

Success rates among doctoral researchers in Flanders who enrolled in 2009-2010 and 2010-2011

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REPORTING OF DOCTORAL SUCCESS RATES AT FLEMISH UNIVERSITIES: PAST AND FUTURE

The Human Resources in Research Flanders (HRRF) database is used to monitor the careers of researchers in Flanders. Checking the extent to which researchers obtain a PhD is part of this. Until now, this monitoring only considers the PhD success rates of doctoral researchers with an appointment at a Flemish university. These success rates are reported every two years in the basic HRRF indicators (1). However, we know from these same basic indicators that an important share of PhDs is awarded to researchers who never had an appointment to carry out the PhD at a Flemish university: of the PhDs awarded in 2016-2017, this amounted to 17% (1). ECOOM brief 26 dealt for the first time with this group **without appointments**; they are in fact researchers who are not funded through the typical pathways mentioned in table 1 of ECOOM brief 24 (2). This concerns, for example, non-Belgians who are financed by their home institution or through specific funding that cannot be traced in the appointment data of universities, such as VLIR-UOS (3). ECOOM brief 26 showed that the group without appointments differs significantly from the group with appointments: it consists of a higher proportion of men, non-Belgians, older doctoral researchers and doctoral researchers in the human and social sciences. Moreover, the analysis showed that from the 2009-2010 academic year onwards we can calculate valid PhD success rates for this group. A first comparison showed lower success rates in the group without appointments than in the group with appointments.

From now on, the intention is to extend the standard reporting (known as the 'basic indicators') by including PhD success rates for the entire group of doctoral researchers, i.e. including the doctoral researchers without appointments. In the current ECOOM brief, we make a first attempt at this.

SCOPE OF THIS BRIEF

In the present brief we will discuss the PhD success rates of the entire group of doctoral researchers who enrolled in 2009-2010 and 2010-2011. We are going to look at the extent to which the PhD is achieved within six years of starting, we call these the **six-year success rates**. We will look at the overall success rates of doctoral researchers in these cohorts and how these success rates relate in function of science cluster, funding type, sex, age and nationality. In a multiple logistic regression analysis, we then measure the simultaneous effect of the above-mentioned factors on the outcome, more specifically the chance of obtaining a PhD within a period of six years.

MARKING OUT DATA SOURCE AND DEFINITIONS

The HRRF database contains the appointments of all researchers associated with one of the five Flemish universities since 1990. In addition, it also includes all doctoral enrolments and public defences. The database contains information such as sex, nationality and age; in which science cluster the research is carried out and with what funding. The latest update on which this brief is based contains the data of the academic year 2016-2017.

For this ECOOM brief, we examined the entire population of doctoral researchers of the 2009-2010 and 2010-2011 enrolment cohorts, with the exception of the small group of art scholars, and doctoral researchers with a multi- or interdisciplinary research domain. This is due to their small share (n=77, 1.5% of enrolments in 2009-2010 and 2010-2011) and the unclear conceptualisation of the terms 'multidisciplinary' and 'interdisciplinary'.

Given that the latest update of the HRRF database runs until the academic year 2016-2017, it is possible to determine at most the six-year success rates.

The method by which success rates are calculated for the entire group of doctoral researchers needs to be adapted compared to the method we use for the group with appointments. After all, for this group we use the date of the first appointment at the university as well as the first enrolment date for the PhD. For the entire group of doctoral researchers, however, we are fully dependent on the first enrolment date for the PhD.

We are also moving away from the strict method we use in the HRRF for determining success rates. This strict method means that only when the period between the public defence of the PhD and the first enrolment for the PhD is less than or equal to exactly six years, the researcher is categorised as someone who obtained the PhD within the period of six years. However, we know from ECOOM brief 26 that the first enrolment for the PhD does not always correspond with the actual start of the PhD (3). For this reason we use a less strict method here: persons who enrolled for the PhD in academic year yyyy and obtained their PhD at the latest in academic year yyyy+6 are categorised as researchers who obtained their PhD within a period of six years. This leads to an additional 214 researchers who are considered as having obtained the PhD within six years.

The science cluster in which the PhD is carried out was determined on the basis of the science cluster in which one enrolled for the PhD. If, over the course of time, we had several enrolments for the PhD for a researcher, which gave rise to several science clusters, the most frequent science cluster was chosen.

