



The mobility of elite life scientists: Professional and personal determinants[☆]



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ABSTRACT

As scientists' careers unfold, mobility can allow researchers to find environments where they are more productive and more effectively contribute to the generation of new knowledge. In this paper, we examine the determinants of mobility of elite academics within the life sciences, including individual productivity measures and for the first time, measures of the peer environment and family factors. Using a unique data set compiled from the career histories of 10,051 elite life scientists in the U.S., we paint a nuanced picture of mobility. Prolific scientists are more likely to move, but this impulse is constrained by recent NIH funding. The quality of peer environments both near and far is an additional factor that influences mobility decisions. We also identify a significant role for family structure. Scientists appear to be unwilling to move when their children are between the ages of 14–17, and this appears to be more pronounced for mothers than fathers. These results suggest that elite scientists find it costly to disrupt the social networks of their children during adolescence and take these costs into account when making career decisions.

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1. Introduction

A central tenet of modern theories of labor markets is that worker mobility enhances economic productivity by allowing workers to find environments where their skills are put to greatest use. In scientific fields, where team efforts are particularly important, mobility may well increase the production of scientific knowledge (e.g. Hoisl, 2007; Agrawal et al., 2014; Ahlin and Ejermo, 2015; Fernández-Zubieta et al., 2016). Yet, we know surprisingly little about what drives scientists to move in the first place.

Economic theory suggests that mobility is driven by efforts to improve employer–employee match quality, but there may be con-

straints to realizing these matches. After all, mobility can generate significant costs, even if only temporary, as a result of professional and personal dislocation. In this paper, we examine both the professional and more personal factors that influence the mobility of elite life scientists. Since many personal factors can influence productivity and vice versa, including both in the same analysis allows us to minimize concerns about statistical confounding and thus develop the most credible measures of each influence to date.

Our analysis builds upon earlier work that has shown the important role played by own-productivity in the propensity to move (e.g. Zucker et al., 2002; Hoisl, 2007; Crespi et al., 2007; Lenzi, 2009) to also examine the role played by the quality of the scientific environment more broadly. Science is increasingly a collaborative “team sport” (Wuchty et al., 2007), and we exploit novel measures of the quality of peers at local and distant institutions to provide the first systematic analysis of this influence on the decision to relocate.

Our analysis also extends beyond the professional to examine the role of children in shaping mobility decisions. Demographic research has shown that the presence of children in a household can limit scientific mobility (Shauman and Xie, 1996). Moreover, the social psychology literature suggests that it may be particularly costly to move children during adolescence, when social bonds are strongest and thus the potential for social disruption is greatest (e.g. Fowler et al., 2014, 2015), and this period roughly coincides with secondary school attendance (hereafter “high school” as it is

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called in the U.S.). As such, our analyses will examine how both the number and age of children influences scientist mobility.

The mobility of elite life scientists is of interest for a number of reasons. First, these scientists are largely responsible for pushing the boundaries of the knowledge frontier in their field. Work environments that enhance the returns to their human capital and potential knowledge spillovers to their colleagues can generate sizable social returns by accelerating biomedical innovation and improving human health. Second, the conduct of research in the life sciences is a team effort that often involves expensive and highly specialized equipment, some of which is financed by external sources that are tied to institutions rather than researchers. As such, mobility may be particularly constrained in this population. Finally, the notoriety of this elite group and the public nature of their careers facilitate the collection of data on family structure that is largely unobtainable in other study populations.

We use a unique data set compiled from the career histories of over 10,000 elite life scientists to understand why and when scientists make decisions to move to new locations.¹ Our rich dataset includes factors that have previously been absent from studies of the determinants of mobility, and including both professional and personal factors in one framework allows us to examine the independent role of each type. We note that while the influence of some of these professional and personal measures on mobility are likely endogenous, our analysis is focused on providing new descriptive facts about the predictors of mobility rather than providing causal estimates of the impacts.

Our analysis confirms the importance of scientist productivity as a positive predictor of moves (Zucker et al., 2002; Lenzi, 2009; Coupé et al., 2006; Ganguli, 2015a). It also highlights several new professional factors that influence the propensity to move. In particular, we find that recent NIH funding serves as a deterrent to moving, likely due, in part, to the significant transaction costs associated with transferring federal research between institutions (Bernstein, 2014). We also find that the peer environment exerts a significant influence on mobility. Scientists are less likely to move when the quality of the peer environment near their home institution is high and more likely to move when the quality of the peer environment at distant institutions is high. Additional analyses suggest that the nature of the move – whether it generates a substantial upward or downward change in institutional rank – has little impact on the role played by these professional factors in shaping scientific mobility.

