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Developing Independence as Young Academics at LTH

Christian Hulteberg; Hanna Isaksson; Joachim Rodrigues; Fredrik Rusek; Christian Sohl

Group project within the "Docent course", Ht-2011

Abstract

In this particular study, the independence of postdoctoral researchers at LTH has been investigated using the time elapsed from the Ph.D. graduation until the first publication in which neither the Ph.D. supervisor nor co-supervisor are co-authors. The method used in this case is an e-mail survey sent to 99 researchers at *Electrical and Information Technology*, *Computer Science*, *Measurement Technology and Industrial Electrical Engineering*, *Mechanical Engineering*, *Automatic Control* and *Solid Mechanics*, *Mathematics* and *Mathematical Physics*, *Atomic Physics*, *Solid State Physics*, *Combustion Physics*, and *Physics*. 37% of the respondents replied to the questionnaire and the gathered information was evaluated using survival analysis. The questionnaire also contained open-ended questions with respect to perceived independence, giving the opportunity to also draw qualitative conclusions from the study.

From the performed survey, a few conclusions may be drawn. First of all, it is not necessarily so that researcher publishes papers without their main Ph.D. supervisor, even at a significant time after graduation. This can be due to several reasons, one being the dependence of funding related to the supervisor and another reason being the inclusion of the department or research group head in all publications. Interestingly, this is underlined by the fact that some respondents considered themselves independent from their supervisor, even without publishing anything on their own.

The qualitative analysis showed that, even if this could not be statistically proven, a higher degree of independence (at least as experienced by the respondents) was achieved by switching research group or university. It is also quite clear that the lack of independence is not necessarily considered as a negative thing in the eyes of the respondents. The time after graduation is also an important factor in the experience of independence, with a longer time leading to a higher degree of perceived independence.

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Introduction

One of the key elements in the education of doctoral students is the journey towards becoming independent researchers. This is stressed in both the legislation surrounding the education of doctoral students in Sweden [1] (as well as elsewhere [2]) and in some of the literature published on the subject of doctoral education. With this as a starting point, we have chosen to investigate these aspects as part of the "docent" course. We have decided to further investigate the time it takes for a researcher to become independent, and how this is influenced when the researcher continues to work at the same institution as where they conducted their doctoral studies.

Specifically, we chose to study the time that is required for a newly graduated doctor at the Faculty of Engineering at Lund University to publish any scientific contribution without the influence of their former supervisors. To the authors' knowledge, there have been some publications on reaching independence during doctoral studies but few, if any, studies have tried to quantify how well independence is achieved after the doctoral degree. The focus of this study has been on researchers that have remained within the same research group after finishing their doctoral studies. However, we have also collected information from researchers that have changed research group, or that have relocated to Lund University after obtaining their doctorate. Moreover, we attempt to distinguish between scientific and financial independence. This study has been performed through en e-mail inquiry and followed up by personal communication with the non-responding participants.

Below, a brief insight into the relevant literature is given, followed by the method used. Thereafter, the obtained data is presented and interpreted, and finally some conclusions are given.

Background

This section initially describes the process of becoming independent during the doctoral education and thereafter, some studies on independence on the postdoc-level are reported. In an early paper by Hockey [3], the motive and meaning of doctoral supervisors were investigated within the social sciences. The author divides the motives to why supervisors take on the responsibility of a doctoral student in three categories, each divided in sub categories:

- Intellectual motives
- Functional motives
- Subjective or self-esteem motives

Several of these motives go in hand with instituting independence with the doctoral candidate, where one such motive is future occupational and disciplinary (an intellectual motive). In which the supervisor perceive it as a responsibility to train students for the purpose of continuing a particular line of research or discipline. This in itself put demands on the student's ability to gain his or her independence and thus be able to shoulder future responsibility.

The theme of independence has also surfaced in a couple of publications by Gardner. In an interview study performed with twenty doctoral students in chemistry and history on the topic of socialisation [4], independence was numbered as one of five major themes describing the socialisation process. In the interviews the topic of independence was more frequently mentioned the closer graduation the students were and was described as a balancing act between too much and too little. The study showed an interesting difference between the two topics studied, with history students displaying more supervisor dependence. In conclusion the students in the study seem to seek independence in their research to show the faculty they are capable of independent research and the faculty ultimately grants them this independence. It is also established that it is difficult to find the balance between too much and too little, especially for students in the middle of their doctoral education. For some more interesting points on socialisation and independence in the academic context, please view Rosen and Bates paper from 1967 [5].

