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**To move or not to move? An investigation of transition to a permanent academic faculty position based on cases of science and engineering doctoral graduates from a UK research-based university**

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**Abstract**

Drawing on data from an original survey of 7 years of career trajectories of doctorates in physical sciences and engineering from a UK research-based university, the paper explores how organisational tenure and inter-organisational mobility are intertwined in the process of postdoctoral fixed-term researchers' transition to a permanent faculty position. Event-history analysis using the multinomial logit approach to analyse discrete time competing risks problems is adopted for the analysis. Results suggest that while casualisation is common in the UK higher education and many S&E doctorates start their academic careers as fixed-term postdoctoral researchers in universities, those who eventually

secure a permanent academic faculty position are those who are mobile. Furthermore, these mobile academics are more likely to obtain a permanent academic faculty position within 2-4 years of their postdoctoral working experience. Results also point out that for mobile scientists, after this 'golden period', however, longer duration of working as a fixed-term postdoctoral researcher has a negative relation with finding a permanent faculty position. As for non-mobile fixed-term postdoctoral researchers who have always been in the same organisations, the longer they stay, the less likely they will obtain a permanent faculty position. Our results suggest that in order for a postdoctoral research experience to be the stepping stone into a permanent faculty position, the researchers must develop a productive research network within the hosting department and translate the research output into tangible and portable knowledge assets such as publications to compete in the open market.

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**Keywords:**

Permanent academic faculty position, science and engineering, postdoctoral fixed-term research, mobility, duration, organisation-specific human capital, generalised human capital

## **1 Introduction**

In the UK higher education, several managerial controls and performance auditing mechanisms have been introduced to make sure that universities are accountable (e.g. Farnham, 1999, Henkel, 2000, Morris, 2003). These measures include the National Student Survey (NSS) to assess student satisfaction, league tables, the UK Quality Code for Higher Education and assessment conducted by the Quality Assurance Agency (QAA), and last but not the least, the Research Exercise Framework (REF) to evaluate academics' research capacity and impact. In particular, the REF has profound impacts on the academic labour market for several reasons. First, academics are increasingly assessed based on performance indicators such as the number of journal publications, impacts and the amount of external funding secured for their organisations. Every few years, just before the REF, universities hunt for new recruits with better profiles for the REF. Academics who have established a good profile also take the opportunity to move to more senior positions or to better universities through open competition in the external labour market. Secondly, research now is crucial to university funding. As research funding can only be secured for a short-term basis, universities have borrowed the 'flexible firm' strategy (Atkinson, 1984) exercised in the private enterprises. Many contract researchers are recruited to fulfil immediate research needs. Indeed, academic professionals have transformed from a relatively small homogeneous elite of intellectuals to a large diversified set of sub-professionals that can be classified into those who teach and those who research, between those whose main duties are managerial and those whose main duties are pedagogic, and between those who are permanent staff and those who are non-permanent staff (Farnham, 1999). Parker and Jary (1995) also pointed out that one of the most telling indicators of the 'new' higher education is the casualisation of the academic labour force, i.e. the wide use of contract researchers/teaching fellows, part-timers, postgraduate tutors, etc. Statistics show that in

2010/11, 28% of the academics in higher education institutions funded by the Higher Education Funding Council for England (HEFCE) were in non-permanent contracts and 21% were part-timers (HEFCE, 2012). For research-only staff, the figures were even more striking. In the same year, in UK universities, as high as 69% of research only staff were employed on a fixed-term basis.<sup>1</sup>

Although there are some studies examining how academics experience casualisation in their daily life and how they make sense of insecurity when long-term employment is unforeseeable (Ackers and Oliver, 2007; Araújo, 2009; Collinson, 2000; Harney et al., 2014), these studies are predominantly qualitative and focus mainly on how the changes within academia affect academics' working experience and personal life. There are also some quantitative studies (Bonnal and Giret, 2010; Gaughan and Robin, 2004; Robin and Cahuzac, 2003) exploring the effect of duration of fixed-term academic research employment on winning a permanent contract in academia, but the dynamics of how the training department and the organisational tenure of a fixed-term academic researcher play a role in securing a permanent academic position for these researchers are less understood. Drawing on data from an original survey of 7 years of career trajectories of doctorates in physical sciences and engineering from a UK research-based university, this paper adopts the resource-based view of strategic human capital investment (Wright et al., 1994; Wright et al., 2001) and explores how organisational tenure and inter-organisational mobility affect fixed-term researchers' careers. We found that while inter-organisational mobility enhances researchers' chance of obtaining a permanent faculty position, a moderate length of organisational tenure further amplifies the chance. Combining information from our qualitative interviews, our results suggest that in order to remain competitive, when recruiting junior faculty members,

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<sup>1</sup> Data source is from the University and College Union (UCU) website: <http://www.ucu.org.uk/index.cfm> (accessed on 1 May 2014)

universities take advantage of fixed-term researchers' organisational research networks within the previous employers by hiring candidates who are from different universities. The reason for doing so is to capture the value of research output resulted from the candidates' previous research networks/projects. Indeed, although organisation-specific research networks might not be easily portable, research output of an individual on the other hand can easily be transferred into tangible scientific productivity of the hiring department. The paper is organised as follows. Section 2 reviews determinants of finding a permanent faculty positions for postdoctoral researchers. Section 3 describes the methodology. Section 4 presents the findings and invites discussion. Conclusions are outlined in Section 5.

