the scientific quality of researchers. We tried to verify whether our results differ for researchers with high productivity levels compared to researchers with relatively lower productivity¹¹ (results are not reported but available upon request). The main results relative to the propensity to leave the host country, although generally weaker in both samples in terms of significance, remained identical in terms of sign and comparable in terms of magnitude between the two samples.

¹¹ We first run a quantile regression including country, age, gender, period of stay and research area as regressors of the number of papers per year. Secondly, we distinguished researchers that had a higher or lower productivity compared to the median predicted from the quantile regression model. In this way we identified two balanced groups of researchers with high and low productivity, relatively to other researchers with similar characteristics, at least based on the variables at our disposal. As such, by construction, the two groups have a significantly different productivity (about 2 and 0.18 papers per year, respectively) but almost identical main personal characteristics. We then run our analyses on the two different samples.

Regarding the results on the destination, we found our results unchanged for highly productive researchers. On the contrary, we did not find a significant effect of aspirational factor for the sample of low productive researchers. In addition, we found that economic factors had a weak but significant negative correlation with the probability of returning to the country of origin. This evidence suggests that economic factors may have an impact, in this case, on the choice of the future destination for less productive researchers, and call for the need of further research on the contingent effects of different motivation factors.

5. CONCLUSIONS

In their attempts to manage the migration movements of scientists, policy makers have traditionally focused on economic incentives for such movements, influenced by the rhetoric associated with the departure of skilled and valuable workers (Davenport 2004). Furthermore, they have paid particular attention to permanent and unidirectional migrations, often failing to obtain a broader picture of scientific mobility. A large body of economic and sociological literature, however, now enables us to better understand the complexity of the phenomenon. In our contribution, we seek to determine the motivational factors that drive scientific mobility. While other studies have examined the reasons why mobile researchers leave their countries of origin, none have focused on the motivations for subsequent movements, although it has been observed that such flows are a consistent feature of scientific mobility (Newland 2009). Furthermore, existing literature has primarily focused on the stay rates of foreign researchers in highly attractive countries such as the United States. Our study addresses this issue by examining a population of foreign researchers in Italy and Portugal. The analyses presented show that non-economic factors associated with the specific nature of the research profession can be crucial determinants of mobility decisions. In particular, we have subdivided non-economic factors into aspirational and relational factors and have documented the prevalence of the former in explaining willingness to leave a host country. Moreover, low levels of satisfaction with respect to

aspirational objectives are especially strongly correlated with decisions to move to a third country rather than return to the country of origin. This latter result implies that dissatisfaction with professional aspirational factors within the host country leads to move to a third country rather than to return to the country origin. We expected relational factors to play a role in the mobility decision, but they do not show any particular effect. Our proposed explanation is that, while relational factors may play a role in attraction towards a country, they do not constrain further movements once a personal network is established.

We identify these effects considering important control variables related to the general characteristics of the researcher, the economic conditions of the country of origin, the reasons for the researcher's initial movement, the level of cultural integration in the host country, research productivity and the impact of policy initiatives. Although it is not the focus of our study, it is worth noting that, similar to other recent studies, we find that the most productive researchers appear to move further and show no preference for third countries over their countries of origin.

The context of our analysis limits the generalizability of our conclusions, especially to those countries that successfully attracted foreign researchers in the past decades. Similarly, our study is not intended to be generalized to initial departures from countries where basic economic opportunities are lacking or to unemployed researchers who might move abroad for lack of job opportunities. Nonetheless, we control for several variables and we can affirm that, holding those dimensions constant, the key difference between those who intend to leave their host countries and those who intend to remain is in the level of satisfaction with respect to aspirational factors. Given our use of the control variables, we believe that similar results may well be found in other countries.

Finally, we acknowledge a series of limitations related with the characteristics of the data at our disposal. First, in some cases, aspirational and relational factors are not aspects that scientists value per se, but rather, they are means through which they pursue other objectives, such as future career developments, higher pay, etc. Our measures are subjective indicators of the level of satisfaction of different aspects of the professional life of a scientist. Second, we acknowledge

that the use of declared intentions to proxy mobility constitute a limitation that we are unable to overcome due to the fact that about the half of the researchers in our sample opted to remain anonymous. Third, the adoption of more refined control variables on the specific research fields and on additional determinants of mobility (e.g. personal and family factors) is advisable for future research.

