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Closing and widening gaps in the competing risks of academic career.¹

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Introduction

In recent decades, the composition of the academic staff of European universities has changed. Due to increasing emancipation, participation in the labour market and gender parity policies, a larger share of academic staff are nowadays women. At the same time, the emergence of knowledge economies and societies leading to worldwide competition for talent and the internationalization of universities have increased the share of foreign and internationally mobile scientists.

Or not?

Available data and studies provide a more complex picture. On the one hand, a large and often majority share of junior academic staff is nowadays composed by women, foreigners and internationally mobile scientists. On the other hand, senior academic staff is still -by large- composed of men, nationals (i.e. non-foreigners) and inbred scientists (Lepori, Seeber & Bonaccorsi, 2015). For example, in the United Kingdom 46% of the academic staff are women but only 25% of professors (source: HESA – Higher Education Statistics Agency); in France, foreigners account for 41% of PhDs but only 5% of senior academic staff (source: ETER – European Tertiary Education Register). Recent studies have also pointed that while PhD and postdocs tend to be increasingly mobile, yet on the other hand inbred scientists represent a large majority of the professorial body in Higher Education systems as diverse as Mexico and Sweden (Horta, Veloso, & Grediaga, 2010; Swedish Research Council, 2016)

In other words, gender parity and internationalization appear to be welcome at the lower layers of the academic ladder. The higher the rank, however, the rarer women, foreigners and mobile scientists.

Two main mechanisms can generate gaps in the representation of different categories of scientists at junior and senior levels that many higher education systems display.

First, assuming that some time is needed to progress the career ladder, some categories of people may be more likely to *leave* the competition too early. It has been argued, for instance, that women are tend to abandon the competition for career earlier than their male peers because they are comparatively less status-driven and less prone to take risks (Croson and

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Gneezy, 2009; Pinker, 2009). On the other side, foreigners may desire to go back to their home countries once completed their PhD or postdoc experiences, and internationally mobile scientists may be more keen to move to another country as soon as an opportunity for career advancement emerges.

A second possible mechanism is that women, foreigners and mobile scientists find it *more difficult to advance* the career ladder within the same higher education institution and/or system – for different possible reasons.

Lower performance can be one such reason. Some scholars have argued in fact that women have to devote more of their time to taking care of others, which in turn affect their performance (Acker & Armenti, 2004; Aiston & Jung, 2015; Bozzon et al. 2017; Rafnsdo'ttir & Heijstra 2013), while a deficiency theory argues that women and people of given minorities may lack qualities necessary for leadership (Morrison and Von Glinow, 1990; Riger and Galligan, 1980). Several studies have found a gender gap in promotion (Bain & Cummings, 2000; Jackson & O'Callaghan, 2009), in several disciplines and countries, such as in the US (Perna, 2001; 2005), Sweden (Danell & Hjerm, 2013), and Iceland (Heijstra, Bjarnason, & Rafnsdo'ttir, 2015), yet such differences are not due to differences in scientific productivity, in the US (Kahn, 1993; Ginther & Hayes, 1999; Tesch et al., 1995; Weisshaar, 2017) nor in Italy (Marini & Meschetti, 2018). In a similar vein, foreign scientists in the US have fewer chances to be promoted despite being more productive (Corley and Sabharwal, 2007). Studies have also found that mobile scientists contribute substantially to countries' research output and that researchers' mobility is beneficial for individuals and research institutions as it stimulates creativity and improves performance (Franzoni, Scellato & Stephan, 2014; Horta, Veloso, & Grediaga, 2010; Inanc and Turcer, 2011; Mamiseishvili & Rosser, 2010), but nevertheless have often less chances to obtain a permanent position compared to inbred scientists (Cruz, Menendez, 2010). In sum, the argument that difficulty in career progression of women, foreigners and mobile scientists – and hence their under-representation at higher level of the hierarchy - is due to their lower performance is not backed by empirical results.

A second reason for the differences in to likelihood to advance the career ladder is discrimination. Discrimination can be overt (Morrison & Von Glinow, 1990; Powell, 1988) or due to organizational policies and practices that create an implicit discrimination, so-called 'glass-ceiling' that keeps women and demographic minorities from rising in organizational hierarchies (Kanter, 1977). For example, senior academics tend to act as gatekeepers in the academia, and some scholars have pointed to a network mechanism to explain the gender gap, namely that senior academics are mostly male and display homophily, namely the tendency to prefer others perceived to be similar (Fletcher et al., 2007 in the UK; Van den Brink & Benschop in the Netherlands, 2014). A similar explanation can apply to the demographic gap for foreigners and mobile scientists as they would be more likely to display different values, interests, cultural and social traits from the senior academics compared to nationals and inbred scientists.