## **2 Strategic human capital and fixed-term postdoctoral researchers' transition to a permanent faculty position**

Although empirical evidence showed that a large proportion of doctoral graduates start their academic careers as postdoctoral researchers (e.g. Lee et al., 2010), we know very little about the effect of having postdoctoral research experience on the pursuing of long term academic careers. Curtis (1969) pointed out that postdoctoral researchers seek to work with famous scholars and gain further research experience. Youtie et al., (2013) showed that for US academic scholars, those who have postdoctoral research experience are perceived to be more creative by their peers. This might lead to a hypothesis that postdoctoral researchers are more competent in research than fresh doctoral graduates. Postdoctoral researchers thus may be more desirable to the hiring departments when recruiting junior faculty members. However, Long et al. (1979) studied 239 American male PhD biochemists and found that the only advantage of postdoctoral experience is that it offers the opportunity for doctoral graduates to upgrade their educational background if their doctoral training was from lower ranked universities. McGinnis et al. (1982) studied 557 American PhD biochemists and found that

getting postdoctoral training does not affect one's chance of obtaining a prestigious job, while where the training is from does. Long et al. (1979) thus concluded that academic employers pay attention only to the candidates' most recent affiliations. This suggests that if a doctoral graduate is from a prestigious university, the benefit of doing further research training for the person in pursuing an academic career is limited. Gaughan and Robin (2004) found evidence of a negative effect of postdoctoral experience on securing a permanent academic position for French life scientists, but not for their US counterparts. Further to this, Robin and Cahuzac (2003) studied French life scientists and explored the effect of duration of doing fixed-term academic research after doctoral training on securing a first permanent faculty position. They found that the longer the time a doctoral graduate spend in fixed-term academic research position, the lower the person's chance of securing an open-ended contract in the public sector rather than not. There is evidence of uncertainty in career development and personal life associated with postdoctoral fixed-term positions. Several empirical studies have been conducted in the UK. Collinson (2000) found that social science contract researchers feel a deskilling in their subject areas as their occupational life involves a sequence of change in projects. Harney et al. (2014) also reported that university fixed term researchers, due to their short cycles of contracts, experience insecurity and uncertainty in many aspects of personal life, including employment prospects, research direction, starting a family and even obtaining a mortgage or buying a house. Similarly, Ackers and Oliver (2007) labelled some academic fixed term researchers as having a 'Cinderella' status because of their lack of security and certainty for the future. These features are not only seen in the UK. Araújo (2009) described Portuguese academic contract researchers' discontent in the conditions of work and in the pursuit of status and a stable career path. These studies indicated that while their research capability is acknowledged, postdoctoral fixed-term researchers are under constant pressure of securing a permanent position. Based on a survey of an Australian university, Nadolny and

Ryan (2015) found that compared to McDonald's casual employees, casual academics express even lower level of overall job satisfaction.

Strikingly, very little is known about how a fixed-term research position can successfully turn into a stepping stone to a permanent faculty position. There are some factors that might determine who will be hired for a permanent academic faculty position. From the resource-based view of strategic human capital investment, organisations invest in human capital that can be sources of competitive advantages (Wright et al., 1994; Wright et al., 2001). It is argued that organisations competing through organisation-specific knowledge assets are more likely to invest in human capital that is organisation-specific and less portable to ensure that inimitable and rare knowledge assets are safely retained within organisations (Barney and Wright, 1998). When an employee moves to another organisation, the person's organisation-specific experience acquired from the previous employer becomes less productive in the new organisation (Hatch and Dyer, 2004). Under such rationale, tenure within an organisation is encouraged and will be valued as it guarantees well developed coordination, networks and shared knowledge among employees. Indeed, employees' job tenure which translates into experience in performing specific tasks within an organisation is positively associated with firm productivity (Chowdhury et al., 2014). Research shows that many universities tend to hire academics who receive doctoral research training within the hiring department (Berelson, 1960; Caplow and McGee, 1958; Cruz-Castro and Sanz-Menéndez, 2010). Especially in the top universities, Eisenberg and Wells (2000), based on the 1993/1994 directory of law teachers of the Association of American Law Schools, found that for entry level, the proportion of faculty graduated from own departments was 81% for Harvard and the figure for Yale was 73%. The hiring of own graduates suggests the significance of the university-specific social-ties in the academic job market. Quality, ability and organisational

commitment of candidates who are trained through the hiring departments are more likely to have been known to faculty members; for the recruiting committee, judgement based on these known facts might be perceived to be more reliable than assessing other candidates based on their application forms (Bonnal and Giret, 2010; Eisenberg and Wells, 2000; Long, et al., 1978). Indeed, university-specific social ties, i.e. who you know and whom you collaborate with locally, is often crucial in the academic job market. Combes et al. (2008) found that in France, for those who compete for the positions of professors of economics, when a candidate's PhD supervisor or workplace colleague are in the recruitment panels, the person is more likely to be hired. In academia, well-established research collaboration relationships within a school or a department can be a particularly important source of competitive advantage. Well-developed collaboration relationships comprise carefully selected researchers with complementary knowledge assets in specific subject areas in which the school/department is specialised help a department/school to sustain competitive advantage (e.g. a mechanical engineering department might be particularly renowned for its research in CFD modelling). This further attracts aspiring researchers and students. Academics working in these organisations can therefore learn not only from colleagues but also from the specialist knowledge embedded within the schools/departments. Therefore, Bonnal and Giret (2010) demonstrated the positive effect of local networks in the academic labour market in France. Furthermore, hiring own graduates can effectively facilitate strategic allocation of teaching duties. It is found that departments recruit strategically their own fresh doctoral graduates to fill in junior teaching positions, in order to reserve more senior positions for more well-known and research-oriented external candidates (Caplow and McGee, 1958). Besides, career theories have suggested that, the longer an employee works for an organisation, the more the person may develop a sense of attachment, obligation or loyalty

towards the organisation (Allen and Meyer, 1993; Mayer et al., 2002). These are valuable organisation-specific assets for the hiring departments.

