

The effect of academic mobility on research performance: the case of Italy

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Abstract

This work investigates the effects of researchers' mobility on their research performance. The reference context is that of national intra-sector mobility, in a country, Italy, characterized by a research system lacking the typical elements of an academic labor market. In particular, the analysis was conducted on 568 academics working at national universities and affected by mobility in the period 2009-2014. The effect of mobility on the variation of performance at the turn of the transfer was analyzed considering the interplay of demographic/sociological characteristics of the researchers, as well as contextual factors related to both the organization of origin and destination. Results show that it is the less productive academics that represent the larger share of those who move, and more than half of the mobile academics worsen their performance after the transfer.

Keywords

Mobile academics; research performance; FSS; universities; bibliometrics.

1. Introduction

Mobility is a hallmark of a scientist's professional life. The phenomenon, especially in recent decades, has acquired important implications and has been the subject of numerous studies by scholars and interventions by policy makers.

The basic idea is that "researcher mobility" is a mechanism of knowledge diffusion able to generate positive spillovers on organizations, sectors, territories (Song, Almeida, & Wu, 2003). In the private sector, inventor mobility underlies performance dynamics of innovation processes of firms and regions (Breschi, Lenzi, Lissoni, & Venzulli, 2010). Inter-firm alongside inter-region mobility have positive effects on inventors' performance, which in turn increases the innovation rates of companies (Van der Wouden & Rigby, 2020). By determining the diffusion of ideas and new knowledge, the mobility of researchers can therefore be considered as a factor for the development of the whole research system (Fernández-Zubieta, Geuna & Lawson, 2016) and, as a consequence, of countries' economies.

The policy implications are such that the European Commission, over the years, has funded a number of studies to collect detailed information and data on the mobility patterns and career paths of EU researchers, the latest named MORE4 survey (European Commission, 2021). Also, within the EU, enhancing balanced mobility of researchers is a priority policy objective under the European Research Area framework. The recent 2020 Communication on the ERA emphasises the need to improve access to excellence and broaden talent capacity, e.g. by supporting mobility.¹

Many scholars have investigated the relationship between mobility and academic careers, since the former impacts on: i) the breadth and standing of a researcher's professional network; ii) the quality of work experiences and scientific challenges faced; iii) the intensity of production of new scientific advances and their impact (Cañibano, D'Este, Otamendi, & Woolley, 2020; Horta, Jung, & Santos, 2020).

There are different types of mobilities, e.g. national vs international, intra-sector vs cross sector, single vs multiple (El-Ouahi, Robinson-García, & Costas, 2021; Horta et al., 2021). Our study analyses the effects of researchers' national intra-sector mobility on research performance. Many scholars claim that these effects are influenced by the demographic/social characteristics of the researchers (Aksnes, Rorstad, Piro, & Sivertsen, 2013), as well as by contextual factors related to both the place of origin and the place of destination (Bäker, 2015; Deville et al., 2014). The effects of mobility on research performance are found to depend also on such other aspects as the field of research, or the frequency and duration of mobility (Franzoni, Scellato, & Stephan, 2014).

Some studies on the relationship between mobility and research performance distinguish between domestic and international mobility. As regards international mobility, a literature review by Guthrie, Lichten, Harte, Parks, and Wooding (2017), which mainly analyzes studies of researchers to and from the UK, highlights the presence of a relation between international mobility and improvements in academic performance, although it is difficult to establish a true direct or reverse causal relationship. A more recent literature review by Netz, Hampel and Aman (2020) reports

¹ https://ec.europa.eu/info/research-and-innovation/strategy/strategy-2020-2024/our-digital-future/era_en, last accessed 4 April 2022.

that 19 out of 34 studies highlight positive effects of international mobility on scientific performance. Inbred scientists tend to pursue cozy research programs, while mobile scholars are risk takers and pioneer new scientific trajectories (Horta, Meoli, & Santos, 2021). At the same time there are several studies that find heterogeneous, no or negative effects (Gyorffy, Nagy, Herman, & Torok, 2018; Halevi, Moed & Bar-Ilan, 2016). The authors point out that the various studies use different indicators and non-homogeneous measurement approaches, so it is clear that the framework for analyzing the relationship between mobility and performance is far from being consolidated.

Referring, instead, to the context of national mobility, a distinction must be made between those countries, typically Anglo-Saxon, where the researcher operates in a free labor market and others, typically in continental Europe, where the researcher is a civil servant who moves within a strongly regulated and centrally governed context, in which individual organizations are in fact precluded from customizing the job offer. Italy falls into this second category. Its higher education system is a long-standing, classic example of a public and highly centralized governance structure, with low levels of autonomy at the university level and a very strong role played by the central state. The Ministry of Universities and Research (MUR) recognizes a total of 96 universities as having the authority to issue legally recognized degrees. 94.9% of faculty are employed in public universities, that are largely financed by the government through mostly non-competitive allocation of funds. There are no ‘teaching-only’ universities, as all academics are required to carry out both research and teaching. At the end of 2020, there were 56,500 faculty members in Italy (full, associate and assistant professors).

There is no tenure-track system in place. The recruitment and career advancement of academics are regulated by specific law, and occur through public competitions. Academics can transfer from a university to another, holding the same academic rank, upon clearance by both institutions. Salaries are regulated at the central level and are calculated according to role (administrative, technical or professorial), rank within the role (e.g., assistant, associate or full professor), and seniority. An academic’s salary does not depend on merit.

These conditions altogether create an environment and a culture that are completely non-competitive, yet flourishing with favoritism in recruitment and career progress. The overall result is a system of universities that are almost completely undifferentiated for quality and prestige, with the exception of the tiny Schools for Advanced Studies and a very small number of the private special-focus universities. Top scientists are dispersed more or less uniformly among all Italian universities, along with the low performers, so that no single university reaches the critical mass of excellence necessary to develop as an elite university and compete at the international level (Abramo, Cicero, & D’Angelo, 2012). Academics’ mobility then is not the effect of competition among universities, trying to attract talents, it rather occurs for career progress and/or family reasons.

