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Life after… or next to the PhD: how PhD candidates look at a career of self-employment

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SELF-EMPLOYMENT

Self-employed activities and SMEs play an important role in job creation, job quality, and productivity (International Labour Organization (ILO), 2019). The step to carry out a self-employed professional activity (both in the case of secondary or main activity) is supported and encouraged by various public bodies (i.e. Flemish Government, European Commission, ILO,…). In her memorandum for 2019-2024, VARIO, the Flemish Advisory Council for Innovation & Enterprise, emphasizes, the importance of encouraging and supporting SMEs and sole traders to optimize economic growth, prosperity and well-being in the Flemish Region (VARIO, 2018). This is echoed in the Action Plan on Entrepreneurial Education 2015-2019 (Flemish Government, 2016), in which specific reference is made to informing and encouraging PhD students and PhD alumni to start their own business (Muyters, 2018 and 2019). To date, however, little is known about the interest of PhD candidates in running their own business in Flanders. In addition, there are not many data on how they assess their chances of starting their own business (whether or not as a secondary activity).

In what follows we will have a look at the PhD candidates' point of view. We will use the following five research questions to present their answers:

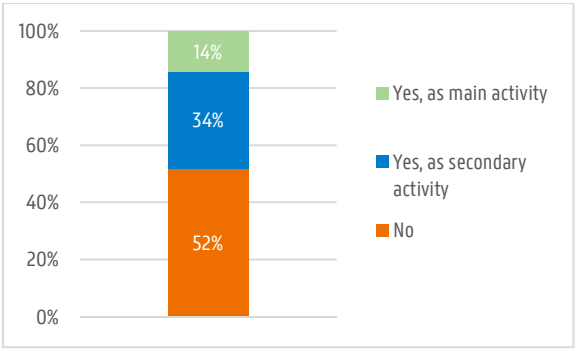
1. *Are PhD candidates interested in becoming self-employed in the Flemish Region anno 2018?*
2. *Does the interest in becoming self-employed differ according to gender, nationality, scientific cluster and PhD phase?*
3. *How do PhD candidates in Flanders anno 2018 assess their chances of becoming self-employed in the future?*
4. *Does the estimated chance of becoming self-employed differ according to gender, nationality, scientific cluster and PhD phase?*
5. *How do PhD candidates who are interested in becoming self-employed, estimate the likelihood of realizing this in the future?*

We will answer these research questions based on the *Survey of Junior Researchers* from 2018. This survey was organized by ECOOM Ghent University and is aimed at all junior researchers at the five Flemish universities. For the current analysis we limit ourselves to those junior researchers who are currently doing a PhD (*N*=3359). For further information about the survey, we refer to ECOOM-brief 17.

ARE PHD CANDIDATES INTERESTED IN BECOMING SELF-EMPLOYED IN THE FLEMISH REGION ANNO 2018?

In the *Survey of Junior Researchers* 2018 we asked the PhD candidates: "Are you interested in becoming self-employed in the future? ". The possible answers were: (a) yes, as main activity; (b) yes, as secondary activity; (c) no. Only one choice could be made. Figure 1 shows that 14% of the PhD candidates were interested in becoming self-employed as main activity, 34% opted for secondary activity and 52% of the PhD candidates were not interested.

Figure 1. PhD candidates and their interest in self-employment, Flanders 2018 (*N* = 3003)

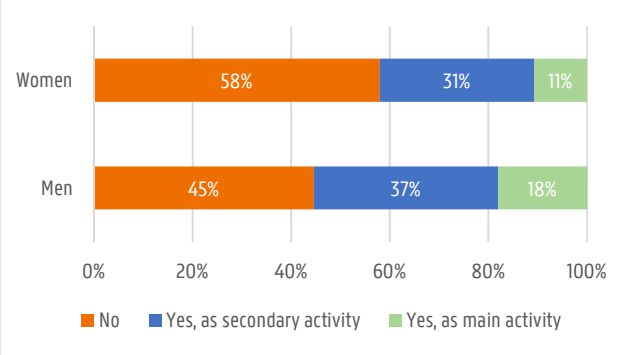


DOES THE INTEREST IN BECOMING SELF-EMPLOYED DIFFER ACCORDING TO GENDER, NATIONALITY, SCIENTIFIC CLUSTER AND PHD PHASE?