On the other hand, organisations may compete through knowledge assets that are valuable and transferrable within the profession and are prepared to pay for them in the open market. In such case, organisations invest in human capital that is superior although it might be general and portable within organisations in a profession (Wright et al., 1994). It is acknowledged that one of the most important performance indicators of academic excellence is scientific productivity (Merton, 1973; Stephan, 1996). In academia, proven and potential scientific productivity has been a key person specification for recruitment in contemporary universities (e.g. Cable and Murray, 1999). Although everyone in academia conducts research and writes papers, it is the superior scientific productivity that really positions an academic in the open labour market. Under such rationale, universities or hiring departments hunt for scientifically productive academics to sustain competitive advantages.

As for who the scientifically productive academics are, there is a theory stressing that mobile scientists are more scientifically productive (Edler et al., 2011; Franzoni et al., 2014). Mobile scientists may outperform others through building networks in different geographical locations. This type of assets could be particularly valuable when scientific output is increasingly characterised by efforts from larger teams (Wuchty et al., 2007) and when collaboration is becoming the dominant mode of academic knowledge production (Gibbons et al., 1994). Indeed, studies showed that internationally mobile scientists are not only able to build greater international research networks (Scellato et al., 2015), but also more productive in terms of research impacts and outputs (Baruffaldi and Landoni, 2012; Franzoni et al., 2014; Jonkers and Cruz-Castro, 2013). From a longitudinal point of view, Bäker (2015) found that,

while German junior non-tenured academic researchers experience a short-term (within 2 years of changing affiliations) negative impact of changing employers on scientific publications, for the long run (after 2 years of changing affiliations), mobility shows a positive effect. Similarly, mobile academics who build up their careers in places other than the ones they received their research training are also found to be more productive in terms of the number of journal publications, citations or h-index (Hargens and Farr, 1973; Horta et al., 2010; Inanc and Tuncer, 2011).

Based on the resource-based view of strategic human capital investment, this paper investigates how the factors such as organisational tenure, which indicates the stock of organisation-specific knowledge development in research tasks, and inter-organisational mobility, which results from a superior generalised human capital investment, are intertwined in the process of junior researchers' transition to a permanent faculty position. By doing so this paper addresses the question of, under what conditions, a fixed-term academic research experience may successfully turn into a stepping stone to a permanent faculty position.

### **3 Methodology**

#### **3.1 Data**

We draw on an original survey of science and engineering (S&E) doctoral graduates from a UK research-based university, the University of Manchester, to explore their career trajectories. The University of Manchester is the largest single-site university in the UK and has renowned and well-developed engineering and physical science departments. This provides a reasonable size sample. Second, it is a member of the UK Russell Group, which represents the top 20 leading universities in the UK. Its leading position means that it offers attractive doctoral training for PhDs seeking either an academic career or a degree respected

by industrial employers. We also adopt the strategy of selecting home (UK and other EU) PhD students graduated from specific years to minimise culture and cohort effects.

The population sampled for the survey includes all the home PhD students that graduated between 1998 and 2001 from the physical sciences and engineering disciplines from the University and all jobs they have had since doctoral training. The sampling frame comprises 512 PhDs with UK addresses and 84 PhDs with other EU addresses. The sampling strategy is a single stage clustered sampling (individuals as primary sampling units and jobs as secondary sampling units), and as all postgraduates in the sampling frame have the same selection probability and all jobs (Appendix A) from individuals have the same selection probability, the sample is self-weighted. Such a sampling strategy allows jobs to be clustered into individuals. It is assumed that individuals are independent from each other, whereas jobs are correlated with the individuals to whom they correspond.

The survey collects retrospective employment history (at the individual and job level). It covers 7-10 years employment history in order both to allow for changes in jobs and to minimise non-responses caused by too long a period. The questionnaire asks respondents details of their current and past jobs (including timing of job change in year, sector, title, job task, whether the job is permanent, full-time, whether the job is the result of a promotion from the previous job and whether the job involves a change of employer). Other personal information including when the respondent finished doctoral training, gender, whether the respondent is from UK or the EU, discipline of doctoral training (sciences or engineering) and scientific productivity resulted from doctoral training (the number of journal publications) was also collected in the survey. We designed a questionnaire that asks all the relevant questions with a layout of four A4 pages printed double sided on an A3 page.

