ECOOM Briefs
CENTRE FOR R&D MONITORING

Nr. 11
March 2016

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# From PhD to professor in Flanders

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ECOOM brief nr 11, 2016.

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## THE FLEMISH ACADEMIC CAREER STRUCTURE & CHANGES IN THE ACADEMIC WORKFORCE

Ph.D. graduates in Flanders have usually taken one of the following routes to fund their Ph.D. (ECOOM brief 1, 2011):

1. 1 in 3 obtain a competitive 4-year scholarship, such as awarded by the FWO, IWT, or the university's own funds.
2. About 12% have an appointment as Research Assistant, usually awarded for 6 years and involving a teaching and Ph.D. research commitment.
3. About 40% have an appointment funded by a principal investigator's (P.I.) research project; we differentiate further between basic versus applied research projects. Not all of these researchers have the obligation (nor the intention) to obtain a Ph.D.
4. The remaining 12% have their own private funding, are employed outside the university, or are funded directly from international funding agencies. International Ph.D. students are the majority in this group.

A postdoctoral appointment (either as fellowship holder, postdoc assistant, or project-based appointment) has become a standard intermediary phase - if not a prerequisite - before obtaining a tenure-track or tenured position as professor.

Tenure-track as well as tenured positions in the rank of "Docent", "Hoofddocent", "Hoogleraar" or "Gewoon Hoogleraar" are all positions providing full P.I. entitlements and a long-term, usually statutory, contract. In Flanders they are called "Zelfstandig Academisch Personeel" ("independent academic staff" or "ZAP").

Most Ph.D. students embark on a research career out of a passion for scientific research. An important share also consider the Ph.D. training phase as the first phase of an academic career. Indeed, 58,1% aspire a further career within the university (ECOOM brief 8, 2013) although not necessarily as professor. The lack of complete academic workforce data, as well as the increasing investment in the number of Ph.D. researchers, gives rise to many myths on the possibilities for Ph.D. students to pursue an academic career. Correct information on the share of Ph.D. holders pursuing a professorship in Flanders as well as on the elements affecting this, can help early-stage researchers to make realistic career choices.

The Human Resources in Research Flanders database (HRRF) at the Interuniversity Centre for R&D Monitoring, ECOOM, has been tracking the careers of all the researchers affiliated to one of the five Flemish universities since the academic year 1990-1991. 25 years of data allow for monitoring individual career progression, from short-term research contracts at entry level to Ph.D. production, postdoctoral appointments, tenured positions and retirement.

For a long time universities in Flanders have adopted relatively closed recruitment practices, preparing many of their own graduates for an academic career within their own institution. While the research community at Ph.D. and postdoc level has become increasingly international over the last two decades, this process of opening up develops more slowly at professorial level. On average three quarters of professors currently working in Flemish universities also obtained their Ph.D. at the same Flemish university, and fewer than 10% of professors are non-natives (Leyman et al, 2011; VLIR 2014).

The current study focuses on careers which have developed within Flanders, using the Flemish Ph.D. as a

starting point and the promotion to professor as an end point. Full-time as well as part-time appointments are treated equally in the following analyses. Temporary guest-professorships are not taken into account. The fact whether the phase between the Ph.D. and the professorship is spent as a postdoctoral researcher at a Flemish university, as a postdoctoral researcher abroad, or in a different sector of the labour market altogether, is not taken into account. Academics in Flanders who obtained their Ph.D. outside Flanders are not included in the current analyses. No information is available on the careers of Ph.D. graduates at Flemish universities who established an academic career abroad or a career outside university.

## HAS IT ALWAYS TAKEN THIS LONG TO BECOME PROFESSOR?

The time when a Ph.D. degree led directly to an appointment as professor is long gone. For the cohort of ZAP-professors appointed between 2001 and 2004 at a Flemish university, 52,6% was appointed in less than 3 years since obtaining their Ph.D. When compared with the later cohorts, the share of academics who became professor in 3 years or less decreased to 40,4% (cohort appointed between 2010 and 2013). Meanwhile, the share of those taking 5 years or more increased steadily.