The statistical analysis to determine whether interest and estimated opportunities to become self-employed differ significantly depending on gender, nationality, science cluster and doctoral phase can be found in Appendix 1.

Do male and female PhD candidates differ in the amount of interest they have in becoming self-employed? Figure 2 points to a clear "yes": male PhD candidates declare, significantly more than women, to be interested in becoming self-employed, both as main and as secondary activity.

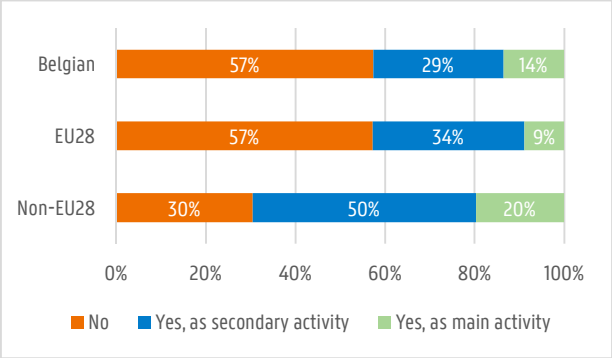
Figure 2. PhD students and their interest in self-employment, Flanders 2018: gender difference



Note. Significant difference ($\chi^2(2)=62.57$, $p<.001$; Cramer's $V = .14$, $p<.001$). N_{men}: 1502, N_{women}: 1841

Figure 3 illustrates that there are also significant differences in interest in becoming self-employed according to nationality. Post-hoc comparisons show that there is a larger proportion of interested PhD candidates outside the EU28 compared to interested Belgian PhD candidates or candidates belonging to the EU28. More specifically, we note that no less than seven out of ten non-European PhD candidates at Flemish universities show interest, while we see that same interest only in two out of five Belgian and European PhD candidates. Among the PhD candidates from outside the EU28, who are doing a PhD in Flanders, no less than one in five is interested in becoming self-employed in main activity. One in two PhD candidates from outside EU28 shows interest in becoming self-employed in secondary activity. Belgian and European PhD candidates differ significantly in their interest in becoming self-employed in main activity. Respectively 14% of the Belgian PhD candidates. 9% of the PhD candidates belonging to the EU28.

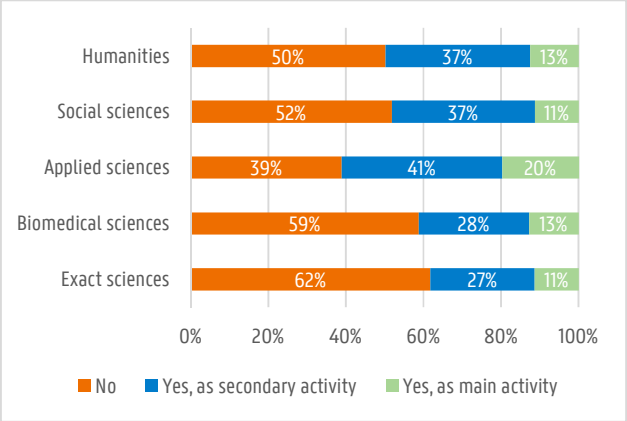
Figure 3. PhD candidates and their interest in self-employment, Flanders 2018: difference in nationality



Note. Significant difference ($\chi^2(4)=151.38$, $p<.001$; Cramer's $V = .16$, $p<.001$). $N_{Belgian}$: 1913, N_{EU28}: 451, $N_{Non-EU28}$: 615

We also see considerable differences depending on scientific cluster. Figure 4 shows that the amount of PhD candidates interested in becoming self-employed in the main profession is significantly higher with PhD candidates in the Applied Sciences (20%) compared to PhD candidates in other scientific clusters. The interest in secondary activity also varies according to scientific cluster. The number of PhD candidates who are interested in a self-employed profession is higher in Social Sciences and in Humanities (37%) in comparison to their colleagues in Exact Sciences and Biomedical Sciences.