One of the main considerations of our research design was to overcome difficulties in accessing personal information due to the UK 1998 Data Protection Act. Thus, the survey was conducted by post through the Alumni Office to preserve confidentiality. The survey was posted between April and July 2008. The first wave of the survey resulted in 82 responses in four weeks. E-mail reminders were sent to encourage responses. After the deadline, 20 more respondents returned the survey questionnaires. A total of 91 UK and 11 other EU responses were obtained. There were 38 UK and 7 other EU undelivered returned questionnaires. The overall response rate is 18.5% at individual level (19.2% for UK addresses and 15.3% for other EU addresses). A total of 102 individuals and 282 jobs are obtained. As the sample is self-weighted, bias could come mainly from non-responses. Non-response bias has been assessed and no significant bias is found.<sup>2</sup>

### 3.2 Methods

Event history analysis of discrete-time to competing events is used to analyse the data. As we asked each respondent to indicate in which year that the respondent had a job change, we measure respondents' time to obtain their first permanent position in yearly intervals. Although the survey obtained respondents' 7-10 years of job history after doctoral training, in this paper, we limited our study to the observation length of 7 years in order to have a fixed censoring time point. We also limited our respondents to those who had a UK address and had been in paid employment only. After missing data are excluded, a total of 85

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<sup>2</sup> At the individual level, the distribution of survey population according to gender, discipline, year of graduation and location (UK or other EU) is known. A characteristic comparison between respondents and non-respondents across these dimensions using chi-square tests for independence indicates that there is no evidence showing that respondents and non-respondents at individual level are different in gender ( $\chi^2=0.29$ ;  $df=1$ ;  $p=0.590$ ), discipline ( $\chi^2=1.073$ ;  $df=1$ ;  $p=0.300$ ), year of graduation ( $\chi^2=0.528$ ;  $df=3$ ;  $p=0.913$ ) and location ( $\chi^2=1.113$ ;  $df=1$ ;  $p=0.291$ ). At job level, as there is no information about the number of total jobs held by the surveyed PhDs - a comparison of the mean number of jobs held by each individual between the concurrent waves indicates there is no significant difference ( $t(97)=1.134$ ; two-tailed  $p=0.260$ ) between the number of jobs held by respondents from the first wave (mean=2.92; SE =0.130; N=79) and the number of jobs held by respondents from the second wave (mean=2.60; SE =0.245; N=20). There are very few cases of missing data due to missing information. Attrition due to such cases is assumed to be insignificant.

respondents, 75 events (a permanent job) and 185 person-years are used for the analysis. The analysing unit is the person-year. In order to incorporate the time-varying variables such as whether a respondent changed employer when the person made a job move, working sector of the job and the time duration after doctoral training, we use the multinomial logit approach to analyse discrete time competing risks problems (Allison, 1982; Box-Steffensmeier and Jones, 2004). This approach allows the assessment of the risk of more than one event at a time. In our case, in each year after doctoral training, each respondent might experience “events” of securing a permanent position either in academic research, in public research organisations and doing research or in employment outside academic/public research. Our respondents almost all entered employment immediately after doctoral training. As individuals might stay in a fixed-term position for many years until securing a permanent position (experiencing the “event”), our data are clustered into individuals. Besides, in order to account for any unknown form of heterogeneity, we use the Huber-White robust estimators (Rogers, 1993; White, 1980; Williams, 2000). These considerations are implemented through the STATA robust-cluster command (Rogers, 1993). Finally, to assess the effect of duration dependence, a time duration identifier is incorporated into the regression analysis. The analysing tool is STATA 10. Quantitative analysis results are then supplemented with qualitative information from our preliminary interviews with two university professors.

### **3.3 Measures**

#### **Dependent variable**

The dependent variable, EVENT, indicating the state of employment status of each respondent in each of the observing years until a permanent position was found. That is, we asked each respondent to state the year when his or her doctoral training was completed and for each job after doctoral training, in which year the respondent started the job. We also

asked each respondent to outline that for each of the respondent's jobs, whether the job is in a permanent or in a fixed-term contract and the working sector of the job.<sup>3</sup> Based on these survey questions, the variable EVENT is constructed and it indicates in each observing year (after doctoral training), the employment status of each respondent in the following four categories: 1) a fixed term position, 2) a permanent position in academic research, 3) a permanent position in research in a public/non-profit research organisation and 4) a permanent position in non-academic/public research. Once a respondent experienced his or her first permanent position, the observation for the person terminated. We define academic research as jobs in academic faculty positions or academic research positions.<sup>4</sup> Similarly, research in public/non-profit research organisations are referred to as research positions in government, public or non-profit research organisations.<sup>5</sup> We then classify those jobs in paid employment but outside academic/public research as jobs in the sector of non-academic/public research. It should be noted that within non-academic/public research positions, there were less than 7% of respondents whose first jobs were in a fixed-term contract (Table 1). A detailed case-by-case investigation shows that these individuals found their first permanent positions within 2, 3 and 5 years of graduation, all in the private sector. Although all our respondents obtained a job within 1 year of the completion of their doctoral training, not all of them had a permanent position and those fixed-term non-permanent jobs were almost all in research position in academia (Table 1).

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Insert Table 1 about here

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<sup>3</sup> Each respondent was asked to provide information about employment code of each job after PhD training among the following options: 1) university faculty position, 2) university research position, 3) other university post, 4) private sector company – service, 5) private sector company – manufacturing, 6) private sector company – other, 7) research post in a government/public/voluntary organisation, 8) other position in a government/public/voluntary organisation, 9) running own company, 10) freelance worker and 11) other type of employment.

<sup>4</sup> This sector comprises categories 1) and 2).

<sup>5</sup> This sector refers to category 7).

