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**Understanding the research time allocations of academics and how it
impacts career success.**

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Abstract

Academics face a daily challenge in balancing the conflicting demands of career enhancing research with teaching and service duties. Using a unique dataset gathered from UK academics across multiple departments, we find that those who devote more time to research hold higher academic titles. We use individual research, teaching and time preferences to examine differences in allocating time to research. We find that preferences for research and teaching are in conflict, and that there are significant gender differences in preferences for research and teaching. Gender differences in research preference provide a lens to examine a male career advantage in academia. We discuss our findings in terms of their potential to shed light on the unexplained gender difference in career outcomes in academia.

Introduction

In this paper, we examine how academics handle the multiple demands of their work, and allocate time to research as against teaching and service. In academia, individuals often have significant discretion in the allocation of their working time (Wilkin & Tavernier, 2002). Our interest in the decision to allocate time to research arises from the link to research productivity (Hattie & Marsh, 1996), and the further link between research productivity and career progression in academia (Blackaby, Booth, & Frank, 2005; Treviño, Gomez-Mejia, Balkin, & Mixon Jr, 2015). Thus, individual time allocation decisions can affect career outcomes.

We argue that individual decisions to allocate time to research will be influenced by preferences for the roles of research and teaching, together with time preferences (Callaghan, C.W. & Coldwell, D., 2014; Frederick, Loewenstein, & O'donoghue, 2002; Matthews, Lodge, & Bosanquet, 2014). A preference for research may translate directly into research time allocations. A preference for teaching, as the other central function of higher education, may translate into teaching time allocations which can conflict with research time allocations (Hattie & Marsh, 1996). Time preferences, a measure of relative preference for larger but delayed rewards over smaller immediate rewards will also matter to research time allocations, given the different timings of the benefits of research (later) and teaching (sooner) (Frederick et al., 2002).

Notably, research, teaching and time preferences may all be gender specific and contribute to gender differences in career decisions and outcomes (Gino, Wilmoth, & Brooks, 2015). This provides a lens to understand phenomena such as the glass ceiling in UK higher education which has persisted despite initiatives to promote gender equality. The proportion of female academics at professor level was only 23% in 2014/15 (Higher Education Statistics Agency, 2017). We argue that gendered role and social preferences (Azmat & Petrongolo, 2014; Konrad, Ritchie Jr, Lieb, & Corrigan, 2000), gender differences in delay gratification (Bjorklund & Kipp, 1996) and a greater female weight to trade-offs arising from progression (Gino et al., 2015) may result in gendered research, teaching and time preferences that individually and together favour greater male allocations of time to research.

As anticipated, we find that academics devoting more time to research hold higher academic titles. A direct relationship between hours allocated to research and a senior academic title is found across a range of UK academic departments with different gender ratios, academic cultures and traditions.

We examine the role of research, teaching and time preferences in the decision to allocate time to research. In the light of the importance of research time to career outcomes, we find that preferences for research and teaching have conflicting effects on devoting time to research. In testing for gendered research, teaching and time preferences, we find that a male preference for research does indeed mediate a male advantage in time allocated to research. Although we do not find strong evidence for the mediating effects of teaching and time preferences, we do find female preferences for teaching and shorter term career payoffs. In combination these three individual preferences mediate greater male time allocated to research. A pattern of high research preference, low teaching preference and low time preference is associated with higher time allocations to research.

Finding a pattern of high research preference, low teaching preference and low time preference associated with higher time allocations to research contributes to the study of academic preferences (Callaghan, C.W. & Coldwell, D., 2014; Matthews et al., 2014). In finding gendered differences in research preferences underlying greater male research time, we contribute directly to work on gender differences in role preferences (Azmat & Petrongolo, 2014; Konrad et al., 2000) and to the developing conversation about gender differences in preferences as a whole (Croson & Gneezy, 2009). Our analysis also adds to the understanding of gendered differences in time preferences (Bjorklund & Kipp, 1996; Dittrich & Leipold, 2014; Silverman, 2003).

Theory Development

The Importance of Time Allocated to Research

Individuals often have significant discretion in the allocation of their working time. It is certainly true in academia where there is a great variation in how academics spend their time at work. Assessing differences in the relative amounts of time academics actually, rather than contractually, spend on research, teaching and service is therefore of interest, with 60% of UK full-time academics engaged in concurrent research and teaching roles (Higher Education Statistics Agency, 2018). Individual preferences, together with incentives, will create differences in the allocation of working time (Wilkin & Tavernier, 2002).