In conclusion, our results provide empirical support for the idea that the key drivers of scientific mobility (including return and temporary movements) are not purely economic. It may be useful for policy makers and organizations seeking to attract skilled scientists at the international level to focus their efforts in this direction. Further research is needed to more precisely assess the impact of different non-economic factors both on the propensity to move and the actual mobility of researchers and in order to extend the analysis to other contexts. The analysis of what determinants are more relevant for different categories of researchers is also a relevant area for further investigations.

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TABLES

Table 1: Scientists professional motivations

Economic factors	- Salary
	- Benefits
	- Job security (Golub, 2002)
	- Opportunities for advancement (Pelizon, 2002; Morano-Foadi 2005)
Non-economic factors	- Access to local knowledge networks (Avveduto and Brandi 2004; Richardson and McKenna 2003)
	- Access to international knowledge networks (Morano-Foadi 2005; Mahroum 2000)
	- University industry links (Thorn and Holm-Nielsen 2008; OECD 2002)
	- Social status (Ackers 2005)
Aspirational factors	- Level of responsibility (Sauer mann and Cohen, 2010; Roach and Sauer mann, 2010)
	- Work conditions (Morano-Foadi, 2005; Avveduto and Brandi, 2004)
	- Degree of independence (Azoulay et al. 2011)
	- Contribution to society (Roach and Sauer mann, 2010)
	- Intellectual challenge (Sauer mann and Cohen, 2010)

Table 2: Variables

Variable	Description	Label(s)	Values
Mobility decision	Ordinal variable that describes the intention of the researchers to: 1 Stay in the host country; 2 No decision taken; 3. Move out temporarily; 4 Leave the host country permanently.	(1 st dependent variable)	The variable is treated as an ordinal, with a value from 1 to 4.
Destination	Categorical variable taking value: 1 if the researcher intends to stay in the host country; 2 if the researcher indicates her country of birth as her future destination country; 3 if the researcher indicates a third different country as destination ¹² .	(2 nd dependent variable)	The variable is treated as a categorical, with a value from 1 to 3.
Country	This variable is equal to 1 for researchers in Italy and 0 for Portugal.	Country	Binary variable = 0, 1
Age	Age of the researcher at the time of the survey	Age	Discrete variable = years
Gender	The variable takes value 1 if the researcher is male	Gender	Binary variable = 0, 1
Period of stay	Period of stay (from the arrival in the host country until the time of the survey)	Period	Discrete variable = years
Origin	Categorical variable that takes into account the geographic zone of origin of researchers among: Western Europe, Eastern Europe, North America, South America, Asia, Africa, Oceania	Origin_EU Origin_EUest Origin_NorthAm Origin_SouthAm Origin_Asia Origin_Africa Origin_Oceania	Mutually exclusive binary variables
GDP per capita	Gross domestic product per capita, corrected for the purchasing power of the country of origin of the researcher (source: International Monetary Fund – IMF - 2006, 2007)	GDP	Dollars
Scientific area	Categorical variable that accounts for the scientific area of work of the researcher: natural science, engineering, health and medical sciences, agriculture, social sciences, humanities.	a_Science a_Engineering a_Health a_Agriculture a_Social a_Humanities	Mutually exclusive binary variables.
Professional situation	Categorical variable that accounts for the professional situation of the researcher in the host country among: PhD student, temporary researcher or professor, tenure researcher or professor.	PrS_PhD PrS_Temp PrS_Tenure	Mutually exclusive binary variables.
Publications per year	Number of papers per year published in refereed journals during the period of stay in the host country. This is self-reported data (the questionnaire was anonymous so it was not possible to obtain publication data from publication databases).	Papers_year	Non-negative continuous variable.
Reason to move	Variables that take into account the reason(s) of researcher moves to the host country: completion of studies, offer or better chance for a higher paid job, academic reasons (access to publishing, work in a specific area, possibility of creating own research team or new research area), personal factors (family, cultural and other non-professional reasons), economic or political factors.	R_To_Studies R_To_job R_To_Academic R_To_Personal R_To_EcoPol	5 binary variables (multiple answers were allowed)
Home linked	This variable has a value of 1 if the researcher declares a link with his/her country of origin.	Home_linked	Binary variable = 0, 1
Knowledge of language	Two variables indicating, respectively, the level of knowledge (from a minimum of 1 – none, to a maximum of 4 – fluent) of the language of the host country before arrival and at the time of the survey.	Language	The variables assume values from 1 to 4.
Policies	The researchers were asked to express their judgment using the ratings 1 (Negative), 2 (Indifferent) and 3 (Positive), regarding various political aspects of their integration into the host country: Policies of the host institution, National research policies, Immigration policy.	jPol_Institute jPol_NationalRes jPol_Immigration	Each variable can assume a value from 1 to 3.
Satisfaction	A series of variables measured on a scale from 1 (not satisfied) to 4 (very satisfied) of satisfaction of the researcher with the following: salary, benefits, job security, working conditions, opportunities of career advancement, intellectual challenge, level of responsibility, degree of independence, contribution to society, social status, involvement in international networks, involvement in local networks, university and industry links.	s_Salary s_Benefits s_JobSec s_Wcond s_Opportunity s_Challenge s_Resp s_Indip s_ContribSociety s_Status s_IntNet s_LocNet s_UniLinks	Each variable can assume a value from 1 to 4.