The goal of this article aims to address four main gaps in the literature on academic careers.

First, research so far has not been able to identify to what extent the under representation of women, foreigners and mobile scientists at higher level of the academic career ladder are due to a higher propensity to leave or difficulties to advance the career ladder.

Second, research so far has focused either on mobility or nationality, whereas both foreign and national scientists can be mobile or not, within the same country or internationally. Therefore the objective is to disentangle their respective impact on career advancement. Third, existing works have focused on the factors predicting access to a professorial position, while this paper explores the entire academic career within an Higher Education system, namely all steps of the academic career ladder – from PhD to graduation, to obtaining a

postdoc position, a lecturer position, and being promoted to senior lecturer, professor and full professor.

Finally, we investigate whether the career risks and the importance of predicting factors have changes throughout time – considering a time frame of twenty years.

Data and Methods

The analysis focuses on Flanders, the Dutch-speaking part of Belgium, and employs data from the Human Resources in Research – Flanders (HRRF) dataset, which keeps track of all academic staff and postdoctoral appointments, PhD registrations and PhD graduation, of the five Flemish universities from 1990 until 2015, for a total of over seventy thousand researchers. We focus in particular on researchers born after the 1st of January 1965, as for this sample the dataset includes complete information about their careers. Compared to previous analyses of academic careers – which mostly relied on surveys, a sample of institutions, or data on a single year - the HRRF dataset contains the full population of researchers in Flanders for a 25-year time span.

We first investigate the composition of the academic staff at PhD entry, PhD graduation, postdoc, lectureship, senior lectureship, professorship and full professorship, in terms of gender, nationality and mobility. Mobility of career tracks is described according to where the researchers obtained their PhD and/or held their postdoc positions, namely in a Flemish university or outside the Flemish university system, leading to three possible tracks: i) non-mobile (all the career steps within the same institution); ii) internally mobile within the Flemish system; iii) externally mobile (PhD and/or Postdoc outside the Flemish university system).

Second, we explore what factors predict the chances of: i) PhD graduates to obtain a postdoc position in a Flemish university and of ii) postdocs, lecturers, senior lecturers, professors to be promoted in a Flemish university or to leave the Flemish system.

The probability of PhD graduates to obtain a postdoc position is explored via a binary regression analysis. In order to explore ii) we fit competing risk regression models, based on the Fine and Gray (1999)'s methodology, computing the sub-hazard ratio for the two competing risks of leaving the system or being promoted vis-à-vis the starting condition.

Findings

Figure 1 illustrates the evolution from 1995 to 2015 in the number of pre-doctoral appointments (mostly PhDs), temporary research positions (postdocs) and tenured positions (lecturers and professors) in Flemish universities.

Figure 1 – Evolution in the number of pre-doctoral, postdoctoral and academic staff of Flemish universities 1995-2015