In a separate paper [6], Gardner goes deeper into the question of "too much or too little". The starting point is similar to the first paper described, but the number of interviewees has been increased to 40, albeit still from chemistry and history. The paper starts by pointing out some changes that may be difficult to handle for the students, namely the transition from consumers-of-knowledge to creators-of-knowledge. It is also stated that the culture of cooperation has an impact on the transition from dependent to independent and that the differences in the traditions between disciplines with respect to collaboration therefore plays a part, favouring the more collaborative nature of the natural sciences. The results from the study were the ability to divide the obtaining of independence during the doctoral studies into three separate phases, based on the US educational system. The first of these three phases is stated to be the admission to the program to the beginning of the coursework. In the second phase, includes time spent on performing the coursework initiated in the first phase while the third phase is the end of the coursework and the dissertation research. The three phases are argued to involve development at three different levels, namely programmatic, relational and personal.

Lovitts [7] discussed the difficult task of choosing students for graduate school from students that has previously been assessed as good course-takers, but are now required to do independent research. Contrary to Gardener, Lovitts discuss the reaching of independence in two, and not three, phases; the first one being the dependent phase, where the student is learning what others know, and the second, being the knowledge-creating phase

With most of the studies referenced so far having socialisation as a starting point, a resent paper by Baker and Pfifer [8] investigate the independence issue from a relational standpoint. The study investigates the phase two transition from dependence to independence as described by Lovitts through interviewing 31 doctoral students on key experiences, challenges, goals for performance, key relationships, types of support present/absent and personal and professional identity. As a model for sorting the results, three themes are used:

- General support and advice
- Identity development as a student
- Identity development for academic practice

To conclude, the authors argue that the students undergo a parallel identity development process that require them to master both the student role and identity while simultaneously starting to enact the identity as an academic. The transition is helped by the relationships the student has at the time of the transition for support and behavioural modelling. The data collected also support the notion that learning and identity development are interconnected and occur simultaneously.

With regards to postdoc independence, Singer summarises the development of the postdoc position in the US over the last few decades [9]. From the paper, it is clear that there has been a shift in the actual funding of postdocs. Over the last three decades the funding for postdocs have, to an increasing degree, shifted from fellowships and traineeships to research grants. This means that the research funds end up with the supervisors and not with the postdocs thus shifting the balance between the two. The author argues in the paper that there are both advantages and disadvantages with this system, but that it definitely has increased the age at which the first independent research grant is given, at least in biomedical sciences. Another issue identified is a shift in focus from the postdoc developing as a person to be considered low-cost labour.

In another paper in BioScience [10], Dawson identifies the long time spent by postdocs in academic appointments with no or little opportunity for research independence as a problem in career development. Another occurrence on the topic of postdoc independence is in the discussion regarding the scientific career paths [11]. In the article the suggestion of "super-postdoc" positions or pure research positions without any managerial or supervisory service. This practice is said to counteract the element of independence which is desired in all trained academics.

Method

To get a relatively coherent group, it was decided that all researchers to be included in the study should have a comparable background. The investigation was therefore limited to the departments at the Faculty of Engineering at Lund University (LTH). It included three departments in the Electrical Engineering building (*Electrical and Information Technology, Computer Science*, and *Measurement Technology and Industrial Electrical Engineering*), three departments in the Mechanical Engineering building (*Mechanical Engineering, Automatic Control* and *Solid Mechanics*), two mathematical departments (*Mathematics* and *Mathematical Physics*) and four departments in the Physics building (*Atomic Physics, Solid State Physics, Combustion Physics*, and *Physics*).

The investigation was limited to researchers that received their Ph.D. degree after January 1, 2000, but are not yet associate professors. The Swedish titles for the researchers that are included in the investigation are: *Forskare, Postdoktor, Forskarassistent* and *Biträdande lektor*. Some of the targeted departments are shared between LTH and other faculties at Lund University. In those cases, only the LTH-employed researchers were selected.