For its peculiar characteristics, Italy reveals an interesting case study for the analysis of the relationship between mobility and research performance. Furthermore, observing the Italian case, will allow us to apply a sophisticated research performance indicator at the individual level, as we can count on an extremely accurate authors’ name disambiguation algorithm, and on a fine-grained field classification scheme of researchers by which we avoid distortions in comparative performance analysis.

The paper is organized as follows: in the next section, we review the relevant literature. Section 3 presents the methodology and describes the data and methods. In

Section 4, we show the results of the analysis. Section 5 concludes the work discussing some policy implications and identifying further research developments.

2. Theoretical background

The literature on the subject under investigation is extremely vast. We will try to describe and comment on the main contributions, organizing them around each of the research hypotheses presented in Section 1.

Mobility positively impacts an academic's research performance

The topic of the link between scientists' performance and science mobility (inter-organizational) can be approached from two different perspectives. On the one hand, considering performance as a driver explaining mobility, as supported by the theory of competition in higher education (Jongbloed, 2004): universities search for a competitive advantage over competitors by attracting top-quality research staff. On the other hand, investigating if it is mobility that influences the research performance, as supported by the theory of knowledge externalities (Ciccone & Peri, 2006), whereby institutions with higher research quality positively impact the performance of new recruits. The topic is still very open because the results are conflicting and such as not to bring to a consolidated view.

Much of this variability may be attributable to the manner in which these studies were conducted and the chosen field of observation. Some of them focus on a single country (Fernández-Zubieta, Geuna, & Lawson, 2016; Aksnes, Rorstad, Piro, & Sivertsen, 2013; Tartari, Di Lorenzo, & Campbell, 2020; Ejermo, Fassio, & Källström, 2020; Cruz-Castro & Sanz-Menéndez, 2010; Jonkers & Tijssen, 2008; De Filippo, Casado, & Gómez, 2009; Cañibano, Otamendi & Andújar, 2008; Allison & Long, 1990). Others, however, have analyzed a single discipline (Bolli, & Schläpfer, 2015; Tartari, Di Lorenzo & Campbell, 2020; Jonkers & Tijssen, 2008; Albarrán, Carrasco, & Ruiz-Castillo, 2017; Dubois, Rochet & Schlenker 2014; Ryazanova, & McNamara, 2019; Tartari, Di Lorenzo, & Campbell, 2020).

Analyses conducted on the effects of mobility taking place on a global scale show mixed results. Franzoni, Scellato and Stephan (2014) showed that foreign academics and those who have spent long periods abroad make higher impact publications; Jonkers and Tijssen (2008) found a positive correlation between international mobility and publication intensity of Chinese researchers, as labor mobility contributes to the scientific and technical human capital of scientists to the extent that it increases the number of collaborations and strengthens existing relationships. Halevi, Moed, and Bar-Ilan (2016), observing the top 100 authors between 2010 and 2015 in terms of publications in each of seven disciplines,² showed that domestic inter-organizational mobility induces an increase in both output and impact, while inter-country mobility does not seem to produce the same effects.

An in-depth analysis of the duality of the link between scientists' productivity and science mobility was carried out in particular by Fernández-Zubieta, Geuna and Lawson (2016) on a sample of 171 UK research active academics, in "tenured type" positions, affiliated in 2005 to 53 different UK universities in four scientific fields (chemistry, physics, computer science, and mechanical, aeronautical, and manufacturing). The authors come to non definitive results, as they find an overall positive effect of mobility, although not significant, and a short-term negative effect, i.e., a drop in performance in

² Neuroscience, Mechanical Engineering, Arts and Humanities, Oncology, Environmental Geology, Business, and Infectious Diseases.

the years following the job change, probably due to adjustment costs. De Filippo, Casado and Gómez, (2009) analyzed the relationship between the mobility of researchers and their scientific performance in a medium-sized Spanish university (Carlos III University of Madrid-UC3M), which had 1,800 researchers distributed in the engineering, social sciences and humanistic disciplines. The results of their analyses show that there is a strong association between mobility, performance, and visibility: researchers “with mobility” show better performance indicators (higher average impact factor, a greater number of citations per document, lower percentages of non-cited documents, and a higher rate of international collaboration) than their “without mobility” colleagues.

The most interesting studies for the purposes of this paper are those that address the issue by focusing on an entire national academic system. Included in this typology are the works of Aksnes, Rorstad, Piro and Sivertsen (2013) and Ejermo, Fassio and Källström (2020) on the Norwegian and Swedish academic systems respectively. In the first case, the analysis conducted on a sample of about 11,000 scientists revealed that researchers affected by mobility episodes tend to have slightly higher publication and citation rates than other researchers. However, the results are not unambiguous so there is no strong evidence that mobility has beneficial effects on research performance. In the second case Ejermo, Fassio and Källström (2020) studied the effects of inter-university mobility on the productivity of over 35,000 Swedish academic researchers for the period 2002-2012. The results indicate that the effect of mobility on performance is not found when considering career progress. In essence, a career progression positively impacts a researcher’s performance, whether this involves a physical transfer or not. It is interesting to test whether in Italy as well, mobility has slight or no positive impact on research productivity.

The impact of mobility on a researcher’s performance is greater if the transfer is to universities/groups with better research performance

As Yan, Zhu and He (2020) found in their recent study of US academia, academics tend to move to institutions with higher research intensity. Earlier, Allison and Long (1990) had already showed that in correspondence with a change of institution, academic scientists who moved to more prestigious departments registered an increase in both the number of publications and the number of citations, as opposed to their colleagues who underwent a downgrade. Fernández-Zubieta, Geuna and Lawson (2016) also showed that researchers affected by upward mobility register significant increases in productivity, but not on citations, while downward mobility negatively affects the researcher’s overall research performance. These results were confirmed by Tartari, Di Lorenzo and Campbell (2020), who found that mobility has a positive effect on individual performance and this effect is strengthened if the movement takes place to better-endowed institutions, although their analysis is limited to a sample of 348 academic scientists working in the biology departments of U.K. universities. According to Bolli and Schlöpfer (2015), however, this hypothesis is rejected in the analysis they conducted with respect to a single field (economics). Deville et al. (2014) have instead observed that there is stratification in science whereby movement is predominantly horizontal rather than vertical: people from elite institutions are more likely to move to other elite institutions; similarly, people from lower rank institutions are more likely to move to peer institutions. In addition, when movement between groups occurs, it is observed that moving from elite to lower-ranking institutions results in a modest

decrease in scientific impact on average; the opposite event, however, does not result in gains in impact. Differently from the Anglo-Saxon higher education system, the Italian one is scarcely competitive and hardly differentiated. Therefore, to what extent the performance of universities/groups of destination impact on that of the mobile academics is difficult to predict.