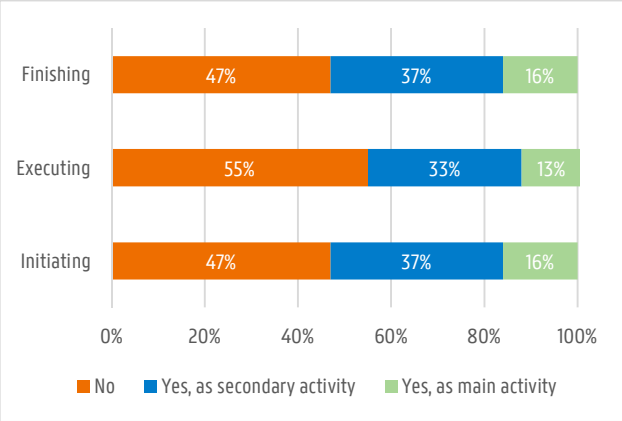
Figure 4 PhD candidates and their interest in self-employment, Flanders 2018: difference in science cluster



Note. Significant difference ($\chi^2(8)=98.11$, $p<.001$; Cramer's $V = .17$, $p<.001$). $N_{humanities}$: 303, N_{social}: 894, $N_{applied}$: 718, $N_{biomedical}$: 952, N_{exact}: 476

If we also look at the interest depending on the doctoral phase, we note significant differences in Figure 5. The PhD consists of a planning phase, the execution phase and the final (completion) phase. However, the post-hoc comparisons in which the three different phases were compared to each other did not show significant differences $p<.01$.

Figure 5 PhD candidates and their interest in self-employment, Flanders 2018: difference in PhD phase

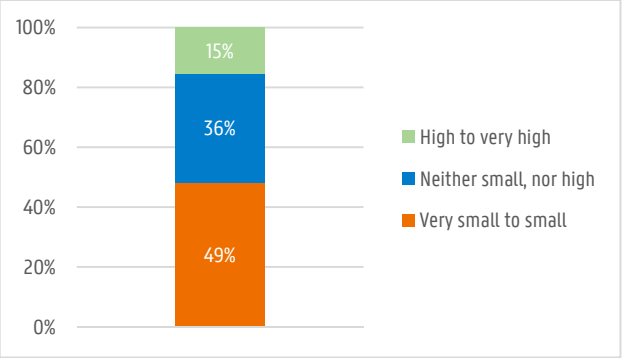


Noot. Significant difference ($X^2(4)=11.92$, $p<.05$; Cramer's $V = .05$, $p<.05$). $N_{finishing}$: 689, $N_{executing}$: 1720, $N_{initiating}$: 594

HOW DO PHD CANDIDATES IN FLANDERS ANNO 2018 ASSESS THEIR CHANCES OF BECOMING SELF-EMPLOYED IN THE FUTURE?

In the *Survey of Junior Researchers* 2018, we not only polled for interest in entrepreneurship, but also asked the question: "*How high do you rate the chance of becoming self-employed in the future?*". The possible answers were: (a) very small to small; (b) neither small, nor great; (c) high to very high. Figure 6 indicates that 49% of PhD candidates rate the chance of becoming self-employed to be small to very small. More than one in three PhD candidates rate the chance to be neither small, nor large and 15% rates it to be large to very large.

Figure 6. PhD students and their estimated chance of becoming self-employed, Flanders 2018 (N=2963)



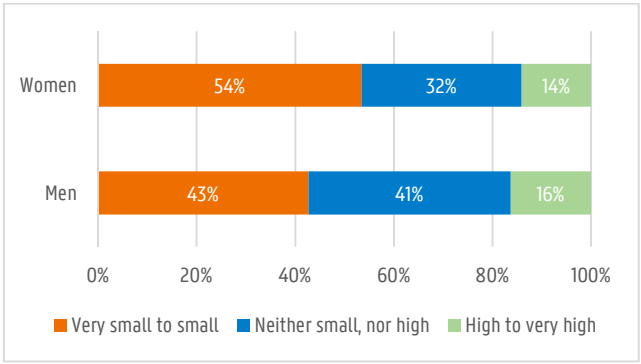
DOES THE ESTIMATED CHANCE OF BECOMING SELF-EMPLOYED DIFFER ACCORDING TO GENDER, NATIONALITY, SCIENTIFIC CLUSTER AND PHD PHASE?

To answer this question, the same statistical procedure as described above is used (see Appendix 1).