A survey was constructed and sent by email to all researchers that hold one of the above positions at the targeted departments. The survey is found in Appendix A. The survey contains basic information about where and when the particular researcher received his/her Ph.D. de-

gree and how many months that can be considered to be deductible (due to maternity leave, sick leave, etc.) from the day of graduation. The cornerstones of the survey are four questions asking about the time from the day of graduation until the first paper (journal/conference) without the former Ph.D. supervisors (main/assistant) in the author list was published. Finally, two free-text questions are included which ask whether the researcher consider himself/herself as independent from the former Ph.D. advisor scientifically and/or financially.

In total, surveys were sent to 99 researchers at LTH, i.e., 33 researchers in the Electrical Engineering building, 28 in the Mechanical Engineering building, 7 in the mathematical departments, and 31 in the Physics building. Due to the time constraints set by the short duration of the docent course, the time frame to respond within was only 4 days. It is plausible that the short timeframe impacted the ratio of response in a negative way since some researchers may have been sick, travelling, etc. One day before the deadline, a reminder was sent out. Although the investigation is targeted towards those researchers that currently work at the same department where they received their Ph.D. degree, surveys were sent to all "pre-universitetslektor" researchers at the departments in order to see whether a difference in independence could be observed between the two groups. In total, 37 researchers responded to the email within the time frame. Of these, 13 researchers were from the Electrical Engineering building, 10 from the Mechanical Engineering-building, 2 from the mathematical departments, and 12 from the Physics building.

When collecting the answers, two outliers were identified. The first person published his first paper without any supervisors 50 months before the Ph.D. defence. This person claimed that the supervisor had left him on his own altogether from the day he was accepted for Ph.D. studies. As this cannot be regarded as "proper supervision", it was decided to remove this person from the study. The second person defended his thesis 2001, but had never published a paper without his supervisor ever since. However, it was not clear from his answers whether he published any paper at all after his Ph.D. graduation. It was decided that it was reasonable to assume that this person left research and had other administrative or educational tasks at the department. He was therefore eliminated from the study.

Results

The results section is divided into one quantitative section focusing on statistical analysis of the data acquired and one qualitative section focusing on the free-text comments given by the respondents.

Quantitative Data Analysis

The Kaplan-Meier function is a statistical estimate of the survival function from life-time data. In the conducted analysis this method is applied to measure the time it took the respondents to be independent. In Figure 1-Figure 2 the Kaplan-Meier survival functions are plotted, where the former represents data "that considers time that is worth subtracting, e.g., industrial service, maternity leave", whereas the latter reflects data that ignores any barriers to academic independence. It is observed that the functions look similar, and as expected, time outside the department will result in a longer time period until the respondents are independent. A few candidates were able to refer to publications without supervisors before Ph.D. graduation. Furthermore, the cumulative distribution functions (CDF) in a stochastic model are plotted in

Figure 3 and Figure 4 together with the corresponding lower and upper 95% confidence intervals.
To summarize the quantitative analysis the following is observed:

- 37 respondents included (2 outliers were removed)
- 16% have no supervisor-free conference papers
- 27% have no supervisor-free journal papers
- 5% have no supervisor-free papers, but still consider themselves scientifically independent
- The average observation time for those that have no supervisor-free papers is 33 months
- 8% have at least one supervisor-free paper but does not consider themselves scientifically independent

The assessment of the statistical analysis is difficult due to the relatively low number of data sets.