Working time allocated to research is important because it is known to positively affect research productivity (Hattie & Marsh, 1996; Stack, 2004). So an academic's discretionary time allocation decisions can have a direct impact on their personal research productivity.

Personal research productivity and impact are often cited as the primary drivers of academic progression (Morley, 2014; West, 2016). Certainly the Research Excellence Framework has focused attention on both institutional and personal research productivity in the face of increasing competition between universities (Murphy & Sage, 2014). Further, in an increasingly global higher education labour market, research outputs are recognised as a key indicator of personal quality and may be more easily appropriable than teaching efforts (Gautier & Wauthy, 2007; Mägi & Beerkens, 2016). Moreover, recently, research productivity has been linked to better teaching (Healey, Jordan, Pell, & Short, 2010; Shin, 2011; Zhang & Shin, 2015). All in all, research productivity thus becomes increasingly linked with positive career outcomes. So, time devoted to research may be expected to relate positively to career outcomes in academia.

Hypothesis 1: (Academic Progression) those who devote more time to research are more likely to achieve higher academic titles.

Evidence from studies of the human capital model, applied to higher education, provide empirical support for the link between research productivity and career outcomes both in the US (Treviño et al., 2015; Umbach, 2007) and for economists in the UK (Blackaby et al., 2005). None of these studies captured data for time allocated to research, which is under more direct control by academics.

The Role of Preferences in Time Allocated to Research

We move on to consider the role of preferences in the discretionary allocation of time to research. Three types of individual preferences may matter (Wilkin & Tavernier, 2002). Firstly, a preference for research may translate directly into research time allocations (Matthews et al., 2014). That would mean that some academics enjoy doing research more than others, as a matter of taste, and thus, choose to spend more time doing what they enjoy more. Secondly, a preference for teaching, as the other central function of higher education, may translate into teaching time allocations which can conflict with research time allocations (Hattie & Marsh, 1996). Thirdly, time preferences, a measure of relative preference for larger but delayed rewards over smaller immediate rewards will also matter to research time allocations, given the different timings of the benefits of research (later) and teaching (sooner) (Frederick et al., 2002). We will develop the arguments for how each of these three preferences will affect time allocated to research in turn.

As explained above, a preference for research will, subject to incentives, result in greater time being allocated to research. Positive incentives, in the form of the research

excellence framework, personal recognition and marketability, and academic cultural norms should aid the translation of the research preference into action (Fishbein, 1979; Fishbein & Ajzen, 2011). Further, studies have found a clear correlation between allocating time to research and research quality (Hattie & Marsh, 1996). So, allocating time to research should develop self-efficacy in research skills, reinforcing a preference for research and the desire to turn that preference in to action (Bandura, 1986). Thus we would expect a stronger preference for research to result in greater time allocated to research.

Hypothesis 2: (Research Preference) those who have a stronger preference for research will allocate more hours to research.

A stronger preference for teaching will, subject to incentives, similarly result in greater time being allocated to teaching. Developing self-efficacy in teaching will also likely reinforce a preference for teaching (Tschannen-Moran, Hoy, & Hoy, 1998). Given that teaching and research represent the two central functions of higher education they represent alternatives in allocating working time (Hattie & Marsh, 1996). The scarcity model posits that limited time, energy and commitment will lead to a conflict between research and teaching and allocating time to teaching will certainly reduce time allocated to research, all else remaining equal (Moore, 1963). Hence we would expect a preference for teaching to negatively impact time allocated to research.

Hypothesis 3: (Teaching Preference) those who have a stronger preference for teaching will allocate fewer hours to research.

Time preferences may impact time allocated to research given the trade-off between the costs and benefits of research and teaching or service activities occurring at different times. The costs, in allocating time to research and teaching, occur each academic year. The economic benefits of teaching, in the form of module evaluations and their impact on performance appraisals, will arise within the appraisal period. However, the benefits of research may be deferred far into the future. The rigorous demands of publishing in highly ranked journals, lengthy gestation periods to publication and the cumulative nature of accruing citations all take time and career benefits will only accrue subsequently. Time preferences will be reflected in the rate at which academic benefits are discounted over time. A higher rate of time discounting will be consistent with a preference for the smaller but more immediate rewards of teaching, and a lower rate of time discounting will be consistent with a willingness to defer the larger reward of academic progression through research.