Do male and female PhD candidates rate their chance to become self-employed in the future differently? Figure 7 confirms this to be the case.

The research shows that men and women do not distinguish themselves significantly from each other in terms of the option "high to very high". There are significant gender differences when it comes to "very small to small" and "neither small nor large". These findings are parallel to the interest in becoming self-employed: compared to female PhD candidates, less male candidates estimate their chances small to very small.

Figure 7. PhD candidates and their estimated chance of becoming self-employed, Flanders 2018: gender difference

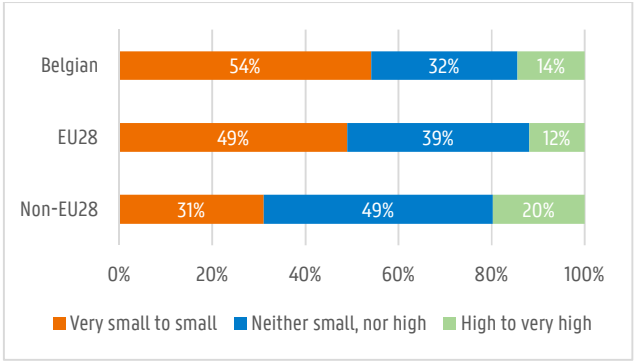


Note. Significant difference ($X^2(2)=34.61$, $p<.001$; Cramer's $V = .11$, $p<.001$). N_{men}: 1330, N_{women}: 1633

Does the estimated chance of becoming self-employed differ according to nationality? Figure 8 distinctly shows that PhD candidates outside the EU28, compared to their Belgian and European colleagues, state significantly less that the chance to become self-employed is small to very small, but also significantly state that the chance is high to very high.

Do PhD candidates from different scientific clusters estimate their chance to become self-employed differently? Figure 9 illustrates the percentages of PhD candidates according to their rated chances and scientific cluster.

Figure 8 PhD students and their estimated chance of becoming self-employed, Flanders 2018: difference in nationality

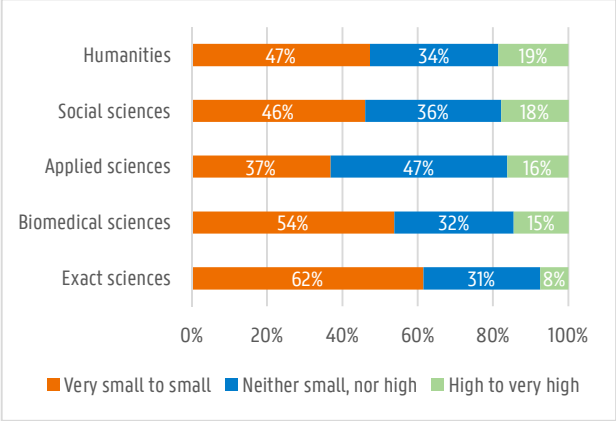


Note. Significant difference ($X^2(4)=102.40$, $p<.001$; Cramer's $V = .13$, $p<.001$). $N_{Belgian}$: 1899, N_{EU28}: 447, $N_{Non-EU28}$: 594

The post-hoc analyses show that the answer "very small to small" occurs significantly more with PhD candidates in the Biomedical and Exact Sciences in comparison to PhD candidates in different scientific

clusters. This answer is least common with PhD candidates who are doing a PhD in the Applied Sciences. This latter group differs considerably from colleagues in other scientific clusters. If we look at who assesses the chance of becoming self-employed as "high to very high", then the post-hoc analyses only show one significant difference, namely between PhD candidates in the Exact Sciences and PhD candidates in other scientific clusters. Within the Exact Sciences, only 8% of PhD candidates indicate that they are likely to estimate the chance of becoming self-employed high to very high. Within the other scientific clusters this percentage varies between 15% and 19%.