The productivity of a mobile researcher increases if he/she joins a larger group

In addition to the prestige of the institution of origin and/or destination, some scholars have also investigated the influence of other factors related to the context of origin and destination of the mobile researcher, including the size of the department in which he/she works. The link between department/university size and research performance has been extensively dissected in the literature (Abramo, Cicero, & D'Angelo, 2012; Bauer, Schui, von Eye & Krampen, 2013; Aksnes, Piro, & Rørstad, 2018), both in general terms and related to researcher mobility. Several studies have analyzed precisely this link between scientific performance and destination department following a mobility event, as it is believed that larger institutions and/or departments may offer more opportunities in terms of facilities and scientific collaborations. From the analysis of a large sample of German-speaking economists and management researchers, Bäker (2015) found that the larger the starting department, the more negative the impact on performance will be in the short run. This change determines a risk of having their social capital reduced for those who have more colleagues in their old department of origin. Deville et al. (2014) in their analysis of the relationships between career, mobility, geography and scientific impact observed that the institution size has little influence on publication intensity but is positively correlated with publication impact. This suggests that large institutions offer more opportunities for internal collaborations: complex research needs complex collaborations, and resulting publications, with more co-authors in the byline, may attract a higher number of citations. Dubois, Rochet, and Schlenker (2014) found that for mathematicians, department size does matter: larger departments attract better researchers, even after controlling for author-fixed effects. Moreover, specialized departments seem to stimulate the quality rather than the quantity of the scientific production of their researchers.

The performance of a mobile researcher increases if associated with an academic rank advancement

Scientific performance and mobility represent two of the determinants that influence the achievement of a permanent position and career progressions towards the top of the academic hierarchy (Sanz-Menéndez, Cruz-Castro & Alva, 2013; Pezzoni, Sterzi & Lissoni, 2012). Particularly in continental European countries, including Italy, academics are civil servants, so that mobility within national borders very often corresponds to career advancement. As mentioned earlier, Ejermo, Fassio, & Källström (2020) in their study on the effects of national mobility on the performance of Swedish university researchers, showed that a move, coupled with a promotion, leads to a greater impact on productivity. However, these researchers do not have a statistically significant different publication rate compared to other moving researchers, so the observed effects are mainly attributable to the move. Furthermore, the results suggest that those who only achieved career advancement without being “mobile” are also able to increase their publications over time, although a slightly smaller effect on citations is

observed. Finally, such effect differs significantly across disciplines: it is rather evident in the technical-scientific disciplines, absent in the social science and humanities. The different effects on publications and citations call for further investigation.

The impact of mobility on a researcher's productivity is confounded by certain personal traits of the individual

The impact of mobility on a researcher's productivity is confounded by certain personal characteristics (age, gender, previous academic rank, etc.) that need to be taken into account when modeling the phenomena and analyzing the results. Aksnes, Rorstad, Piro and Sivertsen (2013) note that in the Norwegian academic system, mobile researchers tend to have slightly higher publication and citation rates than their peers. However, regression analyses where such personal characteristics as gender, age, and academic position of the researchers were accounted for removed most of the independent effect that mobility may have on publication and citations. Our investigation should add more evidence on the role of personal factors on productivity variations.

In particular, concerning national intra-sector mobility, the hypotheses that we find more interesting to test are as follows:

- Mobility positively impacts an academic's research productivity;
- The impact of mobility on a researcher's productivity is greater if the transfer is to universities/groups with better research performance;
- The productivity of a mobile researcher increases if he/she joins a larger group;
- The productivity of a mobile researcher decreases with the geographic-administrative distance of the transfer.
- The productivity of a mobile researcher increases if it is accompanied by academic rank advancement;
- The impact of mobility on a researcher's productivity is confounded by certain personal characteristics, including age and gender.

If, on the one hand, we can affirm that these hypotheses are relevant to adequately support national policies and to evaluate their effects *ex post*, on the other hand, we can also affirm that only two studies related to similar contexts and, in particular, to Scandinavian countries can be found in the literature (Aksnes, Rorstad, Piro & Sivertsen, 2013; Ejermo, Fassio, & Källström, 2020). The major difference between ours and all previous studies, however, is the indicator and method of comparative measurement of research performance. As we will explain in more detail below, our indicator does not separate quantity and impact of scientific production but includes both.

3. Data and Methods

Our field of observation is made of all Italian academics on national mobility between 2009 and 2014. This time period will allow us to measure the bibliometric research performance of individuals in the five-year periods before and after the transfer. As an example, the performance of an academic who moved in 2014, is measured both in 2015-2019 period and in 2009-2013 period, to contrast after with before.

Data on the faculty at each university were extracted from the database of Italian university personnel, kept by the MUR.³ This source contains, at 31/12 of each year, information on each academic, including affiliation, academic rank, and field of research. All academics are classified in one, and only one, field called Scientific Disciplinary Sector (SDS), for a total of 370 SDSs which are grouped into disciplines (called University Disciplinary Areas (UDAs), for a total of 14 UDAs.

As for the measurement of scientific productivity at individual level, we will consider the fractional scientific strength (FSS),⁴ defined as

$$FSS = \frac{1}{t} \sum_{i=1}^N \frac{c_i}{\bar{c}} f_i \quad [1]$$

Where:

t = number of years of work of the academic in the period under observation

N = number of publications by the academic in the period under observation

c_i = citations received by publication i

\bar{c} = average of distribution of citations received for all cited publications in the same year and subject category of publication i

f_i = fractional contribution of the academic to publication i .