Hypothesis 4: (Time Preference) those with a lower rate of time discounting will allocate more hours to research.

It is notable that all three preferences discussed above may be gender-specific. If this is the case, gendered preferences may be an important lens for understanding potential gender differences in research time allocations which, arguably, produce well-defined gender differences in the career outcomes of academics. In this context, lower research productivity associated with lesser career outcomes for female academics has long been a puzzle (Larivière, Vignola-Gagné, Villeneuve, Gélinas, & Gingras, 2011; Leahey, 2006; Shauman & Xie, 2003). Building on hypotheses 2 to 4, we will formulate hypotheses for the mediating

role of gender-specific research, teaching and time preferences on time allocated to research in turn.

Gender Differences in Research and Teaching Preferences.

We anticipate a greater male preference for research, and a greater female preference for teaching. Publishing research in high ranking journals is a competitive process (Brembs, Button, & Munafò, 2013; Fanelli, 2010; Fanelli, 2012; Van Dalen & Henkens, 2012). Men are more willing to engage in competitive interactions and self-select in to competitive environments (Gneezy, Niederle, & Rustichini, 2003; Niederle & Vesterlund, 2007). Male role preferences for challenge, autonomy and influence, in line with gender stereotypes, are also likely to lead to a male preference for research (Konrad et al., 2000).

Greater female other-regarding preferences, and more socially oriented role preferences, have been identified in a range of studies (Azmat & Petrongolo, 2014; Croson & Gneezy, 2009; Konrad et al., 2000; Tonin & Vlassopoulos, 2010). A female preference for affiliation and social interaction may work against a more autonomous research role in favour of a preference for a more socially oriented teaching role (Barbezat, 2006; Callaghan, C.W. & Coldwell, D., 2014; Diener & Fujita, 1995). These effects may be reinforced by the finding that women have more life goals and place more weight on time constraints and trade-offs arising from progression than men (Gino et al., 2015). Female academics may recognise the importance of research productivity to progression but place a lower value on academic progression, and thus on research as a means to progression, compared to male academics.

Given scarce personal resources we expect a conflict between allocating time to research versus teaching, all else remaining equal (Hattie & Marsh, 1996; Moore, 1963). Hence we would expect a male preference for research to both positively impact time

allocated to research and negatively impact time allocated to teaching and a female preference for teaching to both positively impact time allocated to teaching and negatively impact time allocated to research. There is some support for less time being devoted to research and more to teaching and service by female academics (Bellas, 1999; Toutkoushian & Bellas, 1999). To summarize,

Hypothesis 5: (Mediation by (greater male) preference for research) the effect of gender on hours allocated to research will be positively mediated by gender differences in the preference for research. In particular, the positive effect of male gender on time allocated to research will be mediated by a greater male preference for research.

Hypothesis 6: (Mediation by a (greater female) preference for teaching under a research and teaching conflict): the effect of gender on hours allocated to research will be negatively mediated by gender differences in the preference for teaching. In particular, the positive effect of male gender on time allocated to research will be mediated by a lower male preference for teaching.

It is important to note that the view of research conflicting with teaching taken above is contested by some researchers. Theoretical models have been built that assume the relationship between the roles to be conflicting, complementary or for the two to be unrelated academic activities (Hattie & Marsh, 1996; Marsh & Hattie, 2002). Thus, we would have to test empirically how preferences for research and teaching/service relate to each other. To date, a meta-analysis of empirical studies could not find evidence to support research and

teaching being complementary activities (Hattie & Marsh, 1996). There is also evidence that many academics have stronger preferences for either research or teaching such that these preferences are likely conflicting (Callaghan, C.W. & Coldwell, D., 2014).

Gender Differences in Time Preferences

We anticipate higher male time discounting rates. A greater female ability to delay gratification has been theorised based on the evolutionary requirements of a greater female parental investment in children (Bjorklund & Kipp, 1996). Greater delay gratification is consistent with lower female time discounting rates. Conversely, lower male delay gratification will lead to higher male time discounting rates and lower research time allocations. To formalize:

Hypothesis 7: (Mediation by (lower female) rate of time preference) the effect of gender on hours allocated to research will be mediated by gender differences in time preferences. In particular, the negative effect of male gender on time allocated to research will be mediated by a higher male rates of time preference.