## **Explanatory variables**

In order to assess whether fixed-term researchers are more likely to secure a permanent position within the organisations that offer them postdoctoral training or not, a variable concerning job mobility status, **MOBILE**, is constructed. We asked each respondent to indicate whether he or she changed employer from one job to the subsequent job. In any given year, if a respondent was in a job with an employer different from the employer of the previous job, we define that the respondent's job mobility status in that given year will be regarded as being mobile (yes is coded 1; otherwise is coded 0). As all our respondents used in the analysis found their first jobs within one year of the completion of doctoral studies, for job mobility status in the observed year 1 (after doctoral training), all jobs are considered immobile (that is, for all respondents, variable **MOBILE** is coded 0 in the observed year 1). This variable, however, is a time-varying variable. A respondent might change job and employer in year 3, for instance. In such case, in observed year 3, the respondent's job mobility indicator **MOBILE** in this year and onward before another job change is coded as 1.

A further variable, **LNT**, indicating the duration of the time working for a fixed-term position, is constructed. As the censoring variable is the time of obtaining a permanent position (in a permanent position in academic research, in a permanent position in research in a public/non-profit research organisation or in a permanent position in non-academic/public research), for each respondent, for each observed year until obtaining a permanent position, we firstly construct a variable indicating the duration of the years between the completion of doctoral training and the observed year. For instance, if a respondent started his/her career in a fixed-term position and obtained a permanent position within the third year after doctoral training, there will be three person-years for the respondent. The first year after doctoral

training is coded 1, the second year after doctoral training is coded 2 and the third year after doctoral training is coded 3. We then transform the variable indicating the duration years until a permanent position into the variable LNT. Variable LNT takes the form of natural logarithm of the duration years.

Control variables include the number of journal publications resulted from doctoral training JOURNAL, gender of respondents FEMALE (female=1 and male=0) and subject areas of doctoral study ENGINEERING (engineering=1 and physical sciences=0). Descriptive statistics are shown in Table 2.

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Insert Table 2 about here  
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#### **4 Findings and discussion**

Regression results are shown in Table 3. To ensure the robustness of the multinomial logit model, the same specification of the multinomial logit model without the robust-cluster option is tested and the results from both models are entirely consistent. We test the independence of irrelevant alternatives (IIA) assumption (Hausman and McFadden, 1984) using both the suest-based Hausman test and the Small-Hsiao test for the multinomial logit model without the robust-cluster option. Results show that the IIA assumption is satisfied. Using the same model specification, a subsample of those who started their careers in academic research (34 individuals; regardless of whether their first jobs were permanent or

fixed-term)<sup>6</sup> is tested, and again the results are consistent (Appendix B and Appendix C). Furthermore, as there are 75 events and 5 predictors in the model, the ratios of the number of events to the number of predictors is 15, which is greater than the guideline of a minimum ratio of 10 suggested by Peduzzi et al (1996). Using local regression smoothing technique (with bandwidth 0.5), the predicted propensity of finding permanent position by different events and whether there is a change of employer is shown in Figure 1.

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Insert Table 3 about here

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Insert Figure 1 about here

Bearing in mind that the model is nonlinear<sup>7</sup> and we cannot comment on effects of the variables on the predicted propensity solely based on the magnitude of coefficients and signs, a graphical representation showing how the predicted propensity varies by duration in fixed-term employment and by different events (i.e. sectors) is presented (Figure 1). The graphical representation reveals interesting patterns as follows.

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<sup>6</sup> There were 35 individuals started their first jobs in academic research. However there was only 1 individual who eventually found a permanent position in research in public research, non-profit organisations. The individual thus is dropped from the analysis.

<sup>7</sup> At a first glance, regression results (Table 3) show that duration in fixed-term positions decreases the hazard (i.e. the propensity of obtaining a permanent position rather than not). The effect stands for getting a permanent position in academia, in public research organisations and in employment outside academic/public research. On the other hand, results point out that being mobile (a change of employer) increases the propensity of securing a permanent position rather than not).

#### **4.1 Being mobile enhances the chance of securing a permanent faculty position**

Based on our sample, postdoctoral fixed-term academic researchers are more likely to secure a permanent position if they are mobile and change employers (Figure 1). Fixed-term academic researchers are less likely to be employed permanently within departments that host their postdoctoral research training. This confirms that the UK academic job market is relatively open. In order to be successful, for junior academic faculty positions, candidates would need to prepare to move. As competition in an open market means that the hiring departments search for superior transferable human capital that can in turn be converted into the departments' knowledge assets, candidates would need to build their profiles proactively. This includes tangible indicators such as proven scientific productivity (Cable and Murray, 1999).

#### **4.2 A moderate length of organisational tenure amplifies the chance of securing a permanent faculty position**

While the regression results roughly point out a negative effect of duration in a fixed-term position on securing a permanent position, the case for finding a permanent position in the academic research sector is an exception (Figure 1). Mobile academics, which move out of their existing employers, experience a seemingly inverted U-shaped relationship between their propensity of securing a position and the duration of working as fixed-term researchers. It appears that if a mobile doctoral graduate starts his/her career in a fixed-term research position, 2-4 years of postdoctoral research training maximise the candidate's opportunity to win a permanent faculty position. After the "golden period", the likelihood of getting a permanent position in academic research diminishes. By contrast, staying within the same employer where a doctorate receives the postdoctoral research training for a long time does

not convey such advantage. Rather, the candidate will experience continuously diminished opportunity for securing a permanent faculty position within the same organisation.