The fractional contribution equals the inverse of the number of authors in those fields where the practice is to place the authors in simple alphabetical order, but assumes different weights in other cases. For the life sciences, widespread practice in Italy is for the authors to indicate the various contributions to the published research according to the order of the names in the listing of the authors. Hence, according to Abramo, D'Angelo and Rosati (2013), for life science SDSs, we give different weights to each co-author according to their position in the list of authors and to the character of the co-authorship (intra-mural or extra-mural).

The bibliometric dataset was extracted from the Italian Observatory of Public Research (ORP), a database developed and maintained by the authors and derived under license from the WoS. Beginning from the raw data of the WoS and applying a complex algorithm to reconcile author's affiliation and disambiguation of the true identity of the authors, each publication (article, review, letter and conference proceeding) is attributed to the academic that produced it (D'Angelo, Giuffrida, & Abramo, 2011). Thanks to this algorithm, we can measure the FSS at the individual level, on a national scale. For reasons of significance, we will limit the analysis to academics:

- Working in hard sciences SDSs (201 in all, concerning 11 UDAs), where publications in international journals serve as a reliable proxy for overall research output;⁵
- On staff for at least one year in the five years before and after the transfer.

³ <http://cercauniversita.cineca.it/php5/docenti/cerca.php>, last accessed on 4 April 2022.

⁴ A thorough explanation of the theory and assumptions underlying FSS can be found in Abramo and D'Angelo (2014).

⁵ Evaluative bibliometrics should not be applied to the arts and humanities, due to the scarce coverage of these areas in bibliographic repertories (Hicks, 1999; Archambault, Vignola-Gagné, Côté, Larivière, & Gingras, 2006).

Applying this restriction, the final dataset is composed of 568 academics involved in a transfer, 152 of which are characterized by career progression (from assistant to associate professor, or from associate to full professor).

With the aim of filtering out the effect of possible time patterns on the data, the individual productivity value will be normalized to the data expected at SDS level, i.e., to the average value of the FSS measured for all national SDS academics. From now on, the term FSS is to be interpreted as the normalized value of [1].

In turn, the productivity of the group of origin (composed of the academics from the SDS and university in which the academic was placed prior to transfer) and that of the destination group (composed of the academics from the SDS and university to which the academic transferred) will be measured through the average FSS of the individuals that compose the group.

4. Results

The distribution of productivity measured over the five-year period before transfer for the 568 academics in the dataset is extremely skewed (Figure 1), given the presence of several outliers and, in particular, a maximum value of almost 23. The average value is 0.990, therefore slightly lower than the expected (unit) value, but the median is significantly lower and equal to 0.513, since 71% of academics show an FSS lower than the unit, among which 60 (over 10% of the total) are even unproductive. Thus, good research productivity would not seem to be a significant predictor of the likelihood of intra-sector mobility of Italian academics. That could be the case, as Nascia, Pianta, and Zacharewicz (2021) argue, for young researchers at the beginning of their careers who migrate abroad in search of new and better opportunities.

Indeed, one would expect that the destination university would rather welcome high performers. At the same time universities cannot force low performers to move to other institutions.

If we then analyze the difference in productivity at the turn of the transfer (Figure 2), we see that 54.8% of academics worsen their performance, while the remaining 45.2% improve it. So not only are the least productive people that move out, but most of those people are also worsening their performance. Of the initial 60 unproductive academics, 20 remain so. The distribution of performance variation shows an almost normal trend (confirmed by the Shapiro Wilk W test), with a negative mean and median (equal to -0.258 and -0.041, respectively) and particularly long tails due to the presence of several outliers. Among these, two academics stand out, one who goes from an FSS of 22.9 in the five-year period preceding the transfer to 5.8 in the one that follows it and, vice versa, a second who presents an FSS of 5.0 before the transfer and 26.9 after it.

The change in productivity at the turn of the transfer and the productivity in the period before the transfer are inversely correlated, as shown by the Scatter plot in Figure 3. The Pearson's correlation coefficient ρ is equal to -0.700 (p-value 0.0000). It must clearly be difficult for the most productive academics to maintain their research performance, post-transfer, at levels similar to those recorded in the period before the transfer. Of course, there are exceptions: in particular, of the 164 academics with a pre-transfer FSS of more than one, 24 (i.e., less than 15%) show an increase in productivity in the subsequent period.

In a nutshell, empirical evidence from national academic transfers seems to show no positive links between mobility and a scientist's research productivity after the transfer.

Coming to the second hypothesis of the work, Figure 4 represents the dispersion of the data on the change in productivity of each academic at the turn of the transfer, and the difference in productivity between the group in which he/she is being inserted and the one from which he/she comes. It should be remembered that by 'group' we mean colleagues from the same SDS. The diagram shows data for 384 observations of the total 568, as we exclude those transfers involving source/destination locations with less than one FTE staff unit in the moving academic's SDS.

There is a weak correlation between the two variables (Pearson $\rho = 0.163$, p-value 0.0014), indicating that transfers accompanied by an increase in productivity concern destinations that perform better than those of origin and vice versa. Therefore, there is a positive link between the variation in productivity of a researcher and the the difference in standing between the context that he/she leaves and the one that he/she finds.

Regarding the link between performance and size (in terms of FTE) of the group in which mobile academics are inserted, the scatter plot in Figure 5 shows a total absence of correlation between the sizes of the groups of origin and destination and their variation in productivity in the periods at the turn of the transfer. The result is in line with the absence of returns to scale in Italian university research (Abramo, Cicero, & D'Angelo, 2012).