Empirical evidence for gender differences in delay gratification and time preferences is mixed. In the psychology literature, a greater female ability to delay gratification has been found (Bjorklund & Kipp, 1996; Silverman, 2003). The related field of economic time preferences has also provided some evidence for lower female time discounting rates consistent with a greater female ability to delay gratification (Bauer & Chytilová, 2013; Dittrich & Leipold, 2014). Conversely, a series of studies have found higher, not lower,

female time discounting rates (Beck & Triplett, 2009; Martorano, Handa, Halpern, Pettifor, & Thirumurthy, 2015; Reynolds, Ortengren, Richards, & de Wit, 2006). This may be partly attributable to methodological differences between studies (Hosseini-Kamkar & Morton, 2014).

All in all, we are unable to hypothesise the overall effect of gender on research hours allocated. We expect a positive effect of male gender on time allocated to research from hypotheses 5 and 6, but a negative effect from hypothesis 7, such that the combined effect could be either positive or negative.

Study Design

Participants and Design:

The data was gathered as part of a survey sent to 12,272 academics at UK Universities in July 2016. The integrity of responses was ensured by sending personalized email links to the Qualtrics based survey. Survey attrition, and the restriction of the dataset to full-time staff only, led to 1,102 respondents completing the detailed information required for this paper (Mage = 45.00, SDage = 9.59, 36.8% female). The mean duration for completed surveys was 21 minutes 57 seconds.

The number of academics invited to participate was determined by the requirements of an experiment embedded within the survey, which is outside of the scope of this paper. Only academics with titles implying both research and teaching duties were invited to participate. The survey was sent to academics in 15 common departments at 27 pre 1992 universities with both a research and teaching focus.

We checked for selection bias by benchmarking responses (Montaquila & Olson, 2012; Pedersen, 2015). Female academics made up 38.5% of responses to the survey

compared to a benchmark 37.3% (Higher Education Statistics Agency, 2017). Respondents at professor level at 27.5% exceeded a benchmark of 11.9%, but mirror over-representation at 25.8% in a comparable study (Blackaby et al., 2005).

Materials:

Pilot Study: We conducted a pilot study with 45 respondents (Mage = 42.80, SDage = 10.45, 44.4% female) at the University of Surrey to test likely response rates, which were in line with similar surveys (Abreu, Grinevich, Hughes, & Kitson, 2009). The format of the invitation email was subsequently amended based on feedback.

Procedure:

Survey invitations were sent out in two batches on Wednesdays and Fridays at 15:00 to maximise responses (Van Dessel, 2015). Non responders were tracked and up to two reminder emails were sent, as appropriate, one week and two weeks respectively after the original invitation.

Measures:

Research Preferences. Participants were asked five questions on their preferences for research adapted from a previous study questionnaire (Matthews et al., 2014). The responses were on 5-point Likert-type scales anchored by 1 (strongly disagree) to 5 (strongly agree). The responses were averaged together to form a single composite score, where higher scores indicated a greater preference for research (Cronbach's $\alpha = .66$).

Teaching Preferences. Participants were asked five questions on their preferences for teaching adapted from a previous study questionnaire (Matthews et al., 2014). The responses were on 5-point Likert-type scales anchored by 1 (strongly disagree) to 5 (strongly agree). The responses were averaged together to form a single composite score, where higher scores indicated a greater preference for research (Cronbach's $\alpha = .56$).

Time Preferences. Participants were presented with choice pairs of either a declining amount paid in two days' time or £80 at a later date. They completed seven payment choices in each of four tables derived from a previous study of inter-temporal discount rates (Burks, Carpenter, Götte, & Rustichini, 2012). Choice patterns implying negative or inconsistent interest rates were excluded from the analysis. A value for time preference was derived for each participant based on a regression over their choices. A value of 1 indicated perfect future focus with the larger future amount of £80 being chosen every time. Descending values from 1 indicated progressively increasing present focus with more choices of smaller financial amounts in two days' time.

Control variables. Additional measures were based on the controls used in studies of higher education using the Human Capital Model (Blackaby et al., 2005; Doucet, Smith, & Durand, 2012; Travis, Gross, & Johnson, 2009; Treviño et al., 2015; Umbach, 2007). These included controls for gender and also for experience, in the form of years since completion of a PhD (Treviño et al., 2015). A control for research quality was based on a weighted index of published articles in the previous three years (Blackaby et al., 2005; Treviño et al., 2015). A control for teaching quality was based on the achievement of teaching evaluation scores in excess of 4 out of 5 in the last academic year. Controls for number of children, one child under 5 years old, two children under 5 years old and mobility (Treviño et al., 2015) were also included.