A case-to-case investigation reveals that for those fixed-term academic researchers who eventually found a permanent faculty position, 20% obtained it within the same organisations where they did their postdoctoral training, 60% secured it through a change of one employer (i.e. in their second employers) and the other 20% moved to a permanent position in their third employers after doctoral training. Together with information from the regression results, we may suggest that a fruitful fixed-term postdoctoral research experience is to spend 2-4 years working in one organisation for postdoctoral training and then move to another organisation for a permanent faculty position.

Indeed, our qualitative data from preliminary interviews confirm the seemingly inverted U-shaped relationship between the propensity of obtaining a permanent faculty position and the duration in a postdoctoral fixed-term research position. Hiring departments often use candidates' duration in fixed-term employment in academic research as an indicator for the candidates' academic quality. When asked how he sees the postdoctoral experience, a professor serving as the head of division at a UK leading engineering department stressed that:

*"I regard postdoctoral research experience within three years as a positive experience for academia but a postdoctoral position of more than three years as negative. A six-year postdoc will probably make you unemployable in industry and unattractive in academia."*

Another professor in an engineering department at another UK research-based university further elaborated this point of view by saying:

*“In my opinion, the postdoc is the most productive period of a researcher. A postdoc should be 2-5 years. Less than that would not be enough to do a good work in the postdoc and the postdoc experience will not be productive. More than that, it raises the question why the person has failed to find a permanent position so far.”*

Bäker’s (2015) German case also confirms that mobile non-tenured postdoctoral researchers properly realise their postdoctoral research to scientific publications after two years in the position (the finding corresponds to our “golden period” of postdoctoral training to secure a permanent faculty position). Although it is implicit in the interviewees’ statements, bearing in mind that in the UK a postdoctoral fixed-term researcher is typically recruited for a specific project, we may conclude that the quality of one’s postdoctoral research experience is directly tied to an organisational tenure that enables the project to be successfully completed. The success of the project would also depend on interaction, coordination and knowledge sharing among colleagues, in particular among the project investigators, within the hosting department. Thus, while postdoctoral fixed-term researcher is more likely to secure a permanent faculty position externally, his/her tenure within the hosting department, which is positively associated with the development of organisation-specific knowledge assets that require time in the organisation to cultivate, forms a positive signal and effectively boosts his/her profile in the open market.

#### **4.3 The interdependence between organisation-specific and generalised human capital**

Although the team working relationship developed within an academic department is not easily portable to another department through job mobility of one member, tangible research outputs from the research network such as publications can. In an academic labour market where universities compete through tangible performance indicators, hiring departments

search for candidates who bring such knowledge assets. This explains our UK case, as we can see that the fixed-term postdoctoral researchers who successfully secure a permanent position experience a career trajectory characterised by a moderate period of postdoctoral training followed by a faculty position in another university. How universities compete in higher education can differ in countries. For instance, Bonnal and Giret (2010) theorised that in France, for mobile scientists, the postdoctoral duration shows a negative and then a positive effect on the chance to secure a permanent faculty position. Interestingly they suggested that this can be explained by the development of social ties. Because French universities often recruit candidates locally, postdoctoral duration therefore contributes positively to the chance of obtaining a permanent faculty position with time, only when local social ties between the candidates and the hiring department become well developed. This suggests that in the French academic labour market, universities are likely to compete through organisation-specific knowledge assets. Social ties within organisations are relatively more relevant for the hiring departments than superior and portable indicators such as scientific publications as hiring consideration.

It should be noted that our results show that the number of journal publications from doctoral training does not play a significant role in determining whether the postdoctoral fixed-term researchers can get out of fixed-term academic research and win a permanent faculty position. The reason for this may be that this indicator is more likely to be used as a criterion for the entry into an academic research position, rather than later on for competing for a permanent faculty position. After having postdoctoral research experience, candidates for a permanent faculty position will be evaluated by their up-to-date scientific productivity, but not the scientific productivity during their doctoral training.

While many fixed-term researchers in academia seem to face difficulty in getting out of fixed-term positions, many postgraduates continue to pursue a career in academia. One reason may be that many do so because of a commitment to their profession, organisations or families. Many, however, may simply be unaware of the comparative advantage of securing a permanent faculty position by being more mobile and by actively looking for positions during the “golden period” of postdoc. Fixed-term postdoctoral researchers thus will benefit from paying attention to their own career management and from planning their careers strategically. It is suggested that structured post-doctoral training programmes providing mentoring and academic skills may effectively enhance post-doctoral researchers’ academic outcomes (Bessudnov et al., 2014).

Our research also raises the question of whether funding agencies and universities should take more responsibilities to challenge the casualisation of employment of doctorates. While academia may benefit from research by their flexible workers, certain interventions might be possible. For instance, in France, there is a limit of 18 months for a fixed-term contract with an employer or the same job (Langenberg, 2001). This virtually makes long-term employment in a series of fixed-term research contracts impossible. In the UK, although the Fixed Term Employees (Prevention of Less Favourable Treatment) Regulations 2002 state that universities should offer open-ended contracts to any fixed-term employee who has had successive contracts with the same university for more than four years, such open-ended contract is still subject to the availability of funding.<sup>8</sup>

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<sup>8</sup> Information gathered from various universities, including University of Manchester (<http://www.academiccareer.manchester.ac.uk/about/phdandbeyond/fixedterm/>), University of Glasgow (<http://www.gla.ac.uk/services/humanresources/staff/mgrs-admin/moc/ftoepolicy/>), SOAS (<http://www.soas.ac.uk/hr/procedures/recruitment/fixedtermstaff/>), and Imperial College London (<http://www3.imperial.ac.uk/hr/procedures/support/fixedtermworkers/faq#3>) (accessed on 8 June, 2014).