Figure 9. PhD students and their estimated chance of becoming self-employed, Flanders 2018: difference in scientific cluster



Note. Significant difference ($X^2(8)=92.37$, $p<.001$; Cramer's $V=.13$, $p<.001$). $N_{humanities}$: 279, N_{social}: 746, $N_{appliede}$: 647, $N_{biomedical}$: 852, N_{exact}: 439

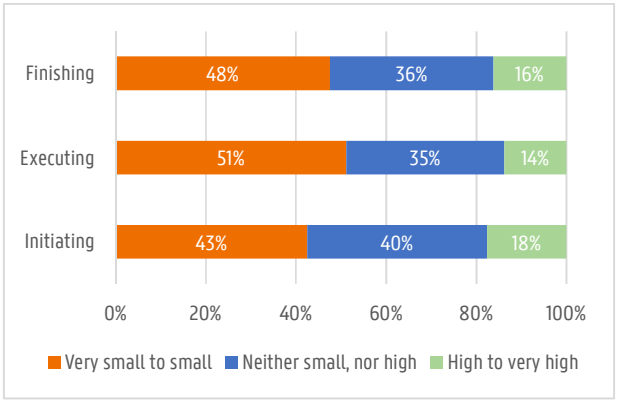
Finally, based on the findings in Figure 10, we also look at whether the estimated chance of becoming self-employed in the future differs according to doctoral phase. Post-hoc analyses note that in all three phases relatively similar percentages are recorded regarding the answer "high to very high".

Thus, in this category there are no noteworthy differences. However, we see that in the three doctoral phases it is indicated to a quite different extent that the chance of becoming self-employed is small to very small. More specifically, we note 43% in the initiating phase, 51% in the execution phase and 48% in the finishing phase of the doctorate. The discrepancy between the initiating and executing phase is statistically significant here.

HOW DO PHD STUDENTS WHO ARE INTERESTED IN BECOMING SELF-EMPLOYED, ESTIMATE THE LIKELIKHOOD OF REALISING THIS IN THE FUTURE?

We still have to answer the question whether there is a link between the interest in self-employment and the assessment of the chance of actually becoming self-employed in the future. Here we strictly focus on what the 1442 PhD students answered to the question: *"Are you interested in becoming self-employed?"* "Yes, in main activity" or "Yes, in secondary activity". Figure 11 shows the combination of their interest and their prognosis.

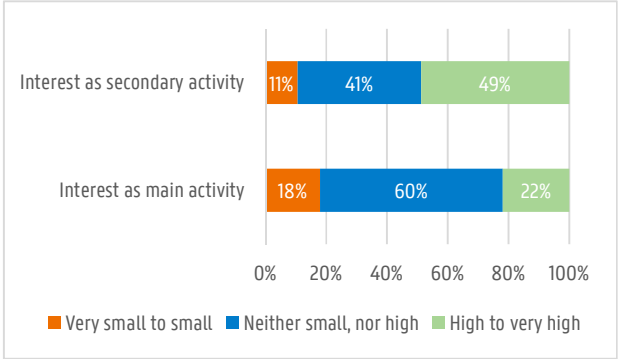
Figure 10. PhD candidates and their estimated chance of becoming self-employed, Flanders 2018: difference according to PhD phase



Note. Significant difference ($X^2(4)=14.87$, $p<.001$; Cramer's $V=.05$, $p<.05$). $N_{finishing}$: 678, $N_{executing}$: 1701, $N_{initiating}$: 584

The percentages exhibit that 11% of the PhD candidates interested in self-employment as main activity and 18% of the PhD candidates interested in self-employment as secondary activity, estimate the possibility of becoming self-employed small to very small. Both percentages differ significantly. Finally, when we also look at the PhD candidates who consider the chance of becoming self-employed to be high to very high, we can see that here too the percentages between main and secondary activity differ considerably. Nearly half (49%) of the PhD candidates interested in self-employment as main activity estimate the likelihood to be high to very high. One in five (22%) PhD candidates interested in self-employment as secondary activity, estimates the chance to be high to very high.

Figure 11. Estimated chance of becoming self-employed in the future according to PhD candidates interested in self-employment, Flanders 2018



Note. Significant difference ($X^2(2)=34.61$, $p<.001$; Cramer's V = .11, $p<.001$). $N_{main\ acitivty}$: 414, $N_{secondary\ activity}$: 1007

DISCUSSION

The *Survey of Junior Researchers* 2018, organized at all Flemish universities, offers some initial insights into the interest in and the estimated chances of becoming self-employed. Our findings show that almost one in two PhD candidates are interested in becoming self-

employed, but only 15% of them consider the possibility to be large to very large. If we only take into account PhD candidates who are interested in self-employment, then half of the interested PhD candidates consider the possibility to be self-employed large to very large. The amount of PhD candidates interested in self-employment and who consider their chances to be high to very high is only one in five.