Incentives and checks

Lotteries were used to incentivise the completion of the survey (Görizt, 2006). A prize of £300 was awarded to the respondent most accurately predicting the behavioural norms of other academics towards teaching duties. This was calculated as the response that minimises the sum of absolute deviations from the mean of each response within each academic

discipline. A prize of up to £80 was awarded randomly, with a 1 in 300 chance of winning, as part of the end-of-survey questionnaire to elicit the time preferences of responders. In addition to incentivising the completion of the survey these specific awards were designed to make the questions they referred to more salient.

To test for selection bias arising from the use of incentives, we used two formats of survey invitation email. In one format we described the incentives whilst in the other format we omitted this information. There were no significant differences in the characteristics of respondents between the two formats.

Results

Descriptive statistics for study variables are shown in Table 1. Although male and female academics report similar working hours (50.99 hours and 50.26 hours per week respectively), their allocation of time between roles differs. Male academic respondents allocate 19.30 hours per week on average to research, female academics 16.68 hours. The effect size of the gender difference, measured by Cohen's D is .271. Male academics allocate 18.05 hours per week on average to teaching, female academics 19.28 hours. The effect size of the gender difference, measured by Cohen's D is -.156.

Insert Table 1 about here

Correlations between research and teaching variables are shown in Table 2. Hours allocated to research are positively correlated with a preference for research and negatively correlated with a preference for teaching. The relationship between research and teaching

variables is always negative with a preference for research negatively correlated with a preference for teaching.

Insert Table 2 about here

To test Hypothesis 1 (Academic Progression), we conducted a probit regression with Professor as the dependent variable, shown at Table 3. Consistent with our hypothesis we found that hours allocated to research per week are correlated with the academic title of professor ($\beta = .02, p < .01$).

Insert Table 3 about here

To test hypotheses 2 to 4 (Preferences), we regressed hours allocated to research on research, teaching and time preferences, as shown in Table 4. Consistent with hypothesis 2, a research preference is positively correlated with hours allocated to research ($\beta = 5.30, p < .01$). Consistent with hypothesis 3, a teaching preference is negatively correlated with hours allocated to research ($\beta = -3.16, p < .01$). However, the rate of time discounting is not correlated with hours allocated to research, so we do not find support for hypothesis 4 ($\beta = -175.93, ns$).

Insert Table 4 about here

To test hypotheses 5 to 7 (mediation), we analysed whether research preferences, teaching preferences and time preferences acted as mediators between the gender of the

academic and the time allocation to research, as shown at Table 5 (Kenny, 2016). For the individual regressions, there is a significant gender difference for research preferences ($\beta = -.08, p < .05$) but only weakly significant gender differences for teaching preferences ($\beta = .08, p < .10$) and for time preferences ($\beta = .00, p < .10$). The small magnitude of the time preference coefficient results from the design adopted (Burks et al., 2012).

For hypothesis 5 (Mediation by (greater male) preference for research) the indirect effect of a preference for research was correctly signed and significant (standardized path coefficient = $-.02, p < .05$). The indirect effect of gender mediated by a preference for research on time allocated to research remained significant when bootstrapping standard errors to allow for kurtosis (Preacher & Hayes, 2008). Thus we have support for hypothesis 5.

For hypothesis 6 (Mediation by a (greater female) preference for teaching under a research and teaching conflict) the indirect effect of a preference for teaching was correctly signed but just outside of significance at $p = .104$ (standardized path coefficient = $-.01, ns$). For hypothesis 7 (Mediation by rate of time preference) the indirect effect of time preferences was not significant (standardized path coefficient = $.00, ns$). Thus we do not find support for either hypothesis 6 or hypothesis 7.

However, the overall (negative) indirect effect of the three mediators; research preferences, teaching preferences and time preferences; is significant (standardized path coefficient = $-.03, p < .05$). The direct effect of gender on time allocated to research remains significant indicating only partial mediation (standardized path coefficient = $-.09, p < .01$).