## **5 Conclusion**

The study suggests that, while casualisation is common in the UK higher education and many S&E doctorates start their academic careers as fixed-term postdoctoral researchers in universities, those who eventually secure a permanent academic faculty position are those who are mobile. That is, those who find a permanent faculty position also involve a change of employer for the job change. Furthermore, these mobile academics are more likely to obtain a permanent academic faculty position within 2-4 years of their postdoctoral working experience, when scientific outputs from the postdoctoral projects can be expected to be properly utilised. The study also points out that for mobile scientists, after this golden period, the relation between duration of work as a fixed-term postdoctoral researcher and finding a permanent faculty position becomes negative. As for non-mobile fixed-term postdoctoral researchers who have always been in the same organisations, the longer they stay, the less likely they will obtain a permanent faculty position. Our results suggest that in order for a postdoctoral research experience to be the stepping stone into a permanent faculty position, the researchers must develop a productive research network within the hosting department and translate the research output into tangible and portable knowledge assets such as publications to compete in the open market.

We acknowledge some limitations of this study. We focus on a small sample of S&E postgraduates from the University of Manchester with 7 years of employment history in the labour markets. The inferences do not go beyond the survey population. Also, the study features junior academics with 7 years working experience only. Senior academics are likely to have different experiences in the labour markets. Nevertheless, overall, we believe that our research sheds light on the understanding of early career behaviour of postgraduates with

doctoral degrees, and provide valuable policy implications for human resource management in academia.

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Table 1: Distribution of first jobs by sector by employment condition, within one year of graduation

	Fixed-term Number (Row percentage)	Permanent Number (Row percentage)	Total Number (Row percentage)
Academic research	20 68.97%	9 31.03%	29 100%
Research in public research organisations	1 20.00%	4 80.00%	5 100%
Non-academic/public research	5 9.80%	46 90.20%	51 100%
Total	26 32.65%	59 67.35%	85 100%

Table 2: Descriptive statistics

	Mean	Std. Err.	EVENT	MOBILE	LNT	FEMALE	JOURNAL	ENGINEERING
EVENT	0.984	0.097	1.000					
MOBILE	0.168	0.028	-0.116	1.000				
INT	0.694	0.053	-0.548	0.394	1.000			
FEMALE	0.411	0.036	-0.299	0.184	0.236	1.000		
JOURNAL	2.427	0.150	-0.215	0.070	0.090	-0.127	1.000	
ENGINEERING	0.162	0.027	0.140	-0.119	-0.140	-0.099	0.132	1.000