Figure 1: Distribution of the productivity of the mobile academics in the dataset, in the five years preceding their transfer

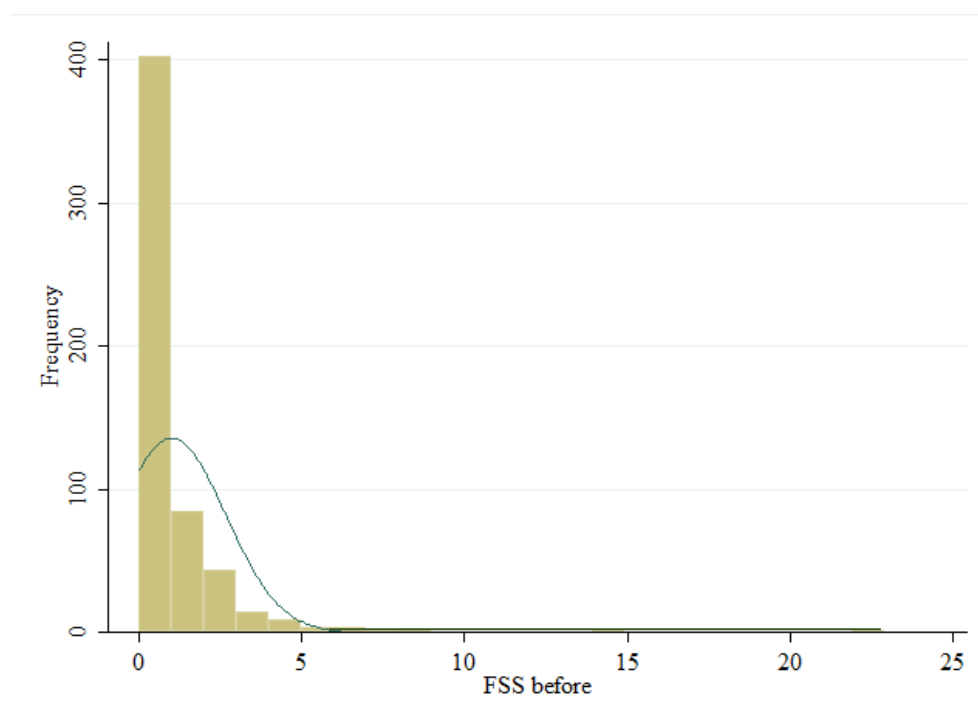


Figure 2: Distribution of the difference in productivity of the mobile academics in the dataset, between the five-year period following and that preceding their transfer

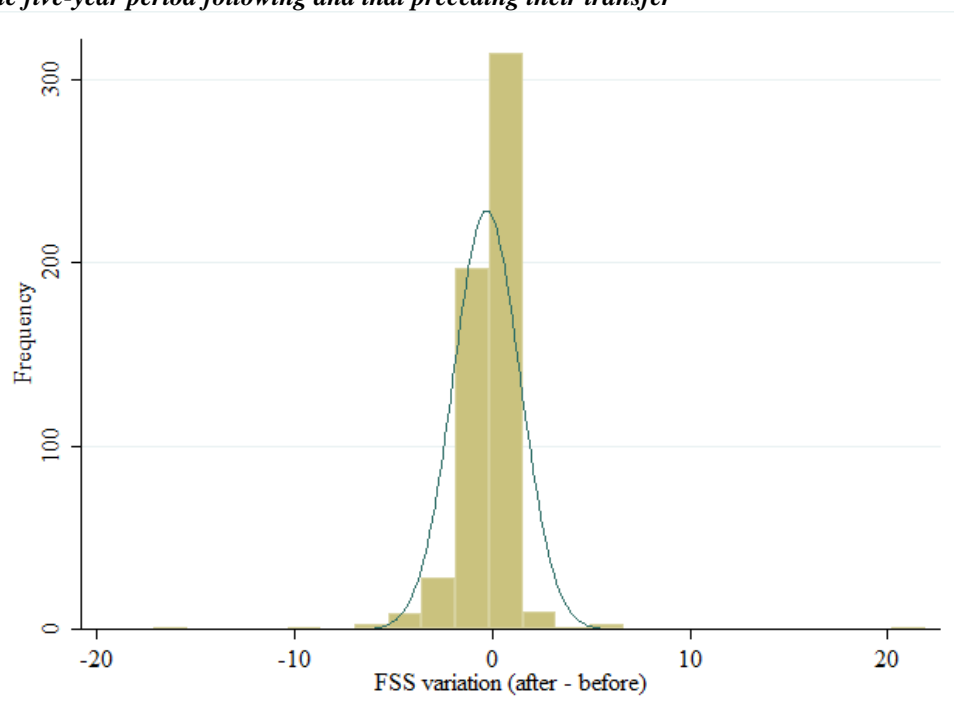


Figure 3: Scatter plot of the difference in productivity of academics in the dataset, as a function of productivity in the five years preceding their transfer

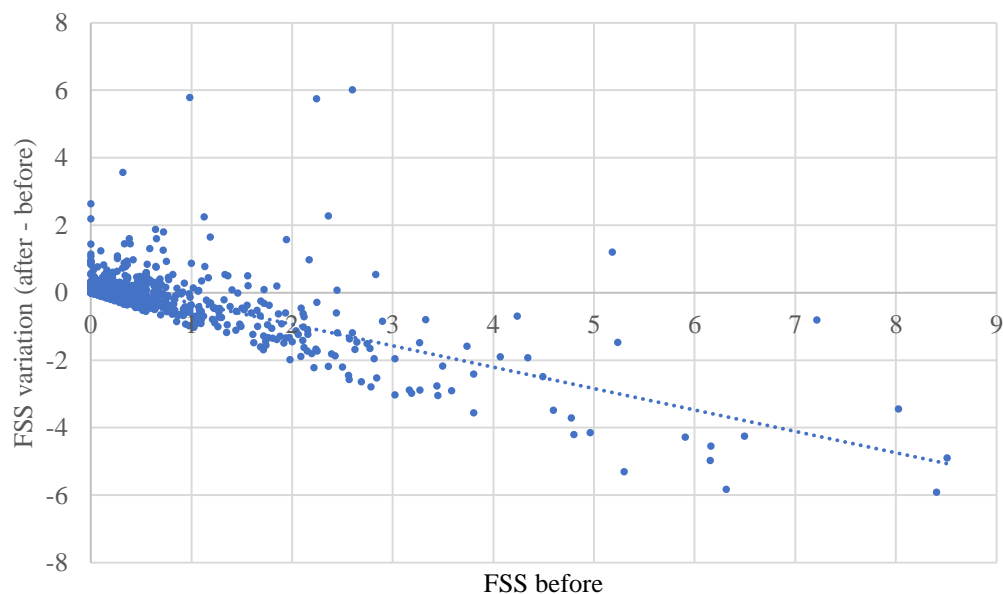


Figure 4: Scatter plot of the difference in productivity of academics in the dataset at the turn of the transfer, as a function of the difference in productivity between the destination (D) and origin (O) groups.