Insert Table 5 about here

To further analyse the combined indirect effect of the three mediators; research preferences, teaching preferences and time preferences; we used a pattern approach (Foti & Hauenstein, 2007). We grouped individuals who had higher than average research preferences, lower than average teaching preferences and lower than average time discount rates in line with the direction of effects in the regression of hours allocated to research, as shown in Table 4. Regressing hours allocated to research on the dummy variable for this pattern, there was a significant effect ($\beta = 4.15, p < .01$). However, the interaction between the dummy variable for this pattern and the female dummy variable was not significant ($\beta = -.35, ns$).

Discussion

In line with our hypothesis, we find that holding a senior academic title is more likely for those who devote more time to research. Time allocated to teaching affects the likelihood of holding a senior academic title negatively.

In examining the effect of research, teaching and time preferences on time allocated to research, we find that a preference for research is negatively correlated with a preference for teaching. Research and teaching preferences work in conflicting directions to increase or reduce time allocated to research respectively. In line with our hypotheses, we find that a preference for research is positively correlated with, and a preference for teaching is negatively correlated with, time allocated to research. However, we do not find support for our hypothesis that those with a lower rate of time discounting will allocate more hours to research.

In examining gender differences in preferences, we find that greater male time allocated to research is mediated by a stronger male preference for research. We also find a

greater female preference for teaching and higher female rates of time discounting. However neither teaching preferences nor time preferences mediate time allocated to research. The combined indirect effect of research, teaching and time preferences does mediate time allocated to research in favour of male academics. Individuals with a pattern of high research, low teaching and low time preferences allocate significantly more time to research, compared to those with other patterns of preferences.

General Discussion

With a unique dataset, based on a survey of UK academics actual time allocations, we determined the role of individual preferences in allocating time to research and the importance of those time allocations. Importantly, we found that a preference for research was positively correlated with, and a preference for teaching negatively correlated with, time allocated to career enhancing research activities. We further found that gender differences in the preference for research produce gender differences in time allocated to research. These new findings may help explain the career advantage enjoyed by male academics.

We highlight the theoretical and practical implications of our results below, together with the limitations of, and future directions for, our research.

Theoretical Implications

We found that a preference for research was positively correlated with, and a preference for teaching negatively correlated with, time allocated to research. These findings provide a better understanding of the motivations of academics and contribute directly to the literature on teaching and research preferences in higher education (Callaghan, C.W. & Coldwell, D., 2014; Matthews et al., 2014).

Theoretical models have been built that assume the relationship between the roles of research and teaching to be conflicting, complementary or for the two to be unrelated academic activities. To date, a meta-analysis could not find evidence to support research and teaching being complementary activities (Hattie & Marsh, 1996). However, recently, research productivity has been linked to better teaching (Healey et al., 2010; Shin, 2011; Zhang & Shin, 2015). In our sample, a preference for teaching is negatively correlated with hours allocated to research. Hence, if there is a complementarity between the two roles, those academics who prefer teaching over research could find their teaching to be under-informed by active personal research. In the light of the ongoing debate about the relationship between research and teaching, this is an area that merits further analysis.

Developing our analysis, we used gender differences in research, teaching and time preferences as a lens to view gender differences in career outcomes. We found that a strong male preference for research mediates time allocated to research. Given studies linking time spent on research to research productivity, and the importance of research productivity to career outcomes, this finding is important and adds to the literature on gender differences in preferences (Croson & Gneezy, 2009; Gino et al., 2015).

We also find that the combined effect of gender differences in research, teaching and time preferences mediates time allocated to research. Individuals with a pattern of higher than average research preferences but lower than average teaching and time preferences allocated significantly more hours to research compared to those with other patterns of preferences. The interaction of preferences in combination may give rise to the additional time allocation to research (Foti & Hauenstein, 2007) and this finding contributes to the study of academic preferences (Callaghan, C.W. & Coldwell, D., 2014; Matthews et al., 2014). Although we do not find a gender difference in this pattern of preferences or strong evidence for the mediating

effects of teaching and time preferences individually, we do find female preferences for teaching and, contrary to our hypothesis, higher rates of time discounting. Our findings contribute directly to work on gender differences in role preferences (Azmat & Petrongolo, 2014; Konrad et al., 2000).

Our findings, in a higher education context, also add to the understanding of gender differences in time preferences. We hypothesised higher time discounting rates for men but found higher rates of time discounting for women. However, our result is consistent with other studies based on hypothetical money choices at different times (Beck & Triplett, 2009; Martorano et al., 2015) and a laboratory study of impulsive behaviour (Reynolds et al., 2006). The study of time preferences is complicated by the likelihood that time discounting rates are domain specific, such that preferences expressed in our study for hypothetical money choices may differ from preferences relevant to time allocated to research and career outcomes (Ubfal, 2016; Urminsky & Zauberman, 2016; Winer, 1997).