Our analyses of PhD candidates in Flanders already show four different patterns.

A first pattern notes that more male than female PhD candidates show an interest in becoming self-employed and also more men than women believe the chance of becoming self-employed to be very likely. Figures from the National Institute for the Social Security of the Self-employed indicate that also outside the population of Flemish PhD candidates clear gender differences exist with regards to self-employed activities. Statistics concerning the Flemish population illustrate that women are less inclined to pursue self-employment than men: 24% of all the self-employed in main activity are female. When we compare this across the entire working population, the number of female self-employed workers in main activity is 6%, compared to 11% self-employed male (figures supplied by National Institute for the Social Security of the Self-employed, consulted via written enquiries to the Department EWI, 2019). All of this considered, we notice that there are gender differences in interest, estimated chances and the actual practice of self-employed activities. Scientific research has already tried to grasp the underlying causes of these gender differences. A probable determining factor is the perceived feasibility of combining self-employment and family life (Entrialgo & Iglesias, 2017). Various initiatives and programs try to somewhat respond to gender differences in self-employed activities. This way some aim to paint an accurate picture of a self-employed life, in which not only the disadvantages but also the benefits for family life are outlined. In such outlines, the identification of female roles is crucial (Greene, Han, & Marlow 2013, UNIZO, 2019). Moreover, entrepreneurial education can help to eliminate the stereotype of the "self-employed person" (Entrialgo & Iglesias, 2017). Another determining factor may be performance anxiety and the extent that this can affect family responsibilities (Minniti & Nardone, 2007, Humbert & Brindley, 2015). Family obligations are usually something in which women are more involved in (Aldrich & Cliff, 2003; Sullivan & Meek, 2012).

A second pattern is the diversity in nationality. The pattern concerning Belgian and European PhD candidates is very similar: almost 60% show no interest and about half estimates their chances to be small to very small. Of all the non-European PhD candidates doing their PhD in Flanders 70% show an interest in becoming self-employed as a main secondary activity. Besides, 20% of PhD candidates of non-European nationality consider their chances to be considerably high. 31% estimate their chances small to very small. An important remark is that we could not obtain information from the *Survey of Junior Researchers 2018* as to whether these interests and chances vary depending on a self-employed profession in Flanders or elsewhere (country of origin).

A third pattern is the difference regarding scientific cluster. On the one hand, we notice a considerable amount of PhD candidates in the Humanities and Social Sciences who are interested in becoming self-employed in secondary activity (both fields 37%). On the other hand, almost one in two PhD candidates estimate their chances to be small to very small when it comes to actually taking this step. In other words, a large number of PhD candidates in the Humanities and Social Sciences are interested, but the results suggest that one does not see the opportunities and possibilities to actually take the step toward one's own business.

The number of PhD candidates in the Applied Sciences interested in becoming self-employed in main activity is larger compared to other scientific clusters: no less than 20% shows interest. In addition, the number of PhD candidates estimating their chances to be small is in fact the lowest (37%) in comparison to the other scientific clusters. So the largest number of interested students is situated in this group and they too estimate their chances to be considerably great.

Regarding the Biomedical Sciences we note a smaller number of PhD candidates interested in becoming self-employed in secondary activity (28%). Also, more than half of them estimate their chances to be small. Finally, in the Exact Sciences, we can see that the number of students interested in becoming self-employed in secondary activity is small (27%) and that a substantial group estimates the chances of becoming self-employed to be small (62%). In the Exact and Biomedical Sciences we can note the largest number PhD candidates estimating their chances to be low. This is remarkable, given that both clusters are part of STEM (Science, Technology, Engineering and Mathematics) and that these scientific clusters in particular are stimulated to pursue a career in entrepreneurship (see i.e. VLAJO and VLAIO).

A fourth pattern is that PhD candidates in the different phases of the doctorate do not significantly differ from each other in interest to pursue self-employed activities. They do differ when it comes to assessing their chances of becoming self-employed in the future. More specifically, it seems that PhD candidates who find themselves in the execution phase of the doctoral journey, estimate their chances to become self-employed to be lower than PhD candidates in the initial phase. However, we cannot determine whether this perceived opportunity significantly reduces as the student moves from planning to execution phase, since we only have cross-sectional data that does not allow us to follow up over time.