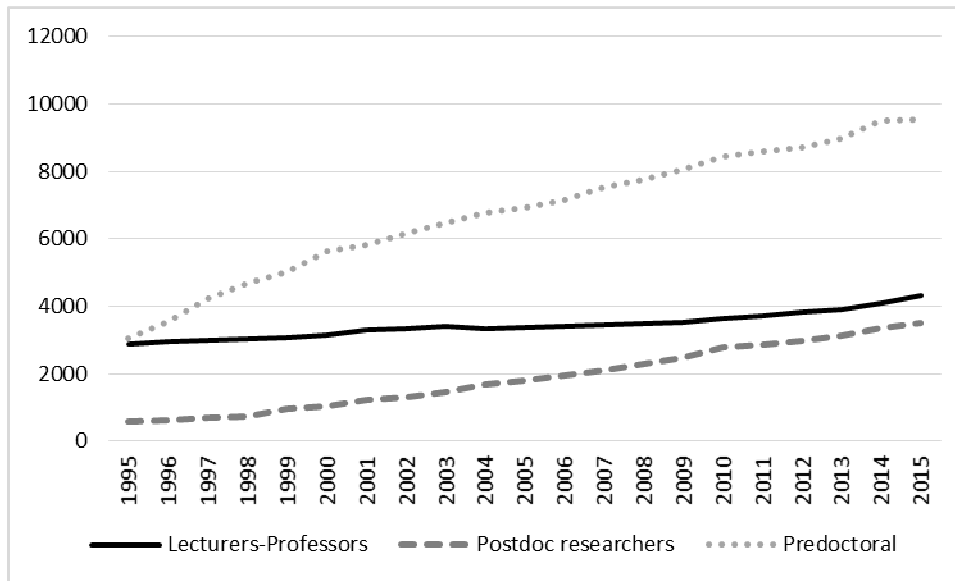


Figure 2 illustrates the evolution from 1995 to 2015 in the share of women and foreigners among the academic staff of Flemish universities at temporary research positions (postdocs) and permanent positions (lecturers and professors). The share of women and foreign postdocs and senior staff have increased. The gender gap between junior and senior positions has narrowed, whereas the nationality gap has broadened.

Figure 2 – Evolution in the composition of academic staff of Flemish universities 1995-2015

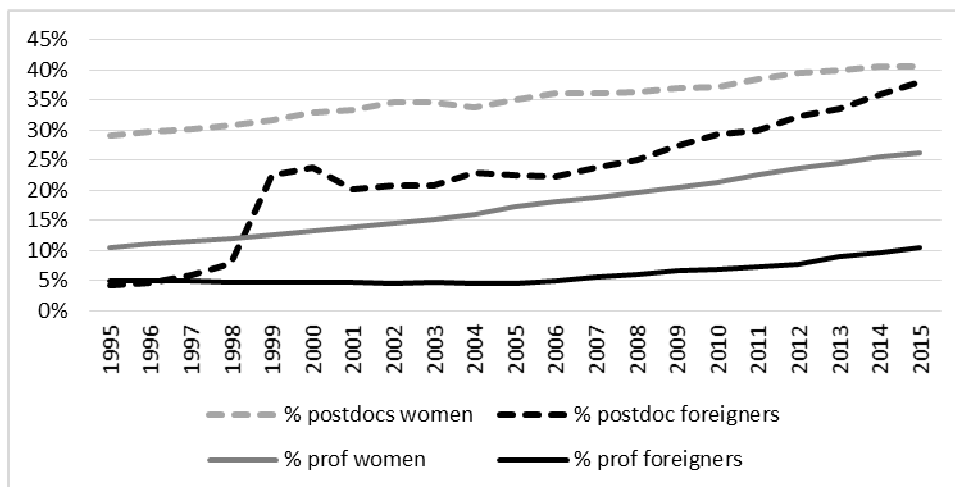


Table 1 presents the result of a binomial regression predicting the likelihood of PhD graduates from a Flemish university to obtain a postdoc position in a Flemish university.

Table 1 –Binary regression: probability of PhD graduates from a Flemish university to be appointed as postdocs in a Flemish university – PhD students with no bursary excluded

VARIABLES	Status postdoc	
	Coeff.	st.err.
Foreign vs. Belgian	-0.703***	(0.055)
Dutch vs. Belgian	-0.400***	(0.139)
trend	-0.039***	(0.003)

gender Female vs Male	-0.047	(0.035)
age	-0.000***	(0.000)
vs. funding 'other'		
funding phd assist	0.849***	(0.130)
funding phd fwo	0.854***	(0.130)
funding phd iwt	0.609***	(0.132)
funding phd drfellow	0.555***	(0.126)
funding phd scstaff	0.707***	(0.135)
cluster hw vs med	1.345***	(0.060)
cluster sw vs med	1.303***	(0.056)
cluster tw vs med	1.509***	(0.049)
cluster w vs med	1.122***	(0.047)
Constant	-0.034	(0.241)
Observations	17,319	

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

The results show that foreign PhD graduates are much less likely to obtain a postdoc position in a Flemish university compared to Belgians², as well as females compared to males. Chances to obtain a postdoc position have reduced throughout time for all researchers – not because of fewer postdoc positions but because of larger numbers of PhD graduates. Strong differences are also observed between different categories of financial support – compared with the category ‘*other funding*’; and by disciplines – compared with medicine as a benchmark (graduates in the social sciences and humanities having more chances,).

Table 2 presents the results of survival analysis regression model from postdoc position to full professorship.