Table 3: Countries of Origin (percentages)

	Italy	Portugal
Western Europe (Origin_EU)	0.25	0.43
Eastern Europe (Origin_EUest)	0.25	0.16
North America (Origin_NorthAm)	0.04	0.02
South America (Origin_SouthAm)	0.15	0.24
Asia (Origin_Asia)	0.23	0.1
Africa (Origin_Africa)	0.06	0.05
Oceania (Origin_Oceania)	0.01	0

Table 4: Ordered probit on the intention to move out of the host country

	Model 1		Model 2		Model 3	
	Coeff.	Mfx.	Coeff.	Mfx.	Coeff.	Mfx.
Country	0.360** (0.148)	0.104** (0.0424)	0.352** (0.154)	0.102** (0.0439)	0.265* (0.154)	0.0781* (0.0446)
Age	-0.00819 (0.00978)	-0.00242 (0.00289)	-0.00594 (0.00944)	-0.00175 (0.00279)	-0.00537 (0.00970)	-0.00161 (0.00290)
Gender	-0.142 (0.108)	-0.0423 (0.0325)	-0.133 (0.110)	-0.0396 (0.0332)	-0.152 (0.114)	-0.0459 (0.0347)
Period	0.0304** (0.0141)	0.00897** (0.00409)	0.0348** (0.0145)	0.0103** (0.00420)	0.0324** (0.0148)	0.00967** (0.00435)
GDP_origin	-7.37e-06 (7.87e-06)	-2.18e-06 (2.35e-06)	-8.90e-06 (7.67e-06)	-2.63e-06 (2.31e-06)	-7.26e-06 (8.40e-06)	-2.17e-06 (2.54e-06)
Origin_EUest	-0.00666 (0.192)	-0.00196 (0.0564)	-0.0170 (0.188)	-0.00499 (0.0550)	-0.0893 (0.207)	-0.0262 (0.0594)
Origin_NorthAm	0.592* (0.355)	0.206 (0.139)	0.616* (0.348)	0.216 (0.137)	0.357 (0.334)	0.119 (0.123)
Origin_SouthAm	0.221 (0.241)	0.0687 (0.0783)	0.232 (0.246)	0.0721 (0.0799)	0.251 (0.250)	0.0793 (0.0828)
Origin_Asia	-0.0224 (0.236)	-0.00657 (0.0688)	-0.0565 (0.225)	-0.0164 (0.0649)	-0.0498 (0.245)	-0.0147 (0.0716)
Origin_Africa	0.233 (0.390)	0.0742 (0.132)	0.205 (0.378)	0.0648 (0.126)	0.284 (0.373)	0.0926 (0.130)
a_Engineering	0.0787 (0.126)	0.0235 (0.0379)	0.0991 (0.126)	0.0297 (0.0381)	0.0567 (0.129)	0.0171 (0.0392)
a_Health	0.196 (0.217)	0.0613 (0.0721)	0.22 (0.207)	0.0693 (0.0697)	0.253 (0.212)	0.0812 (0.0729)
a_Agricultural	-0.542** (0.262)	-0.128*** (0.0475)	-0.495* (0.280)	-0.119** (0.0532)	-0.401 (0.274)	-0.102* (0.0578)
a_Social	0.224 (0.151)	0.0698 (0.0493)	0.223 (0.148)	0.0696 (0.0482)	0.234 (0.164)	0.0740 (0.0542)
a_Humanities	-0.00821 (0.196)	-0.00242 (0.0574)	0.0615 (0.195)	0.0185 (0.0597)	0.0199 (0.207)	-0.00591 (0.0612)