The funding type is determined on the basis of the dominant funding statute. For a detailed explanation of the different types of funding we refer to Table 1 of ECOOM brief 24 (2). Note that FWO PhD fellow stands for the holder of a doctoral fellowship for fundamental research. In addition, we have taken the holders of a doctoral fellowship for Strategic Basic Research (SB) and the Baekeland mandate together. This is abbreviated as SB+Baekeland.

The age at which the PhD started was divided into four categories, namely ≤ 24 years,]24-28] years,]28-38] years and >38 years. These were chosen because of the very different ages at which Doctoral researchers started their PhD (see appendix 1, characteristics of Doctoral researchers).

Nationality is divided into Belgian and non-Belgian.

RESULTS

In Table 1 we see the six-year success rates of doctoral researchers divided according to age, sex, nationality, science cluster and funding type.

If we look at the entire population of doctoral researchers, we see that 67.9% obtain their degree within six years. For doctoral researchers with appointments at a Flemish university, this is 71.5% (not shown in the table) and significantly higher than for doctoral researchers without appointments (53.3%, $X^2(1, N=505050)=119.651, p<0.001$). We observe a significant difference in function of the age at which one started the PhD; researchers who were younger at the start had higher success rates than researchers who started the PhD at an older age.

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Table 1: Share of doctoral researchers having enrolled in 2009-2010 and 2010-2011 (n=5050) who obtained their PhD within the period of six years after starting - Global results and results in function of sex, age of start, nationality, scientific cluster and funding type

	%	§
Overall	67.9	
Age when starting the PhD		***
≤ 24 years	77.0	
]24-28] years	68.2	
]28-38] years	59.4	
> 38 years	52.8	
Sex		ns
Men	68.7	
Women	67.0	
Nationality		ns
Belgian	68.4	
Non-Belgian	67.1	
Scientific cluster		***
Medical sciences	73.2	
Humanities	56.6	
Social sciences	61.3	
Applied sciences	69.8	
Exact sciences	72.7	
Funding type		***
FWO PhD fellow	82.2	
SB+Baekeland	83.2	
BOF PhD fellow	73.7	
Assistant	62.1	
PhD fellow ⁽¹⁾	70.6	
Research staff ⁽¹⁾	57.9	
Remainder	47.2	
Without appointments	53.3	

§ significance: ns=not significant ; * $p<0.05$; ** $p<0.01$; *** $p<0.001$

(1) Funded by project means

We do not see any significant difference in the success rates between men and women, nor between Belgians and non-Belgians. For the scientific clusters, however, there is a significant difference, with medical, exact and applied sciences having the highest six-year success rates and humanities and social sciences the lowest. We also notice a significant difference depending on the type of funding. Researchers of the type FWO PhD fellow and SB+Baekeland have the highest six-year

success rates, while research staff and assistants have the lowest six-year success rates.

Next, Table 2 shows the results of the multiple logistic regression. It examines the effect on the outcome, more specifically the completion of the PhD within a period of six years, of the factors sex, nationality, age at start, scientific cluster and funding type at the same time. The chance of an outcome is expressed in an odds ratio (OR). An OR > 1 indicates a higher probability of finding an outcome, an OR < 1 indicates a lower probability of finding an outcome. The comparison is always made in relation to the reference group "(ref.)".

Table 2: Opportunity to obtain the PhD within a period of six years for doctoral researchers who enrolled in the academic years 2009-2010 and 2010-2011 (n=5050) - Results multiple logistic regression

	OR	95% CI	§
Constant	7.92	-	***
Age when starting the PhD			
≤ 24 years (ref.)	-	-	-
]24-28] years	0.68	(0.58-0.80)	***
]28-38] years	0.54	(0.44-0.66)	***
> 38 years	0.54	(0.40-0.71)	***
Sex			
Men (ref.)	-	-	-
Women	0.86	(0.76-.98)	*
Nationality			
Belgian (ref.)	-	-	-
Non-Belgian	1.49	(1.28-1.74)	***
Scientific cluster			
Medical sciences (ref.)	-	-	-
Humanities	0.52	(0.42-0.64)	***
Social sciences	0.60	(0.49-0.74)	***
Applied sciences	0.72	(0.60-0.86)	***
Exact sciences	0.76	(0.62-0.94)	*
Funding type			
FWO PhD fellow (ref.)	-	-	-
SB+Baekeland	0.95	(0.67-1.35)	ns
BOF PhD fellow	0.65	(0.45-0.93)	*
Assistant	0.43	(0.31-0.59)	***
PhD fellow ⁽¹⁾	0.51	(0.39-0.67)	***
Research staff ⁽¹⁾	0.37	(0.26-0.52)	***
Remainder	0.25	(0.15-0.43)	***
Without appointments	0.29	(0.21-0.39)	***