Table 2 –Survival analysis: probability of promotion in a Flemish university or leave the Flemish HE system vs starting situation

² Exponential of -0.67 = 0.51

VARIABLES	POSTDOCS		LECTURERS		SENIOR LECTURERS		PROFESSORS	
	become LECTURER	Leave	become SENIOR LECTURER	Leave	become PROFESSOR	Leave	become FULL PROFESSOR	Leave
Foreign vs. Belgian	-1.099*** (0.153)	0.376*** (0.053)	-0.184 (0.229)	0.580 (0.577)	-0.691*** (0.250)	1.414** (0.553)	0.228 (0.532)	0.098 (0.903)
Dutch vs. Belgian	-0.321 (0.220)	0.258*** (0.097)	-0.273 (0.380)	0.738 (0.743)	-0.982** (0.435)	1.692*** (0.516)	-2.703** (1.135)	4.520*** (1.151)
Mobile internal vs inbred	-0.237* (0.125)	0.067 (0.098)	-0.008 (0.103)	-1.138 (0.747)	-0.124 (0.136)	-0.771 (0.742)	-0.297 (0.230)	1.607 (-1.362)
Mobile external vs inbred	-1.082*** (0.137)	0.331*** (0.052)	-	-	-	-	-	-
Mobile external pure vs. inbred	-	-	-0.386* (0.215)	0.740 (0.567)	-0.379** (0.154)	0.827 (0.788)	-0.439 (0.369)	2.203* (-1.252)
Mobile external link vs. inbred	-	-	-0.347 (0.270)	1.296** (0.605)	-0.392 (0.266)	0.944 (0.809)	-0.395 (0.430)	4.517*** (-1.278)
trend over time	-0.067*** (0.005)	-0.099*** (0.005)	-0.014 (0.012)	-0.009 (0.045)	-0.013 (0.014)	-0.046 (0.057)	-0.094*** (0.034)	0.080 (0.136)
gender_f	-0.416*** (0.061)	0.215*** (0.031)	-0.181** (0.081)	0.111 (0.293)	-0.079 (0.102)	0.081 (0.383)	-0.008 (0.182)	1.310 (-1.254)
age	0.000*** (0.000)	-0.000*** (0.000)	0.000** (0.000)	-0.000 (0.000)	-0.000* (0.000)	-0.000 (0.000)	-0.000 (0.000)	-0.001 (0.001)
funding_doc_assist vs other	1.265*** (0.089)	-0.858*** (0.071)	0.063 (0.119)	-0.319 (0.503)	0.045 (0.159)	0.254 (0.792)	0.308 (0.354)	-24.843*** (-1.134)
funding_fwo&iwt vs other	1.290*** (0.075)	-1.334*** (0.066)	0.500*** (0.103)	-0.475 (0.431)	0.126 (0.129)	-0.411 (0.700)	0.428 (0.341)	-1.096 (-1.293)
humanities vs med	0.316*** (0.084)	-0.234*** (0.059)	-0.183 (0.117)	-0.268 (0.469)	0.019 (0.137)	0.323 (0.441)	-0.084 (0.242)	0.610 (-1.110)
social science vs med	0.544*** (0.085)	-0.323*** (0.062)	-0.022 (0.113)	-0.069 (0.428)	0.082 (0.144)	0.050 (0.469)	-0.182 (0.221)	-2.865 (-1.888)
technical vs med	-0.173** (0.084)	0.166*** (0.042)	0.187 (0.137)	-0.273 (0.541)	0.043 (0.127)	-0.637 (0.782)	-0.316 (0.230)	1.658 (-1.357)
natural science vs med	-0.503*** (0.085)	0.282*** (0.040)	0.108 (0.122)	-0.121 (0.446)	-0.013 (0.126)	-0.258 (0.534)	-0.226 (0.239)	-1.189 (-1.528)
university_2 vs. 1	0.240*** (0.064)	-0.137*** (0.036)	-0.246** (0.102)	-0.083 (0.471)	-0.214* (0.117)	-0.010 (0.651)	-0.847*** (0.164)	1.796 (-1.519)
university_3 vs. 1	-0.104 (0.099)	-0.100* (0.053)	-0.197 (0.150)	-0.495 (0.807)	-0.438*** (0.165)	0.009 (0.842)	-0.244 (0.331)	-23.095*** (-1.198)
university_4 vs. 1	-0.011 (0.102)	-0.096** (0.048)	-0.417** (0.172)	1.050** (0.505)	-0.361* (0.194)	0.045 (-1.205)	-0.727 (0.485)	5.080*** (-1.443)
university_5 vs. 1	0.463*** (0.160)	-0.427*** (0.119)	0.371 (0.282)	0.036 (-1.035)	0.312 (0.346)	-23.347*** (0.675)	0.483 (0.502)	-22.228*** (-1.403)
Observations	11540	11540	1325	1325	1279	1279	543	543