PrS_PhD	0.0148 (0.207)	0.00439 (0.0612)	0.0287 (0.208)	0.00850 (0.0619)	0.0184 (0.215)	0.00551 (0.0646)
PrS_Tenure	0.790*** (0.188)	-0.201*** (0.0420)	0.777*** (0.182)	0.198*** (0.0413)	0.768*** (0.186)	-0.198*** (0.0431)
Papers_year	0.0663** (0.0267)	0.0196** (0.00780)	0.0629** (0.0259)	0.0186** (0.00757)	0.0581** (0.0265)	0.0174** (0.00785)
R_To_job	-0.0947 (0.0912)	-0.0277 (0.0262)	-0.0749 (0.0861)	-0.0220 (0.0249)	-0.0718 (0.0845)	-0.0213 (0.0248)
R_To_Academic	0.0953 (0.118)	0.0283 (0.0352)	0.1 (0.117)	0.0298 (0.0350)	0.0688 (0.118)	0.0206 (0.0355)
R_To_Personal	-0.190 (0.136)	-0.0561 (0.0400)	-0.185 (0.134)	-0.0546 (0.0395)	-0.178 (0.139)	-0.0532 (0.0412)
R_To_EcoPol	-0.0572 (0.145)	-0.0166 (0.0415)	-0.0797 (0.142)	-0.0230 (0.0403)	-0.0287 (0.150)	-0.00851 (0.0443)
Home_linked	0.0555 (0.185)	0.0161 (0.0530)	0.0818 (0.176)	0.0236 (0.0498)	0.0754 (0.176)	0.0221 (0.0504)
Language	-0.0695 (0.0687)	-0.0205 (0.0205)	-0.0787 (0.0690)	-0.0232 (0.0206)	-0.113 (0.0755)	-0.0338 (0.0228)
jPol_NationalRe s	-0.118 (0.106)	-0.0349 (0.0314)	-0.112 (0.103)	-0.0331 (0.0305)	-0.0964 (0.110)	-0.0288 (0.0330)
jPol_Immigratio n	0.0296 (0.0863)	0.00873 (0.0253)	0.0549 (0.0855)	0.0162 (0.0250)	0.0300 (0.0840)	0.00896 (0.0249)
jPol_Institute	-0.148* (0.0889)	-0.0436* (0.0262)	-0.134 (0.0894)	-0.0395 (0.0264)	-0.147 (0.0916)	-0.0438 (0.0274)
s_Salary	0.0286 (0.0788)	0.00844 (0.0232)				
s_IntNet	-0.00608 (0.0593)	-0.00180 (0.0175)				
s_Indipend	-0.169** (0.0789)	-0.0499** (0.0236)				
m_Economic			-0.00190 (0.128)	0.000562 (0.0378)		
m_Relational			-0.00179 (0.0810)	0.000529 (0.0239)		
m_Aspiration			-0.276** (0.128)	0.0817** (0.0383)		
f_Economic					-0.0267 (0.0756)	-0.00797 (0.0226)
f_Relational					-0.00797 (0.0484)	-0.00238 (0.0145)
f_Aspiration					-0.127** (0.0595)	-0.0379** (0.0179)
Observations	442	442	447	447	417	417
chi2	430.5	430.5	401.1	401.1	392.4	392.4

Standard errors clustered by institution in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 5: Multinomial regression on destination