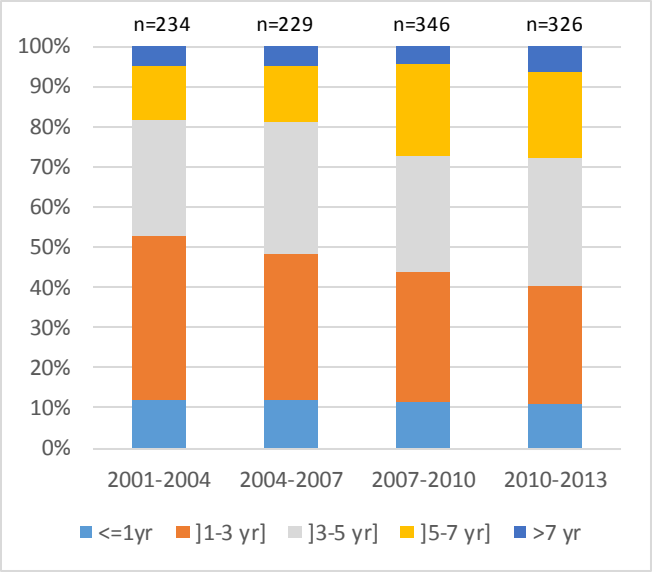


Figure 1: Time between obtaining the Ph.D. and the appointment as ZAP at a Flemish university, by cohort of ZAP appointment. n= number of ZAP appointments during this period.

The differences between the individual cohorts are not significant ($Chi^2(12, n=1135)=17,88, p=0,119$), but comparing the grouped cohort of 2001-2007 on the one hand with the grouped cohort of 2007-2013 on the other, illustrates a significant trend towards a longer postdoc phase before being appointed as ZAP ($Chi^2(4, n=1135)=14,59, p=0,006$).

For each of the above analyses the time-frame for the potential recruitment pool of Ph.D. graduates is limited to a sliding window of 10 years, which allows for fair comparison over time. References to 'years' correspond with 'academic years' (e.g. 2001 being the academic year 2001-2002).

In order to examine the factors affecting these trends in more detail, we follow various cohorts of Ph.D. graduates at Flemish universities, taking this potential recruitment pool as the starting point for academic career progression.

## TRENDS IN THE SHARES THAT PROMOTED TO PROFESSOR

The number of new appointments as professor or "ZAP" has increased over the subsequent cohorts (Figure 2), more due to a retirement turnover than to an increasing number of professorships. Indeed, with 361 additional headcounts in 2004 compared to 1996 there is only an 11% increase in the ZAP-staff (VLIR). The potential recruitment pool (i.e. the number of Ph.D. graduates) has increased even more. The graph below illustrates how the number of ZAP appointments (bar chart) increased in Flanders between cohort 1 (Ph.D.'s graduating in 1995-2000) and 2 (Ph.D.'s graduating in 2000-2005), while the share of doctorate holders continuing to obtain such a professorship in Flanders (black dots) barely changed (19,0% versus 17,5% ($Chi^2(1, n=6623)=2,29, p=0,13$).

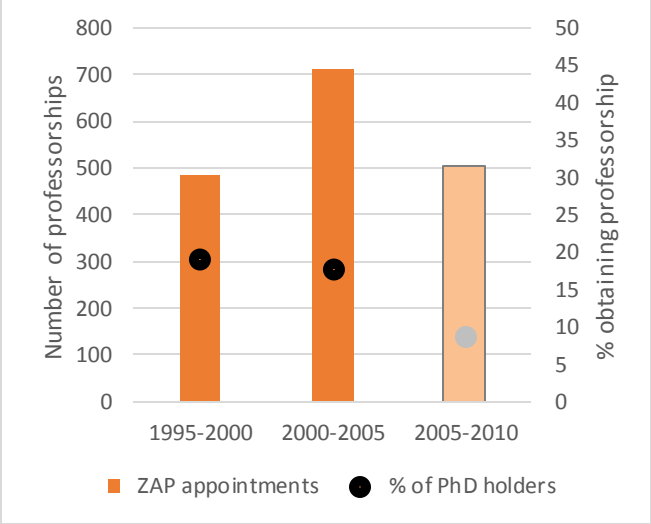


Figure 2: Number of professor appointments per cohort of Ph.D. graduates in Flanders, and share of Ph.D. graduates obtaining a professorship at a Flemish university, by graduation cohort.

The more recent cohort data of 2005-2010 are still subject to change: the majority of professors recruited over the last few years have spent more than 3 years in some type of postdoctoral appointment (Figure 1), therefore the share of recent graduates obtaining a professorship is likely to grow as the HRRF-database continues to add more recent appointment data. Nevertheless, we can expect that the overall share of the current generation of Ph.D. graduates that will become a professor in Flanders will remain under 1 in 5, if the same

recruitment tradition continues and if the interest in an academic career remains unchanged.

## ACADEMIC CAREER PROGRESSION BROKEN DOWN BY DIFFERENT SUBGROUPS

Given the time frame of the HRRF (starting in 1990, with the most recent update for 2012-2013) only the cohorts graduating between 1995 and 2005 are used to examine in more detail the evolution of the elements affecting academic career progress. We not only look at those researchers who benefited from the 'regular' funding mechanisms in Flanders (the first three routes towards a Ph.D. as described above) but include also those who obtained a Ph.D. with funding from international sources, or in their free time, or combined with an appointment elsewhere (the fourth route).