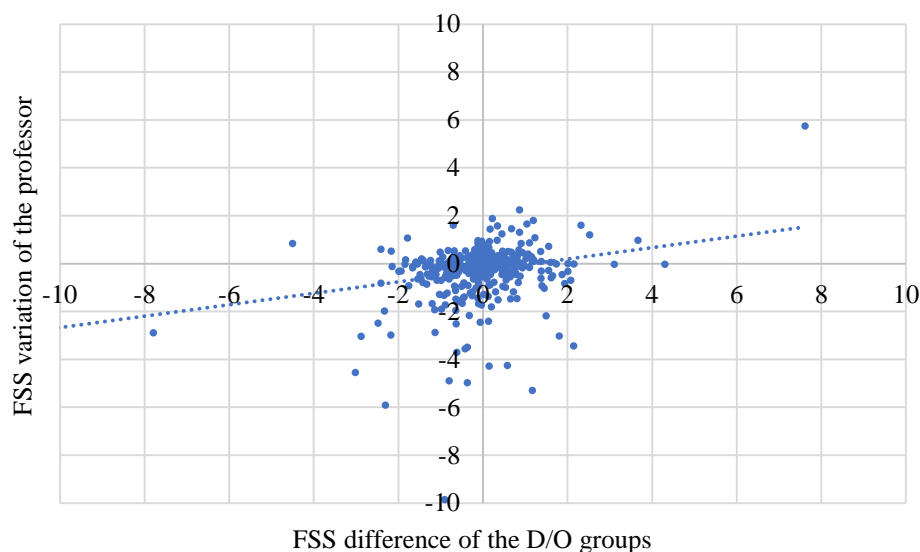
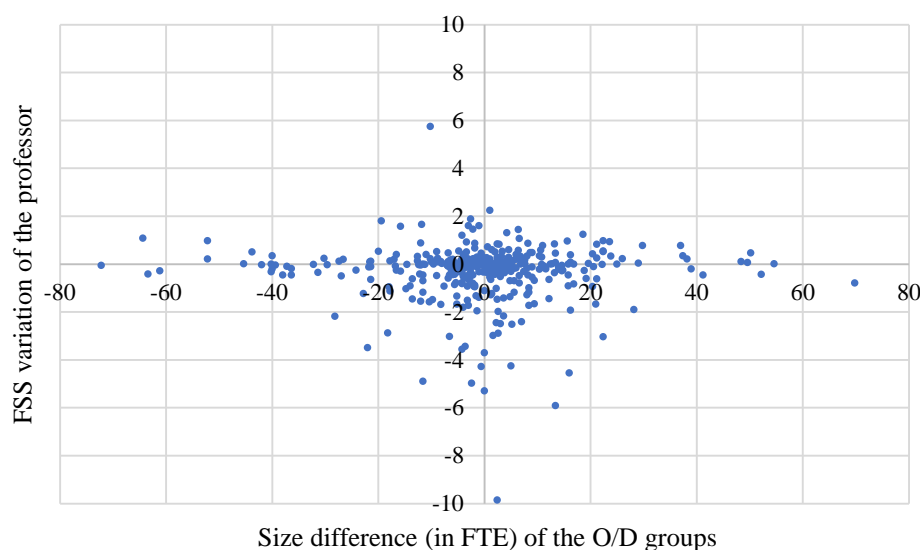


Figure 5: Scatter plot of the difference in productivity of the academics in the dataset at the turn of the transfer, as a function of the difference in size between destination (D) and origin (O) groups.



The question now arises whether the possible effect of the change in performance following a transfer can be related to the fact that the transfer takes place following the award of a competition involving a change of academic rank (from assistant to associate professor, or from associate to full professor). There are 152 such cases in the dataset, and in Table 1 we report the outcome of a t-test to check for differences in the productivity gap for such academics and the remaining 416 affected by a transfer without a change of academic rank. Although there is a smaller average reduction in productivity for the former (-0.138), the difference with respect to that recorded for the latter (-0.306) is not statistically significant. The same result is reached with the non-parametric Wilcoxon rank-sum Mann-Whitney test ($z = 1.239$; $\text{Prob} > |z| = 0.215$).

Table 1: Two-sample t-test with equal variances for FSS variation at the turn of the transfer between academics moving for a career progression (vertical move) or not (horizontal move).

Type of move	Obs	Mean	Std Err.	Std Dev.	[95% Conf. Interval]	
Horizontal	416	-0.306	0.071	1.447	-0.446	-0.167
Vertical	152	-0.138	0.178	2.198	-0.490	0.214
Combined	568	-0.261	0.071	1.680	-0.400	-0.123
Difference		-0.168	0.159		-0.481	0.145

$$t = -1.0567 - Pr(T < t) = 0.1455$$

The same result is reached by considering the FSS as a function of:

- a period dummy, which takes the value of 0 before the transfer and 1 after;
- a “treatment” dummy, which takes the value of 1 for transfers characterized by an academic rank change and 0 for others;
- an interaction effect between the two dummies above.

The coefficient of this interaction effect takes the value of 0.168, but the relative p-value is 0.423. This means that academics in the treatment group (transferred because of an academic rank change) tend to record positive changes in FSS compared to their peers transferred without upgrade of academic rank, but this outcome is statistically non-significant.

We then tried to investigate the correlation, if any, between the variation in academic performance and the geographic-administrative distance of the transfer that affected him/her. In fact, the transfer may have taken place between universities:

- in the same city (46 cases, equal to 8.1% of the total);
- from different cities but from the same region (18.5% of total cases);
- from different regions but from the same macro geographical area of the country, i.e., North-East, North-West, Center, South and Islands (24.8%);
- from different macro areas (48.6%).