	Model 1		Model 2		Model 3	
	Return	Third country	Return	Third country	Return	Third country
Country	-0.0461 (0.0467)	0.0223 (0.0679)	-0.0371 (0.0491)	0.00167 (0.0629)	-0.0494 (0.0535)	-0.0173 (0.0659)
Age	0.00289 (0.00254)	-0.00508 (0.00397)	0.00302 (0.00240)	-0.00420 (0.00399)	0.00310 (0.00253)	-0.00342 (0.00394)
Gender	-0.0198 (0.0271)	-0.0502 (0.0436)	-0.0169 (0.0261)	-0.0496 (0.0439)	-0.0243 (0.0296)	-0.0721 (0.0446)
Period	-0.0139*** (0.00525)	-0.00306 (0.00672)	-0.0154*** (0.00511)	-0.00382 (0.00651)	-0.0156*** (0.00545)	-0.00381 (0.00664)
GDP_origin	-1.83e-06 (2.79e-06)	3.32e-06 (4.19e-06)	-1.75e-06 (2.81e-06)	2.47e-06 (4.03e-06)	-1.65e-06 (2.87e-06)	2.72e-06 (4.27e-06)
Origin_EUest	-0.0697 (0.0491)	0.171 (0.104)	-0.0650 (0.0508)	0.166 (0.104)	-0.0629 (0.0522)	0.113 (0.103)
Origin_NorthAm	0.239* (0.142)	0.0495 (0.156)	0.247* (0.137)	0.0536 (0.151)	0.128 (0.103)	0.0600 (0.166)
Origin_SouthAm	0.0624 (0.103)	0.0965 (0.119)	0.0567 (0.1000)	0.111 (0.120)	0.0665 (0.103)	0.0968 (0.116)
Origin_Asia	0.00413 (0.0897)	0.183 (0.128)	0.0156 (0.0932)	0.164 (0.115)	0.0282 (0.101)	0.130 (0.125)
Origin_Africa	-0.0322 (0.0877)	0.297* (0.176)	0.0105 (0.107)	0.268 (0.173)	0.00906 (0.111)	0.281 (0.171)
a_Engineering	0.0837* (0.0428)	-0.0788 (0.0524)	0.0899*** (0.0432)	-0.0804 (0.0507)	0.0893** (0.0446)	-0.0916* (0.0529)
a_Health	0.0515 (0.0714)	0.00600 (0.104)	0.0781 (0.0711)	0.00692 (0.101)	0.0750 (0.0764)	0.0301 (0.106)
a_Agricultural	0.0836 (0.123)	-0.224*** (0.0469)	0.0971 (0.133)	-0.222*** (0.0502)	0.150 (0.142)	-0.216*** (0.0526)
a_Social	0.0784 (0.0637)	0.00321 (0.0687)	0.0725 (0.0617)	0.0120 (0.0665)	0.0789 (0.0703)	0.00745 (0.0717)
a_Humanities	-0.000548 (0.0730)	-0.0646 (0.0902)	0.0384 (0.0783)	-0.0659 (0.0901)	0.0238 (0.0886)	-0.111 (0.0821)
PrS_PhD	-0.0799** (0.0338)	0.0839 (0.0611)	-0.0781** (0.0320)	0.0931 (0.0625)	-0.0763** (0.0342)	0.0855 (0.0640)
PrS_Tenure	-0.143*** (0.0440)	-0.106* (0.0558)	-0.144*** (0.0434)	-0.0992* (0.0546)	-0.153*** (0.0445)	-0.0803 (0.0523)
Papers_year	0.00167 (0.00928)	0.0187 (0.0116)	0.00185 (0.00948)	0.0161 (0.0112)	0.00186 (0.00928)	0.0167 (0.0113)
R_To_job	-0.0623** (0.0285)	0.00143 (0.0431)	-0.0698** (0.0280)	0.0208 (0.0428)	-0.0718** (0.0307)	0.0124 (0.0440)
R_To_Academic	0.00673 (0.0350)	0.0171 (0.0477)	0.00918 (0.0334)	0.0134 (0.0482)	-0.00465 (0.0342)	0.0236 (0.0519)
R_To_Personal	-0.0586 (0.0400)	-0.000103 (0.0460)	-0.0628 (0.0400)	0.00659 (0.0439)	-0.0534 (0.0408)	-0.00261 (0.0471)
R_To_EcoPol	0.0775 (0.0534)	-0.0271 (0.0613)	0.0781 (0.0519)	-0.0400 (0.0618)	0.0937 (0.0572)	-0.0171 (0.0667)
Home_linked	0.0648* (0.0377)	-0.0310 (0.0770)	0.0704** (0.0354)	-0.0363 (0.0720)	0.0744** (0.0362)	-0.0317 (0.0674)
Language	-0.0396** (0.0199)	0.0392 (0.0306)	-0.0380* (0.0212)	0.0316 (0.0314)	-0.0441** (0.0218)	0.0197 (0.0340)
jPol_NationalRes	0.000428 (0.0230)	0.0126 (0.0438)	0.00475 (0.0243)	0.00451 (0.0434)	-0.00145 (0.0250)	0.00481 (0.0463)
jPol_Immigration	-0.0269 (0.0243)	-0.0104 (0.0423)	-0.0388 (0.0253)	-0.0194 (0.0447)	-0.0354 (0.0265)	-0.00397 (0.0460)
jPol_Institute	0.0340 (0.0252)	0.00506 (0.0435)	0.0366 (0.0265)	-0.00371 (0.0435)	0.0438 (0.0283)	-0.00322 (0.0470)
s_Salary	-0.00345 (0.0224)	0.0106 (0.0302)				
s_IntNet	-0.0108 (0.0163)	0.000536 (0.0259)				
s_Indipend	-0.00879 (0.0259)	-0.0608* (0.0314)				
m_Economic			-0.00875 (0.0311)	-0.00176 (0.0431)		
m_Relational			-0.0440 (0.0295)	0.0490 (0.0384)		
m_Aspiration			0.0446 (0.0425)	-0.166*** (0.0570)		
f_Economic					-0.00826 (0.0191)	-0.00625 (0.0276)
f_Relational					-0.0173 (0.0180)	0.00610 (0.0234)
f_Aspiration					0.0123 (0.0193)	-0.0746*** (0.0282)
Observations	442	442	447	447	417	417
chi2	12141	12141	33116	33116	47054	47054