Factors influencing Ph.D. completion rates are type of funding and research area, and to a lesser extent also gender (see Groenvynck et al., 2013). Do these factors also have an impact on the attainment of professorships?

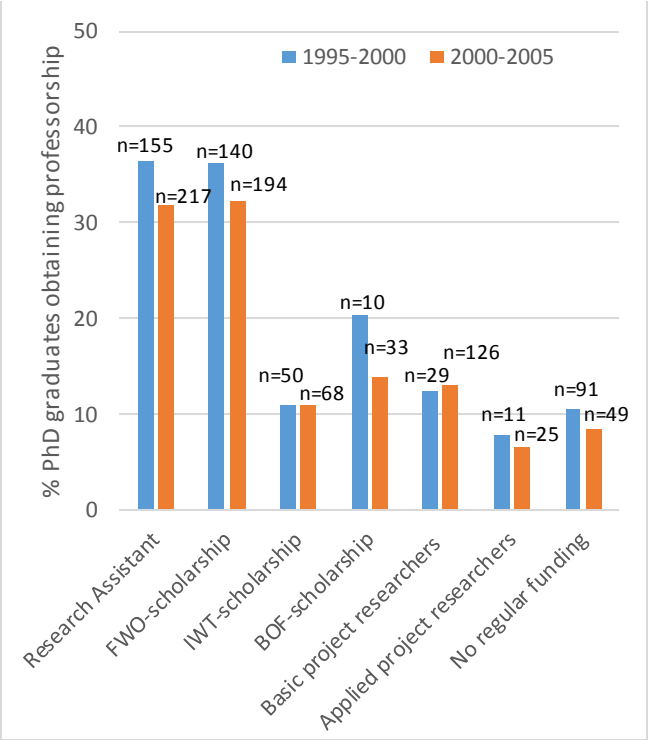


Figure 3: Share of Ph.D. graduates obtaining an appointment as professor in Flanders, by type of funding and by Ph.D. completion cohort (1995-2005). n= number of corresponding professor appointments.

First we look at the different **types of Ph.D. funding**. Some of the 4 funding routes towards a Ph.D. degree in Flanders, as delineated above, can be divided further into the following subgroups: competitive scholarships in Flanders are awarded by the FWO (Research Foundation Flanders) for fundamental research, by the former IWT (Agency for Innovation by Science and Technology) for applied research and by the university's own research funds (BOF). Project-based funding can be distinguished in focus, namely basic versus applied research. The latter groups contain both bursaries and scientific staff.

For cohort 1 and cohort 2, FWO scholarship holders and Research Assistants have the highest share of graduates becoming professor, significantly above the other groups ($Chi^2(6, n=2557)=236,25$, $p<0,001$ and $Chi^2(6, n=4064)=284,74$, $p<0,001$ respectively). On average 1 in 3 become professor at a Flemish university. This may be surprising for Research Assistants, as they tend to have much lower completion rates and a longer time-to-degree for the Ph.D. itself. Of the Ph.D. graduates funded directly by the IWT, an agency focused on funding applied research and industry collaboration, only 11% become professor. In the remaining PhD funding groups, however, a similarly low share becomes professor within the Flemish university system.

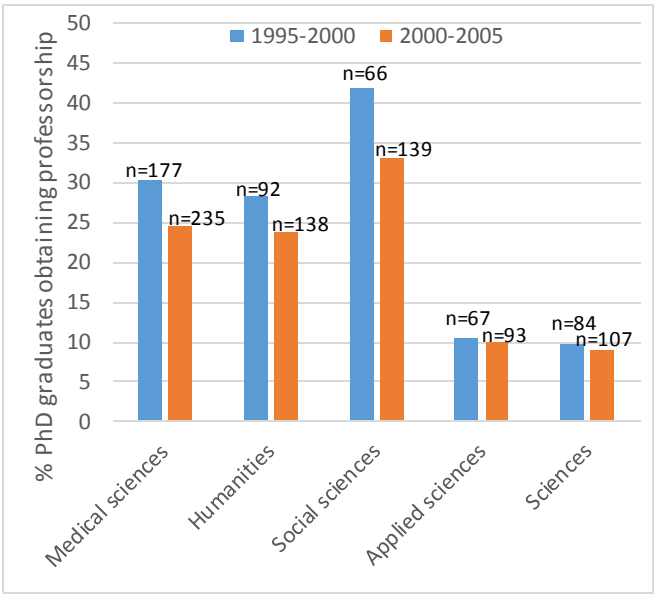


Figure 4: Share of Ph.D. graduates obtaining an appointment as professor in Flanders, by research area and by Ph.D. completion cohort (1995-2005). n= number of corresponding professor appointments.