§ significance: ns=not significant ; *p<.05; **p<0.01; *** p<.001

Model fit : LR = 6004 ; df = 16, p < 0.001 ; Nagelkerke R²=0.09

CI=Confidence interval

(1) Funded by project means

Contrary to what we found in the bivariate analysis, we see that there is a significant difference for both nationality and sex. In particular, we see that women have slightly lower success rates than men and that non-Belgians have higher success rates than Belgians.

In addition, the differences we observed earlier in the bivariate analysis in function of age at start, scientific cluster and funding type remain significant in the multiple logistic regression analysis. More specifically, we found that people who started their PhD later in life had lower success rates than researchers who started their PhD at a younger age. We also note higher success rates for medical sciences, followed by applied and exact sciences. In humanities and social sciences we see the lowest success rates. Researchers with a mandate for fundamental research (FWO PhD fellow), strategic basic research (SB) and Baekeland have the highest success rates. This is followed by BOF PhD fellows and PhD fellows funded by project means.

DISCUSSION

Until now, the PhD success rates in the HRRF have only been determined for doctoral researchers with appointments at a Flemish university. However, there are doctoral researchers in Flanders who are not funded through the typical pathways and therefore do not end up in the group with appointments at a Flemish university during their PhD. In 2016-2017, this group accounted for 17% of doctorates obtained. Because it is advisable to include this group in the HRRF basic indicators, we took a first look at the group of doctoral researchers without appointments in ECOOM Brief 26 (3) in order to check 1) if and 2) from when we were able to calculate PhD success rates for this group. This showed that this is possible as of the researchers who started their PhD in 2009-2010 and 2010-2011. The current ECOOM brief looked for the first time at the success rates of the entire group of doctoral researchers for these two enrolment cohorts.

In total, 68% of the doctoral researchers who enrolled during the academic years 2009-2010 and 2010-2011 obtained their PhD within a period of six years. There are major differences depending on the type of funding: for holders of a fundamental research mandate (FWO PhD fellow), a strategic basic research mandate and a Baekeland mandate, just over 80% obtained a PhD within six years. Just over 70% of BOF PhD fellows and PhD fellows on project means obtained a PhD within six years. Among research staff, 58% obtained their PhD within six years and among people without an appointment, this is 53%. Among assistants, we note a success rate of 62%, but they combine research with education, and usually take more than six years to obtain a PhD, as shown by the basic indicators (1). For researchers who started their PhD at the age of 24 or younger, we have established a success rate of 77%. The older one is when starting the PhD, the lower the six-year success rate (53% if one is over 38 years old). In the medical, exact and applied sciences we see success rates of 70% or just a little more. In the social sciences and humanities, the success rates are 61% and 57% respectively.

In the multiple logistic regression analysis the observed differences persisted, but on top of that we also find significant differences in function of sex and nationality. More specifically, we see that women have a slightly lower chance than men of obtaining a PhD within six years. In terms of nationality, we see that non-Belgians have a significantly higher chance of obtaining a PhD within six years compared to Belgians. If we break down nationality in more detail by

continent (not shown in the results), we get the same result, i.e. researchers from all continents except Oceania have significantly higher success rates than Belgian researchers. The success rates per continent are shown in appendix 2 for the sake of completeness.

Finally, we mention that the predictive value of the multiple logistic regression is small ($R^2=9\%$). This means that the model does not allow for accurate predictions; however, the effects found in it do indicate a significant effect of these factors on obtaining the PhD within six years. The HRRF database is composed purely of administrative data. This means that we have no information about intrinsic personality characteristics, nor about factors such as, for example, the family situation, factors that may also have a significant effect on the outcome studied. Indeed, there are studies that suggest that civil status or having children, more than gender in itself for example, may have an effect on the duration of the PhD (4).