The geographical dimension of the transfer could have an impact on the so-called adjustment costs for the moving academic, who shall face increasing “difficulties” as the geographical, administrative and cultural distance between the place of origin and the place of destination increases. However, the analysis on the data reveals the total absence of correlation between transfer distance and performance variation.

Finally, we investigated the influence of some personal characteristics such as age, gender and academic rank at the time of transfer. To do so, we conducted an OLS regression in which the response variable (Y) is represented by the FSS variation recorded for the mobile academic at the turn of the transfer. The independent variables considered are:

- Gender (X_1), specified by a dummy variable (1 for female);
- Age (X_{2-4}), specified with 4 classes, through 3 dummies (baseline “40 or less”);
- Academic rank (X_{5-6}), specified by 2 dummies (baseline “Assistant professor”);
- Productivity before transfer (X_7), FSS measured for the mobile academic in the five-year period preceding the transfer;
- Productivity difference of the destination/origin group (X_8), i.e., difference in the average FSS of the research group (SDS) that the mobile academic joins with respect to the one the academic left;
- Career progress (X_9), specified by a dummy variable (1 if the transfer is associated to a career progression).

The results are reported in Table 2,⁶ and indicate that gender is not statistically significant. The coefficient of this variable is negative and could indicate that, for a woman, the adaptation in the new work environment is more complex than for a man; however, the p-value is very high and, therefore, this conclusion is not supported by statistically significant evidence. Age, on the other hand, shows a significant coefficient, for all classes considered. In particular, all other things being equal, compared to a young academic (under 40 years of age), one between 41 and 46 years old experiences a significant reduction in productivity after the transfer, and the reduction is further exacerbated for even older academics. The data therefore seem to show a greater “flexibility” of young people who are less affected by change than their older colleagues.

Regarding the academic rank at the time of transfer, the coefficients of the two variables considered are both positive and significant. This indicates that compared to an assistant, the transfer of an associate (and even more in the case of a full professor) is accompanied by an increase in performance. Perhaps this could be explained by the fact that the higher the academic rank, the higher the value that the transferred academic brings to the new university in terms of social, professional and instrumental capital, which the assistant professor has perhaps to (re)build after his/her transfer to the new university.

Finally, the data for the last three variables shown in Table 2 confirm what has already emerged in the univariate analyses presented earlier. The scientific standing of the academic matured before his/her transfer is not easy to be maintained and developed downstream of the transfer: the coefficient of this variable is negative (-0.657) and significant. Similarly, the significance of the contextual conditions in which the moving academic operates is confirmed. The positive and significant value of the variable X_8 (0.137) indicates that the transfer can have a positive link to the academic’s productivity if it takes place to more productive groups than the source groups, and vice versa. Finally, it is confirmed that any career progress accompanying the transfer does not have a significant link on the change in productivity of the mobile academic.

Table 2: OLS regression on the possible drivers of FSS variation at the turn of the transfer of academics in the dataset.

	Coeff.	Std Err.	t	P> t	[95% Conf. Interval]	
_cons	0.587	0.193	3.04	0.003	0.207	0.967
X_1 Gender	-0.165	0.189	-0.87	0.384	-0.537	0.207
X_2 Age: 41_46	-0.572	0.234	-2.44	0.015	-1.033	-0.111
X_3 Age: 47_53	-0.641	0.262	-2.44	0.015	-1.157	-0.124
X_4 Age: 54 or more	-0.961	0.290	-3.31	0.001	-1.532	-0.390
X_5 Rank: Associate	0.370	0.223	1.66	0.098	-0.069	0.810
X_6 Rank: Full	0.694	0.277	2.5	0.013	0.149	1.239
X_7 FSS before the move	-0.657	0.043	-15.46	0.000	-0.741	-0.574
X_8 FSS difference of the O/D groups	0.137	0.069	1.99	0.048	0.001	0.272
X_9 Career progress	0.201	0.211	0.95	0.341	-0.214	0.616

Number of obs = 345; $F(9, 335) = 28.96$; $Prob > F = 0.000$; $R\text{-squared} = 0.438$; $Adj\ R\text{-squared} = 0.423$; $Root\ MSE = 1.451$

⁶ The footnote indicates that the analysis is referred to 345 observations, because compared to the initial 568 transfers, we excluded those concerning places of origin/destination with less than one unit of FTE staff in the SSD of the moving professor and 39 transfers relating to professors whose age is not known.

5. Discussion and conclusions

The mobility of a researcher represents a mechanism of knowledge diffusion, able to generate relevant spillovers on organizations, sectors, countries. As it leads to the dissemination of ideas and new knowledge, mobility is considered an important factor for the development of the research systems and, consequently, of the economies of countries. All this explains the interest of policy makers, which are increasingly engaged in defining and implementing interventions to facilitate and support mobility, as well as the wealth of studies in the literature aimed at investigating motivations, drivers and effects. In this paper, we focused on this last aspect and, in particular, on the relationship between mobility and research performance, considering the confounding effect of the researchers' personal traits, as well as contextual factors related to the origin/destination of their transfer. We limited the analysis to transfers between national universities, therefore to a particular type of mobility, i.e., the one within a domestic domain, the Italian one, strongly regulated and centrally governed. A context in which the researcher is in fact a *civil servant*, whose mobility is not determined by incentives typical of a real labor market, being in fact precluded to individual organizations the possibility of customizing the job offer (salaries, for example, are only a function of academic rank and seniority).

Data on Italian mobile academics in the five-year period 2009-2014 reveal that good research productivity is not a significant predictor of the likelihood of transfer, rather the opposite is true. The research performance of mobile academics is quite heterogeneous, but it is the less productive ones that represent the larger share of those who move, and very numerous are the cases of transfers of unproductive academics. This evidence is contrasted by the results of those who have analyzed the flows of young researchers going out of the country, in search of better opportunities to exploit their potential (Nascia, Pianta, & Zacharewicz, 2021), especially to countries with *world-class* universities. This apparent contradiction is partly explained by rigged competitions for recruitment and career advancement, involving extensive favoritism: talented young scientists who cannot enter the higher education system or whose career progress is halted by “favored” candidates are likely to expatriate to countries that better appreciate and reward merit (Abramo, D’Angelo, & Rosati, 2014; 2015). A national mobility entrusted to researchers without a high scientific profile, combined with the presence of such consistent outflows and, at the same time, very modest inflows (less than 1% of academics in Italy are foreigners, with an average research productivity only slightly higher than that of Italians),⁷ does not bode well for the development of the Italian research system.