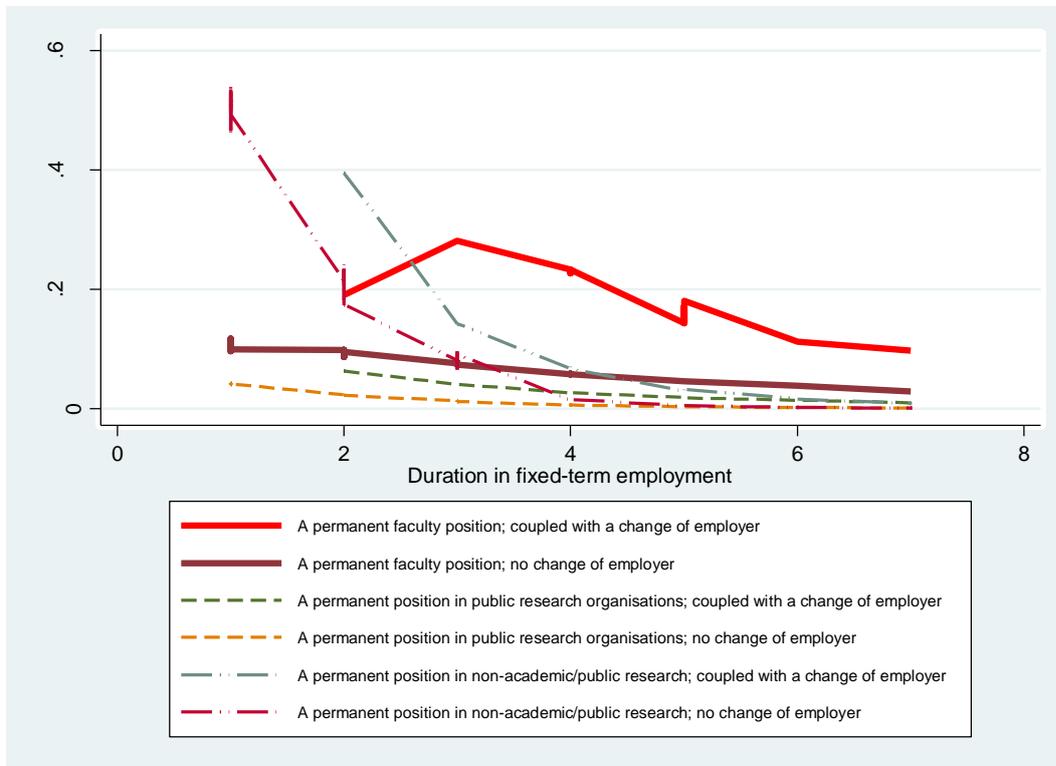
Table 3: Regression results

EVENT <sup>(a)</sup>	Coef. (Robust Std. Err.)	Coef. (Robust Std. Err.)	Coef. (Robust Std. Err.)
<b>Academic research</b>			
MOBILE			1.860* (1.090)
LNT		-0.642* (0.378)	-1.153* (0.624)
FEMALE	-0.197 (0.608)	-0.108 (0.561)	-0.189 (0.566)
JOURNAL	0.085 (0.160)	0.080 (0.146)	0.027 (0.147)
ENGINEERING	1.556** (0.689)	1.468** (0.596)	1.747** (0.702)
CONS	-2.246*** (0.646)	-1.729*** (0.584)	-1.657*** (0.583)
<b>Research in public research, non-profit organisations</b>			
MOBILE			2.368*** (0.699)
LNT		-1.550 (1.088)	-2.394** (0.971)
FEMALE	-0.540 (1.093)	-0.306 (1.071)	-0.431 (1.167)
JOURNAL	-0.113 (0.325)	-0.106 (0.320)	-0.153 (0.331)
ENGINEERING	0.867 (1.209)	0.578 (1.139)	0.780 (1.182)
CONS	-2.684** (1.175)	-1.781 (1.090)	-1.663 (1.114)
<b>Non-academic/public research</b>			
MOBILE			3.073*** (1.039)
LNT		-2.671*** (0.575)	-3.902*** (0.943)
FEMALE	-1.813*** (0.637)	-1.435*** (0.522)	-1.553*** (0.522)
JOURNAL	-0.377** (0.149)	-0.358*** (0.119)	-0.403*** (0.124)
ENGINEERING	1.044* (0.621)	0.397 (0.574)	0.555 (0.637)
CONS	0.488 (0.590)	1.615*** (0.457)	1.719*** (0.460)
N=185 person years clustered into 85 individuals			
Wald chi2(15)	40.88***	75.76***	109.94***
Log pseudo likelihood	-161.933	-136.14607	-128.725
Pseudo R2	0.121	0.2609	0.301

Note: (a) Fixed-term positions as the reference category.

\*\*\* significant at the 1% level; \*\* significant at the 5% level; \* significant at the 10% level

Figure1: Predicted propensity of obtaining a permanent position by duration in fixed-term employment



## Appendix A: Definition of a job

- Include any job (including self-employment), full-time or part-time, which you did for at least six months (or which you expect to last for at least six months).
- Don't count jobs or work experience that you did while registered as a full-time PhD student.
- If you **changed the kind of work you did, rank or job title** while working for **the same employer**, count it as a **change of job**.
- If you have worked in a Government Department, school or hospital, count any move from one Government Department, school or hospital to another, as a change of job.
- Contract researchers in academic institutions or other employment on short-term contracts: if your contract was renewed count this as an extension of the same job.
- If you had a period of "temping", free-lancing, consultancy or self-employed contract work, count the whole period as one job.
- If you went on maternity leave or sick leave and went back to the same employer for the same kind of work, rank and job title, count the whole period as one job.

Appendix B: Regression results with a subsample of those who started their first jobs in academic research<sup>(a)</sup>

EVENT <sup>(b)</sup>	Coef. (Robust Std. Err.)	Coef. (Robust Std. Err.)	Coef. (Robust Std. Err.)
<b>Academic research</b>			
MOBILE			1.641* (0.974)
LNT		-0.771* (0.432)	-1.198* (0.631)
FEMALE	-0.086 (0.643)	0.065 (0.576)	-0.011 (0.580)
JOURNAL	0.094 (0.161)	0.100 (0.137)	0.051 (0.137)
ENGINEERING	1.304* (0.724)	1.228** (0.597)	1.470** (0.674)
CONS	-2.265*** (0.682)	-1.672*** (0.622)	-1.618*** (0.613)
<b>Non-academic/public research</b>			
MOBILE			3.803** (1.788)
LNT		-0.127 (0.442)	-1.170 (1.189)
FEMALE	-0.750 (1.084)	-0.735 (1.080)	-1.605 (1.122)
JOURNAL	-0.243 (0.230)	-0.244 (0.237)	-0.362 (0.250)
ENGINEERING	-34.793*** (0.730)	-31.862*** (0.724)	-32.734*** (1.032)
CONS	-2.047** (0.951)	-1.922 (1.174)	-2.106** (0.922)
N=127 person years clustered into 34 individuals			
Wald chi2(10)	3796.70***	3110.00***	3766.36***
Log pseudo likelihood	-67.664	-65.835	-58.354
Pseudo R2	0.062	0.087	0.191

Note:

(a) Event of finding a permanent position in research in public research, non-profit organisations is dropped as there is only one such case.

(b) Fixed-term positions as the reference category.

\*\*\* significant at the 1% level; \*\* significant at the 5% level; \* significant at the 10% level

Appendix C: Predicted propensity of obtaining a permanent faculty position by duration in fixed-term employment, results based on a subsample of those who started their first jobs in academic research