The doctoral success rates that we see in Flanders are difficult to compare with those of other countries. On the one hand, this is because Flanders has a unique landscape in the field of research, where doctoral researchers enjoy more financial security than, for example, the model in the United States or the United Kingdom (5). On the other hand, there are few comparable systems in other countries for determining doctoral success rates. Often, knowledge about the time taken to obtain a PhD is based on self-reporting and it is not the success rates that are reported, but the average and median duration. This is generally around 60 months (figures for Wallonia and the Netherlands) (4,6,7). In the UK data is available for full-time doctoral researchers who started in 2010-2011: 72.9% obtained the PhD within seven years (8). A recent Australian study shows somewhat lower overall PhD success rates compared to Flanders. But also here these rates vary considerably depending on the age of the doctoral researchers, the scientific domain, nationality and by funding (scholarship versus no scholarship) (9). Other studies also show that the scientific cluster and the PhD funding type are the main indicators related to (the time needed for) obtaining the doctoral degree (4,10,11,12), just like the study by Groenvynck et al. which was previously carried out on the HRRF database and therefore only concerned doctoral researchers with appointments (13). The effects found may have different explanations: in order to obtain a funding grant of the competitive type, for example, strict procedures are foreseen that take into account the results of the master's degree and previous (published) experiences in the research field; in the human and social sciences, the doctoral student may start his own research, which is not in line with that of the supervisor, and therefore has to work more in isolation; for the exact, medical and applied sciences, on the other hand, there may be more teamwork on a specific project.

In this brief, we provide, for the first time, detailed information on doctoral success rates for the entire population of doctoral researchers in Flanders, i.e. including the doctoral researchers without appointments. It is the intention to include these global figures in the next HRRF Basic Indicators, which serve to support the research policy, starting from the doctoral researchers who enrolled in 2009-2010. In the past, we had few tools to delineate the group without appointments, more specifically to determine their starting point.

Thanks to the obligation to enrol for the PhD and the better administrative follow-up, it will be possible to include this group in the more recent enrolment cohorts. In this way, we can provide PhD success rates for all doctoral researchers who start their research at a Flemish university.

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APPENDICES

Appendix 1: Characteristics of doctoral researchers for the group with and without appointments

	With appointments (n=4067)	Without appointments (n=983)
% women	46.9%	40.5%
% non-Belgians	29.9%	67.7%
Detail non-Belgians		
% EU (without Belgium)	11.7%	16.3%
% Asia	11.3%	27.4%
% Africa	2.2%	13.1%
% South America	1.8%	4.9%
% North America	1.1%	3.7%
% Europe non-EU	1.6%	1.9%
% Oceania	0.1%	0.4%
Age when starting the PhD		
P25	23.5 years	27.9 years
P50	24.6 years	32.4 years
P75	27.0 years	38.6 years
Scientific cluster		
Medical sciences	23.1%	24.1%
Humanities	11.9%	23.9%
Social sciences	14.3%	18.6%
Applied sciences	32.1%	22.9%
Exact sciences	18.7%	10.5%
Funding type		
FWO	11.3%	
SB + Baekeland	11.1%	
BOF	7.0%	N/A
Assistant	9.3%	
PhD fellow ⁽²⁾	52.7%	
Research staff ⁽²⁾	6.7%	
Remainder	1.8%	

(1) P25, P50 and P75 represent respectively the 25th, 50th and 75th percentiles

(2) Funded by project means

Appendix 2: Share of doctoral researchers from the enrolment years 2009-2010 and 2010-2011 (n=5050) who obtained their PhD within the period of six years after starting - Results in function of nationality ⁽¹⁾ grouped in the different continents

	%
EU (without Belgium)	66.9
Europe non-EU	72.1
North America	68.8
South America	68.3
Asia	67.0
Africa	65.1
Oceania	50.0

(1) Nationality is displayed according to the different continents (Africa, Asia, North America, South America, Europe, Oceania). Europe is further divided into Belgium, Europe EU without Belgium (EU) and Europe non-EU (non-EU), taking into account the dates of accession to or departure from the European Union.

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