To complicate the picture, there is the fact that more than half of the academics affected by mobility worsen their performance after the transfer. This evidence is in line with that part of the literature that detects significant productivity decreases in the years after job changes, due to the so-called “adjustment costs” (Fernández-Zubieta, Geuna, & Lawson, 2016), which do not seem to differ with the “geographical” relevance of the move. The absence of positive effects of mobility on research performance for the Italian case confirms what emerged from Aksnes, Rorstad, Piro and Sivertsen, (2013) for the Norwegian academic systems, featured by low levels of mobility and differences

⁷ For details, see Abramo, D’Angelo, and Di Costa (2019).

in publication and citation rates of mobile researchers (as compared to other researchers) vanishing when demographic characteristics are accounted for. It must be said, however, that comparability between studies is always made complex by the different methodologies employed, both in terms of indicators but also in terms of empirical strategy. In particular, the Norwegian study involves pure cross-sectional data (mobile vs non-mobile academics' performance), while ours is a longitudinal study (mobile academics' performance before vs after transfer). With respect to the second hypothesis of the paper, the analyses revealed a weak correlation between the change in performance at the turn of the transfer and the difference in performance of the two locations of origin and destination. Thus, it is not possible to establish a causal link, according to which upward mobility is associated with a significant increase in performance and vice versa; a link that is indicated in the literature in several papers, but almost all of which refer to Anglo-Saxon academic systems (Tartari, Di Lorenzo, & Campbell, 2020; Yan, Zhu, & He, 2020; Fernández-Zubieta, Geuna, & Lawson, 2016; Allison, & Long, 1990).

Certainly, there is no correlation between the variation in performance of a mobile researcher and the size of the groups he/she leaves/joins with his /her transfer, confirming the absence of returns to scale in Italian research (Abramo, Cicero, & D'Angelo, 2012). It should be noted that the result may be flawed by the inability to stratify the analyses by subject area, given the low number of observations. The overall analysis overlooks the possible existence of area effects and, in particular, the differences existing between scientific fields of an experimental nature and others of a theoretical nature, in terms of technologies, necessary infrastructural endowments, critical financial mass, etc. (He, Zhen, & Wu, 2019).

The presence of a concurrent career advancement in an academic's transfer does not appear to impact his or her research performance, at least not in a statistically significant way. Related to this, the observation of the Italian case seems to return a similar result to that obtained by Ejermo, Fassio, and Källström (2020) in their study on the effects of national mobility on the performance of Swedish researchers. More precisely, the authors report a positive effect of mobility on some bibliometric indicators, but not when mobility implies career advancement.

Regarding the confounding effect of the personal characteristics of the mobile researcher, the multivariate analysis conducted reveals that gender is not a variable that significantly impacts the variation in productivity at the turn of the transfer, while age is, all others being equal. Compared to an academic less than 40 years old, an older academic of the same academic rank, shows a significant reduction in productivity after the transfer, a reduction that increases for the older age groups, indicating a greater "plasticity" in adapting to the new context on the part of young people compared to older colleagues. The effect of academic rank, all others equal, is also significant and positive. It is plausible that higher academic ranks correspond to infrastructural endowments and social capital that the mobile academic "transfers" to the destination location with less difficulties. An assistant professor needs more time/costs to adapt to the new working environment than a full professor, whose transfer is probably preceded by informal interactions with colleagues in the new university, which speed up the start up.

The results of the work represent a relevant stimulus of certain interest for policy making. The fact that mobile academics are not the most productive ones reveal the absence of adequate competitive mechanisms in the Italian higher education system,

which should elicit competition among universities to attract talented academics. Furthermore, rejoining our results with those by Nascia, Pianta, and Zacharewicz (2021) showing the brain drain, reveal the failure of the national level competition exams (*concorsi*) for career progress. The ultimate question is whether national research mobility should be favored or not, given that it does not seem to be beneficial for research performance. Of course, there are benefits other than research performance, e.g. the territorial transfer of knowledge. A future research might investigate the effects of mobile academics on the research performance of colleagues in the hosting university.

By nature, the study is inevitably domestic in scope, since the cultural, sociological and normative context of the country heavily affects results. Consequently, a certain caution is recommended in generalizing results, or even comparing them with those of other national contexts. Nevertheless, compared to the state of the art, which can be composed through the merging of contributions typically referring in any case to individual national contexts or individual fields of interest, the contribution presented here is characterized by the robustness of the approach used to measure performance, compared instead to the heterogeneity of the approaches proposed in the literature, especially with reference to the partiality and non-homogeneity of the indicators used that could, at least in part, explain the non-convergence of the evidence so far emerged on the subject.

The authors are aware of few limits of the study. First of all, the intrinsic limits of evaluative bibliometrics approaches apply to this work: i) publications are not representative of all knowledge produced (tacit knowledge is not captured); ii) bibliographic repertories do not cover all publications; and iii) citations are not always certification of real use and representative of all use. Furthermore, the scope of the work is limited to national mobility, as information on international mobility was not available to us. Finally, results might be affected by confounding variables that we do not consider in our study, e.g. the frequency of mobility, or the variation in the disciplinary focus that mobility might entail.

Author contributions

Abramo, Giovanni: Conceptualization; Methodology; Project administration; Supervision; Writing - Review & Editing

D'Angelo, Ciriaco Andrea: Methodology; Data curation; Formal analysis; Investigation; Validation; Visualization; Writing – original draft

Di Costa, Flavia: Data curation; Formal analysis; Investigation; Visualization; Writing – original draft

Competing interests

The authors declare that they have no known competing financial interests or personal relationships that could have appeared to influence the work reported in the manuscript.

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Data availability

Being subject to Clarivate-WoS licence restrictions, raw data cannot be made publicly available, but are available from the authors upon request by the reader for personal interest only.

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