Standard errors clustered by institution in parentheses
 *** p<0.01, ** p<0.05, * p<0.1

APPENDIX

A1: Satisfaction variables correlation matrix

	s_Salary	s_Bene-s	s_Job	s_Wcon-s	s_Oppo-s	s_Chall-e	s_Resp	s_Indi-d	s_Soci-y	s_Status	s_Intnet	s_locnet
s_Benefits	0.5527	1										
s_Job	0.2952	0.5066	1									
s_Wconditions	0.3315	0.3832	0.265	1								
s_Opportunities	0.3001	0.3881	0.2442	0.4511	1							
s_Challenge	0.1741	0.2136	0.0618	0.407	0.3587	1						
s_Resp	0.175	0.2422	0.1839	0.333	0.4094	0.4131	1					
s_Indipend	0.1197	0.1766	0.1679	0.3191	0.2317	0.3489	0.4077	1				
s_Society	0.0862	0.2471	0.0967	0.264	0.2958	0.3731	0.4298	0.304	1			
s_Status	0.3014	0.3465	0.3031	0.2662	0.2766	0.1861	0.3201	0.2041	0.2785	1		
s_IntNet	0.1473	0.2854	0.2649	0.3174	0.2975	0.3121	0.3057	0.243	0.3315	0.2787	1	
s_LocNet	0.1968	0.1849	0.1945	0.3526	0.2493	0.4087	0.2945	0.2548	0.3887	0.2615	0.3897	1
s_UniLinks	0.2385	0.2804	0.1725	0.3458	0.3747	0.2814	0.2811	0.1654	0.2565	0.2411	0.4834	0.3743

A2: Satisfaction variables factor analysis

Variable	Factor1	Factor2	Factor3	Uniqueness
s_Salary	0.0603	0.7487	0.0842	0.4288
s_Benefits	0.1357	0.8182	0.1561	0.2878
s_Job	0.0178	0.7036	0.1237	0.4894
s_Wconds	0.4295	0.416	0.3187	0.5409
s_Opportunities	0.4129	0.419	0.2977	0.5653
s_Challenge	0.6516	0.0366	0.3304	0.4649
s_Resp	0.7308	0.1759	0.1626	0.4086
s_Indip	0.7359	0.1145	-0.0135	0.4452
s_Society	0.6025	0.0227	0.3425	0.5192
s_Status	0.2748	0.4819	0.2021	0.6514
s_IntNet	0.1668	0.1596	0.7565	0.3745
s_LocNet	0.3363	0.0673	0.6338	0.4806
s_UniLinks	0.0697	0.1935	0.7941	0.3272

Pattern matrix - principal component factor analysis

A3: Robustness research field categories

Variable	Description	Frequency	Percentage
a_Science_University	Researchers in Natural Science, affiliated with an University and without collaboration with industry.	95	19.71
a_Engineering_University	Researchers in Engineering, affiliated with an University and without collaboration with industry.	93	19.29
a_Health	Researchers in Health Science	37	7.68
a_Agricultural	Researchers in Agriculture	20	4.15
a_Social	Researchers in Social Science	80	16.6
a_Humanities	Researchers in Humanities	44	9.13
a_Science_Pcenters	Researchers in Natural Science affiliated with a Public Research Center.	29	6.02
a_Engineering_Pcenters	Researchers in Engineering affiliated with a Public Research Center.	10	2.07
a_Science_Univ_Industry	Researchers in Natural Science, affiliated with an University and involved in collaboration with industry.	28	5.81
a_Engineering_Univ_Industry	Researchers in Engineering, affiliated with an University and involved in collaboration with industry.	46	9.54