We also contribute to studies of progression in higher education, by submitting to an empirical test the concept that devoting hours to research matters to career outcomes. As expected, holding a senior academic title is more likely for those devoting more time to research. This finding is across a range of academic departments with different gender ratios, academic cultures and traditions. The links between allocating time to research and research productivity (Hattie & Marsh, 1996; Stack, 2004) and research productivity and career outcomes (Blackaby et al., 2005; Treviño et al., 2015; Umbach, 2007) are established in existing literature. Our finding is a first step in directly linking time allocated to research to career outcomes. We discuss below the limitations of our approach and future directions in research to provide insight into causal relationships.

Practical Implications

The practical implications of our findings depend on how individual preferences, and gender differences in preferences, are formed. Preferences are based on direct experiences with more abstract preferences developed and refined with age from interactions between individuals and their environment (Druckman & Lupia, 2000; Sameroff, 2010). The polarization of preferences that we found for either research or teaching roles in the UK will also reflect the culture and norms of higher education institutions and the incentives provided for each role. The introduction of the Teaching Excellence Framework (Bhardwa, 2017; Wild & Berger, 2016) and findings for research-driven teaching (Healey et al., 2010; Shin, 2011; Zhang & Shin, 2015) may modify preferences going forwards.

Gender differences in preferences have been widely studied (Croson & Gneezy, 2009). Social experiences, education and parental gender-role attitudes are likely to affect the early development of gender-role attitudes leading to gender differences in preferences (Thornton, Alwin, & Camburn, 1983). Much research confirms the gender stereotypes of women being more communal and men more competent (Biernat & Fuegen, 2001; Diekmann & Eagly, 2000; Eagly & Johannesen-Schmidt, 2001; Lockheed, Harris, & Nemceff, 1983) and there is evidence of gender differences in role preferences broadly following these stereotypes (Corrigall & Konrad, 2007; Konrad et al., 2000).

Gender differences in role preferences may be reinforced by the finding that women have more life goals and place more weight on time constraints and trade-offs than men (Gino et al., 2015). Female academics may prefer more flexible, less research-intensive departments to accommodate the demands of childbirth and family (Rothausen-Vange, Marler, & Wright, 2005). Together with gender stereotypes, these gender differences may underpin the observed male preference for research and a weaker female preference for teaching. Changing societal gender stereotypes and institutional cultures will influence the

preferences of future female academics and be crucial in equalising career outcomes derived from research in higher education.

Limitations and Future Directions

Our study, like most studies of higher education using the human capital model, is based on cross-sectional data (Blackaby et al., 2005; Travis et al., 2009; Treviño et al., 2015; Umbach, 2007). Other studies of research and teaching preferences have also used cross-sectional data (Callaghan, C.W. & Coldwell, D., 2014; Matthews et al., 2014). As such, we can only identify correlations between variables rather than causes and effects. Our results may also be subject to the risk of bias from the specific timing of the sample, the possibility of recall bias and non-response bias (Andrews, 2018; Sedgwick, 2014).

To counter the risk of bias we collected a large sample, of 1,102 viable responses. Unlike a comparable survey based cross-sectional study, we tracked responses and sent multiple reminders to maximise uptake (Blackaby et al., 2005). In line with best practice, we conducted benchmarking to ensure that a representative sample, in terms of gender and seniority, was obtained (Montaquila & Olson, 2012; Pedersen, 2015). We also compared signs and coefficients of control variables, where comparable, with similar studies. Our study benefitted from a wealth of additional data with which we conducted a large number of internal consistency checks.

We found that holding a senior academic title is more likely for those who devote more time to research. Two considerations may support the direction of the relationship from time allocated to research to career progression. Firstly, we would expect senior academics to have some flexibility to reduce both research and teaching effort. Hence, the risk of examining cross-sectional data would be in finding a negative relationship where a positive

one would hold longitudinally. Instead we see a positive relationship that is unlikely to be the artefact of analysing cross-sectional data. Secondly, we find that time discount rates are negatively correlated with seniority. There is both theoretical and empirical support for patience being greatest in middle age and declining into old age, such that we might expect to see higher discount rates for older, more senior academics (Martorano et al., 2015; Read & Read, 2004; Sozou & Seymour, 2003). Here, the risk of examining cross-sectional data would be in finding a positive relationship where a negative one would hold longitudinally. Instead we see a negative relationship that is again unlikely to be the artefact of analysing cross-sectional data.