The number of Ph.D. graduates in Flanders is not evenly spread across **disciplines**: far more Ph.D. degrees are awarded in engineering, natural sciences and biomedical sciences than in social sciences and humanities, which obviously affects the possibilities of academic career progression. 2 in 5 social scientists in the first cohort and 1 in 3 in the second cohort became a professor. Among medical scientists 1 in 3 (first cohort) or 1 in 4 (second cohort) obtained a professorship. For many of them, this professorship may be a part-time university appointment of ZAP as low as 10%, the remaining time being affiliated to a university hospital.

The humanities are an interesting case. If those who self-funded their Ph.D. had not been included, the humanities scholars would have shown a similarly high progression rate towards professorship as social scientists, but the high number of self-funded Ph.D.'s in the humanities not continuing in academia, affects the entire group's share that becomes professor (not in graph). In the applied

sciences and natural sciences, 90% of the Ph.D. graduates leave the Flemish university system in order to continue their career elsewhere. This is significantly higher than in other disciplines ($Chi^2(4, n=2557)=196,21, p<0,001$ and $Chi^2(4, n=4065)=214,36, p<0,001$, cohort 1 and 2 respectively).

Finally, we investigate whether **gender** has an impact on the share of graduates establishing an academic career within the Flemish university system. In the first cohort, the share of male graduates obtaining a professorship at a Flemish university is higher than the share of female graduates (not in graph - 20,5% versus 15,9% respectively, $Chi^2(1, n=2557)=7,53, p=0,006$), but the gap is closing in the following cohort (18,2% versus 16,3% respectively, $Chi^2(1, n=4066)=2,26, p=,133$). Between cohort 1995-2000 and cohort 2000-2005 the share of women obtaining a professorship however does not show any significant increase ($Chi^2(1, n=2262)=0,05, p=0,818$). It is a drop in the percentage of male Ph.D. graduates continuing to pursue a professorship - however not significant ($Chi^2(1, n=4361)=3,54, p=0,06$) - that helps to close the gender gap.

In addition, we conducted a logistic regression analysis using Ph.D. funding, research area and gender as independent variables. A test of the full model against a constant only model is statistically significant ($Chi^2(11, n=4064)=457,13, p<0,001$). The predictive value of the model is low (Nagelkerke $R^2=0,176$), however the Wald criterion demonstrates that the above mentioned findings remain. Additionally, we observe a significantly higher share of men promoting to professor than women ($Exp(B)=0,62, p<0,001$) (data for the second cohort).

## CONCLUSION

About 1 in 5 Ph.D. graduates at a Flemish university obtain an academic post as professor at the same or a different Flemish university. This share is the combined result of opportunities to remain within the Flemish academic system, interest to establish a career path within the system and degree of internationalization within the system. The increasing number of Ph.D. graduates implies that this figure will decrease slightly for the current generation if the total number of professorships is to remain the same. Comparing recent cohorts with older ones, the time between Ph.D. completion and entry at professorial level now more often covers a longer period of time.

Of those who funded their Ph.D. through competitive scholarships and Research Assistant appointments, higher shares established an academic career in Flanders. Ph.D. graduates in the natural sciences and engineering – less often establish an academic career. Finally, men more often than women used to continue their early-stage research career within academia. Further analysis is needed to identify at which step of the academic career ladder exactly the career progression starts to differentiate.

The HRRF-database is constructed using administrative data sources, without information on personal aspirations, opinions, experiences, … which are also important variables of career progression. Although the variables gender, discipline and PhD funding have a significant impact, the predictive value of each of these independent variables is low, as shown in the logistic regression model. Still the HRRF database is unique in its kind in its provision to map the career track of all the researchers working within the Flemish university system and to monitor changes over time.

Obviously, the above analyses are limited as the HRRF-data do not include researchers' international or intersectoral mobility. Incoming and outgoing researchers constantly change the potential recruitment pool for universities. While many graduates, Flemish or international, leave Flanders for professorial positions elsewhere (both groups 'reducing' the competition) international candidates not included in the above graduation cohorts heighten the competition for professorships for locally-bound graduates in Flanders. Adding to the complexity of career opportunities are the labour market demands in the non-academic R&D sector, often scouting proactively to recruit highly educated talents. For those Ph.D. graduates with academic career aspirations but reluctant to pursue those abroad, information on their opportunities within the Flemish academic system may help them to make realistic career choices, or re-envisage their career on a global scale.

## SOURCES


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