Robust standard errors in parentheses. *** p<0.01, ** p<0.05, * p<0.1

*above 50% of appointment, >0.5 FTE full time equivalent

The results show that foreign postdocs are less likely to be appointed as lecturer than Belgian postdocs and more likely to leave. Women are also less likely to advance and more likely to leave compared to men. Being mobile within the Flemish HE system increases the chances to leave compared to inbred postdocs, while postdocs who obtained a PhD outside the Flemish HE system are less likely to be appointed as professor and more likely to leave than inbred postdocs.

The chances of appointment have decreased in time,³ while the probability to leave has grown. Strong differences in the probability to be appointed are observed between different categories of financial support at postdoc level (e.g. higher for FWO bursary holders– the Flemish Research Council), and between disciplines, compared to medicine the probability to be appointed is higher for social sciences and lower for the natural sciences.

³ trend variable measures the year the person began the starting position

Foreign scientists are also less likely to be promoted to professorial and full professor ranks, whereas for women slightly fewer chances are observed only for the step from lecturer to senior lecturer. Mobile scientists are more likely to leave at any step of their career, particularly if they are externally mobile. Mobility is associated with fewer chances of promotion to senior lecturer only for scientists coming directly into a professorial position from outside the Flemish HE system (see also “mobile external pure” in table below), while it is related to higher chances or no significant differences in the other cases.

Finally, Table 3 provides a longitudinal perspective and shows that compared to Belgian postdocs, foreign postdocs have become both less likely to leave and less likely to be promoted to lecture position. In the time span considered, the probability of promotion of women compared to men have not changed, while they have become comparatively less likely to leave.

Table 3 –Survival analysis: probability of postdocs to become lecturer in a Flemish university or of leave the Flemish HE system vs steady state. Interaction gender and nationality with time trend

VARIABLES	become Lecturer	Leave
foreign	-0.328 (0.323)	2.845*** (0.249)
mobile internal	-0.238* (0.125)	0.086 (0.081)
mobile external	-1.106*** (0.137)	0.358*** (0.056)
trend	-0.062*** (0.007)	-0.030*** (0.006)
gender f	-0.255 (0.160)	0.596** (0.233)
trend × foreign	-0.039** (0.019)	-0.146*** (0.013)
trend × gender f	-0.012 (0.011)	-0.025** (0.012)
age	0.000*** (0.000)	-0.000*** (0.000)
funding doc assist	1.275*** (0.090)	-0.794*** (0.067)
funding fwo	1.304*** (0.075)	-1.167*** (0.067)
cluster hw	0.321*** (0.084)	-0.269*** (0.060)
cluster sw	0.549*** (0.086)	-0.325*** (0.060)
cluster tw	-0.182** (0.084)	0.146*** (0.044)
cluster w	-0.512*** (0.084)	0.242*** (0.045)
university 2 vs. 1	0.242***	-0.100***

	(0.064)	(0.036)
university 3 vs. 1	-0.105	-0.176**
	(0.099)	(0.078)
university 4 vs. 1	-0.012	-0.084*
	(0.102)	(0.046)
university 5 vs. 1	0.476***	-0.494***
	(0.160)	(0.136)
Observations	11540	11540

Discussion and conclusions

The results show that demographic gaps are not only due to a higher propensity of women, foreigners and mobile scientists to leave,⁴ but also to more difficulties in advancing on the academic career ladder.

Despite mobility of scientists and attraction of international talent figure prominent in the European policy agenda towards an open and excellent research environment and a European Research Area (Musselin, 2004), nevertheless mobile and foreign scientists have less chances to progress and more chances to leave.

While some scholars argued that gender bias increases over the course of a career (Johnsrud and Heck, 1994), we observe that the greatest demographic gaps occur in the early stage of the career, and particularly in the step from postdoc to lecturer. Arguably, this is due to the fact that this is the most selective step – with the highest proportion of ‘casualties’ – as well as one with high social and symbolic value, as it marks the entrance into permanent, senior positions.

Finally, throughout time the gap in career chances between foreigners and Belgians have narrowed when it comes to the probability to leave while widened in terms of probability to progress, while the gender gap has narrowed when it comes to chances of leaving and remained stable in terms of chances to progress.

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⁴ Possibly, the high ‘leave’ coefficient of foreigners is also due to be hired on shorter term positions

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