Turning to the non-professional side, our results reveal an important influence of family structure on mobility. We find a sizable drop in non-local mobility when scientists have children of high school age. Interestingly, scientists appear to anticipate these constraints by increasing moves just before their oldest child enters high school. Mobility accelerates once again when their youngest child is beyond high school age. These results appear more pronounced for mothers than fathers.

The remainder of the paper is organized as follows. In Section 2 we provide a review of the literature and develop hypotheses about the drivers of scientists' mobility. Section 3 describes our data and descriptive statistics. Section 4 lays out our empirical approach. Results are presented in Section 5, while Section 6 concludes.

¹ We are primarily focused on understanding the determinants of the *timing* of employer changes. Because we do not observe the set of academic institutions to which a scientist could have potentially moved, our results speak to the preferences and constraints that shape the decision to leave one's current institution. We cannot say much about the choice of a specific destination.

2. Conceptual model and predictions

The movement of a scientist from one institution to another is an equilibrium outcome that depends on the preferences of the scientist on the supply side as well as demand from the destination institution. On the supply side, financial compensation will clearly play a role, but non-pecuniary factors are also quite important in the science community (Foster et al., 2015; Roach and Sauermann, 2010; Stern 2004). From the scientists' perspective, one of the key benefits from moving is the change in proximity to coauthors and a new set of interlocutors working within their field (e.g. Azoulay et al., 2011; Møen, 2005; Agrawal et al., 2006). These benefits must be weighed against the potentially large social costs of moving due to uprooting one's own family or moving away from family and friends (Dahl and Sorenson, 2010). From the institutional perspective, the demand for new scientists is largely a function of how a scholar will contribute to the prestige and intellectual reputation of the institution. In this section, we develop a number of hypotheses about the professional and non-professional drivers of mobility in this setting.²

2.1. Demand-Side professional factors influencing scientist mobility

On the demand side, universities want to hire talented individuals who will enhance the institutional reputation and the quality of scholarship produced within the university. Determining precisely which scientists will best serve this purpose is challenging since prospective employers cannot perfectly observe the talents of a particular scientist. As such, they may rely on costly signals of worker quality, such as training pedigree (Spence, 1973) and letters of recommendation (Caplow and McGee, 1958) when making hiring decisions. For seasoned scientists, the nature of this asymmetric information problem is more nuanced. Scientists leave an extensive paper trail of accomplishments that includes publications, patents, and grants (and the citations to them), which provide a relatively clear signal about scientist quality (Jaffe and Trajtenberg, 2002; Lehmann et al., 2006). Since universities are recruiting based largely on the science that they will produce under their employ, the challenge here is assessing the degree to which past is prologue. Is the scientist still in a productive phase of their career? Are previous accomplishments a reasonable proxy for future ones?

Perhaps due to the fuzziness of this quality signal, empirical evidence on the relationship between individual productivity and mobility is inconsistent (Allison and Long, 1987; Zucker et al., 2002; Hoisl, 2007; Crespi et al., 2007; Lenzi, 2009). While this relationship may indeed be mixed, it may also be the result of analyses that lean too heavily on past rather than present accomplishments as a proxy for future quality. As such, our first hypothesis concerns the relationship between the productivity of a scientist and the timing of their mobility:

H1. Scientists are more likely to move when their productivity is high.

² Our framework and empirical analysis is focused on domestic moves between US institutions. While moves to and from foreign institutions would be interesting to study, they entail being subject to a different incentive system (in particular for funding) and data that would do not have (peer and funding measures). However, we acknowledge that there is an emerging and interesting related literature that focuses on international mobility. These studies suggest that the most productive, or most motivated, are the ones that leave for the US from Europe (Van Bouwel et al., 2011) and the former USSR (Ganguli 2015a,b). These studies also point to drivers of international mobility such as better access to funding and resources, collaboration opportunities, and career opportunities (Enders and Mugabushaka, 2004). They also suggest that previous social ties through collaborators or other colleagues abroad can lead to emigration (Ayari-Gharbi et al., 2014).

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