The four patterns we distinguished in the *Survey of Junior Researchers 2018* describe the interest and prognosis of practicing self-employed activities. The concept of "self-employed activity" is a very broad one and encompasses a variety of activities. Some clusters of activities are better understood by the concept of "entrepreneurship". Through their activities entrepreneurs create something new with added value through time investment and effort and by taking financial, psychological and social risks. In return, they receive monetary rewards, personal satisfaction and independence (Hirich & Peters, 2005). Entrepreneurship is often seen as a lever to economic growth, prosperity and well-being (VARIO, 2018). An important prerequisite for encouraging entrepreneurship is to make sure that people feel capable of doing so. This prevents young researchers from ignoring a career of self-employment because they do not feel able to do so (Entrialgo & Iglesias, 2017). In Flanders, unique initiatives are being developed to

speed up this process. The Flemish Government, accordingly, provides for the possibility of Baekeland-mandates and innovation mandates. Both have an economic finality and are set up in cooperation with a company, making sure that a PhD is not just an added value for the PhD alumnus/a, the university and the company involved, but also can result in a start-up of a spin-off. Another initiative includes the opportunity for companies to call on business advisors of VLAIO, Flanders Innovation & Entrepreneurship, who offer advice or provide information on various opportunities of cooperation between the company and Flemish knowledge and research centers. Also, there are many initiatives being developed in the university's workplace. Ghent University offers DO! (former Durf Ondernemen). DO! is the center for student entrepreneurship where both students and researchers can turn to for coaching, training, workshops, networking events etc. KU Leuven, in turn, launched Leuven Community for Innovation Driven Entrepreneurship (KULeuven KICK!), which functions as the point of contact for all students, researchers, professors and alumni who have an entrepreneurial spirit and are interested in entrepreneurship. VUB offers start.VUB that supports and guides all entrepreneurial students and researchers through the set-up and launch of their start-up. Hasselt University collaborated with PXL University of Applied Sciences to create PXL-UHasselt StudentStartUP. These instances support and develop entrepreneurship by providing information, offering boot camps, organizing competitions, workshops and encouraging networking. The University of Antwerp does not have a separate center supporting entrepreneurship, but there is a permanent point of contact concerning questions and coaching. In addition, they also work with TAKEOFFANTWERP.

Furthermore, all Flemish universities also have Tech Transfer offices, specifically for their staff members. These services focus on the transfer of innovative research results to the market, which in turn proves to be beneficial for society. This can be done in various ways, such as research collaborations, services, licenses, spin-offs, … They provide legal support, help with registering intellectual property, help with the search for investors, offer a proof-of-concept fund and they have a broad industrial network. Recently, more emphasis has been placed on "flipped technology transfer offices" where the academic researcher is no longer at the center of it all. The idea is that demand-driven work is done by companies, the market and society (VARIO, 2018; Flemish Government, 2019).

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APPENDIX 1. DESCRIPTION OF THE STATISTIC ANALYSIS

To determine whether the interest and estimated chances of becoming self-employed differs significantly according to gender, nationality, scientific cluster and PhD phase, both the *Chi-squared* test and Cramér's *V* were used. Both tests verify whether the difference in percentage is significant across the various groups, with Cramer's *V* being less subject to the effect of sample size on the test's significance. We consider differences in percentages to be significant if the probability of the

percentages not being different from each other was less than 5% (p<.05). If the differences in percentages are significant, additional comparisons are made by means of the *Chi-squared* test and Cramer's *V* (= post-hoc comparisons). These additional comparisons can clearly identify where the actual difference in percentage is situated: for example, in which scientific cluster can the largest number of interested PhD students be found? When repeated tests are performed, the chance of detecting a significant difference is higher (= Type 1 flaw). To avoid this, the level of significance is more stringent in the post-hoc comparisons: the discrepancy in percentage of the post-hoc comparisons is considered if the probability of the percentages not being different from each other was less than 1% (p<.01). Therefore, significant associations can occur when tested on the group level mentioned above, however, this is no longer the case when comparisons are made between the different groups.