We also find that time allocated to teaching affects the likelihood of holding a senior academic title negatively but this finding could be artefact of cross-sectional data, with senior academics being shielded from teaching duties.

Our findings, especially those relating to individual preferences, represent a springboard for further research. Conducting a longitudinal study would enable us to track time allocation to research and individual research, teaching and time preferences over a period of time and obtain a better insight into causal relationships. Associating individual preferences, and gender differences in those preferences with career outcomes merits further investigation using such advanced data-analytic methods.

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TABLE 1

Means (and standard deviations in brackets) for study variables

	Female	Male
Total Hours per week	50.26 (8.79)	50.99 (9.50)
Research Hours per Week	16.68 (8.54)	19.30 (10.29)
Teaching Hours per week	19.28 (8.16)	18.05 (7.73)
Research Preference Index	3.04 (0.71)	3.07 (0.61)
Teaching Preference Index	2.29 (0.70)	2.19 (0.67)
High Research Quality	0.50 (0.50)	0.55 (0.50)
High Teaching Quality	0.39 (0.49)	0.38 (0.49)
Years Post PHD	13.12 (8.73)	17.80 (10.59)
Observations	498	828

Standard Errors in parenthesis

TABLE 2

Correlation Matrix showing Pearson's r for Research and Teaching variables

	Research Hours per Week	Research Preference Index	High Research Quality	Teaching Hours per week	Teaching Preference Index	High Teaching Quality
Research Hours per Week	1.00					
Research Preference Index	0.38	1.00				
High Research Quality	0.15	0.05	1.00			
Teaching Hours per week	-0.36	-0.18	-0.07	1.00		
Teaching Preference Index	-0.31	-0.13	-0.04	0.25	1.00	
High Teaching Quality	-0.09	-0.01	-0.23	0.10	0.07	1.00

Note: N= 1,339, values in **bold** = significant.

TABLE 3

Probit regression for Professor dummy variable

Dependent Variable	Professor
Research Hours Per Week	0.02*** (0.01)
Teaching Hours Per Week	-0.04*** (0.01)
Research Quality	0.47*** (0.12)
Teaching Quality	0.15 (0.12)
Female Academic	-0.08 (0.13)
Years Post PHD	0.11*** (0.01)
Children Number	0.09* (0.05)
One Under 5	0.20 (0.17)
Two Under 5s	-0.29 (0.30)
Research Preference Index	0.21** (0.09)
Teaching Preference Index	-0.04 (0.09)
Time Preference	117.15** (45.51)
Mobility	0.27** (0.11)
Department (Note 1)	
University (Note 1)	
Constant	-121.37*** (45.51)
Observations	1,102

Standard errors in parentheses

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

Note 1: output for 15 departments and 27 universities omitted from this table.

TABLE 4

Regression for research hours per week on preferences and gender.

Dependent Variable	Research Hours Per Week
Professor Level	2.94*** (0.71)
Female Academic	-1.79*** (0.56)
Years Post PHD	-0.12*** (0.04)
Research Quality	2.54*** (0.53)
Teaching Quality	-1.44*** (0.55)
Children Number	-0.27 (0.26)
One Under 5	-1.27* (0.75)
Two Under 5s	-0.51 (1.20)
Research Preference Index	5.08*** (0.41)
Teaching Preference Index	-3.07*** (0.38)
Time Preference	-175.93 (197.26)
Mobility	-0.90* (0.51)
Department (Note 1)	
University (Note 1)	
Constant	189.78 (197.05)
Observations	1,102
R-squared	0.32

Standard errors in parentheses

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

Note 1: output for 15 departments and 27 universities omitted from this table.

TABLE 5

Standardized Mediation Effects between gender and research hours per week.

	Indirect effect of IV on DV					Total Effect IV on DV
	Direct Effect of IV on DV	Via Research Preferences	Via Teaching Preferences	Via Delta (Time Preference)	Total	
Gender	-0.09	-0.02	-0.01	0.00	-0.03	-0.13

Note: N= 1,102, DV = dependent variable, IV = independent variable (Gender), Values in **bold** = significant.