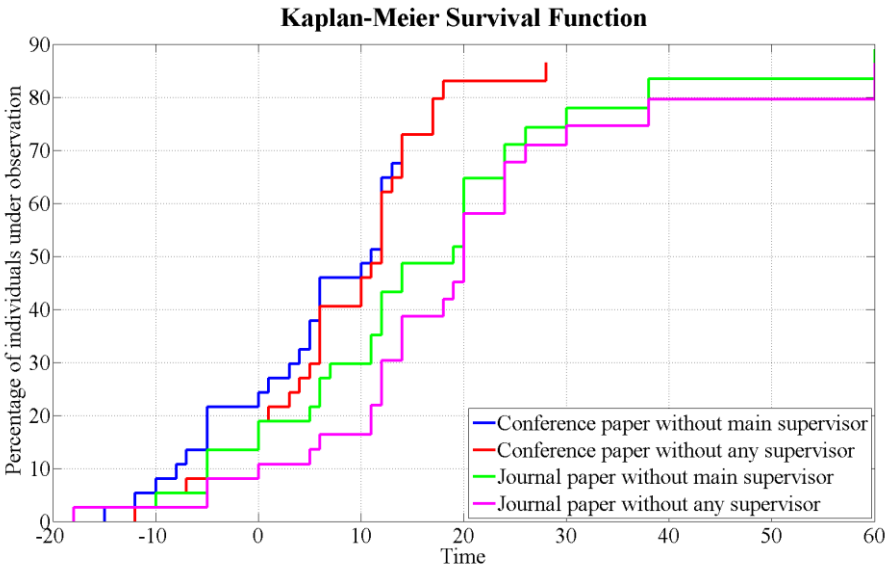

Figure 1 Percentage of individuals under observation is plotted versus the time in months after Ph.D defence including time reduction.

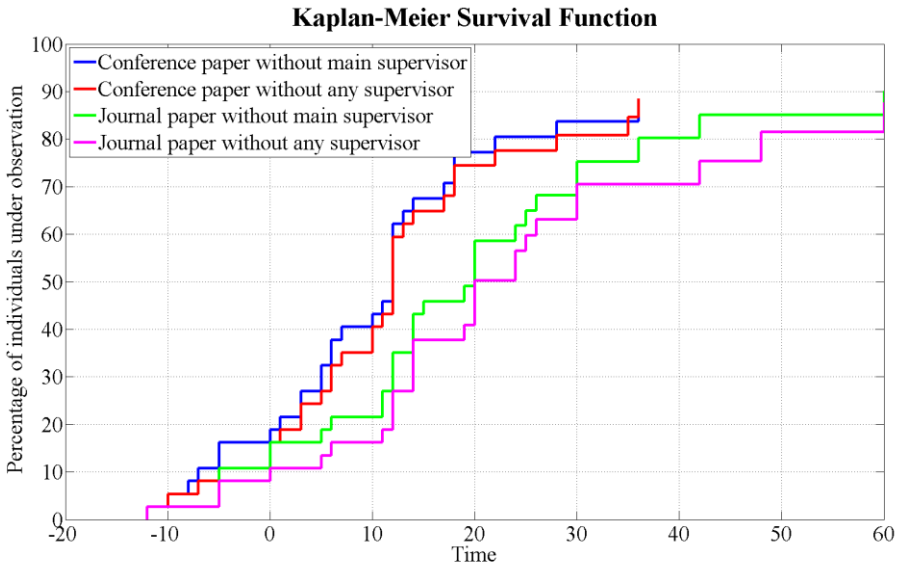

Figure 2 Percentage of individuals under observation is plotted versus the time in months after Ph.D defence excluding time reduction.

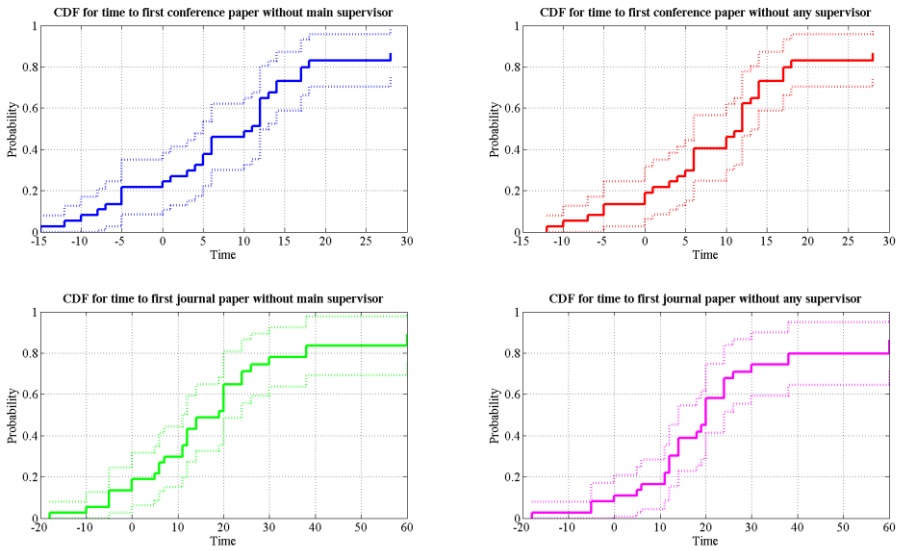

Figure 3 CDF of the Kaplan-Meier survival function including time reduction. Various scenarios with former supervisors are considered.

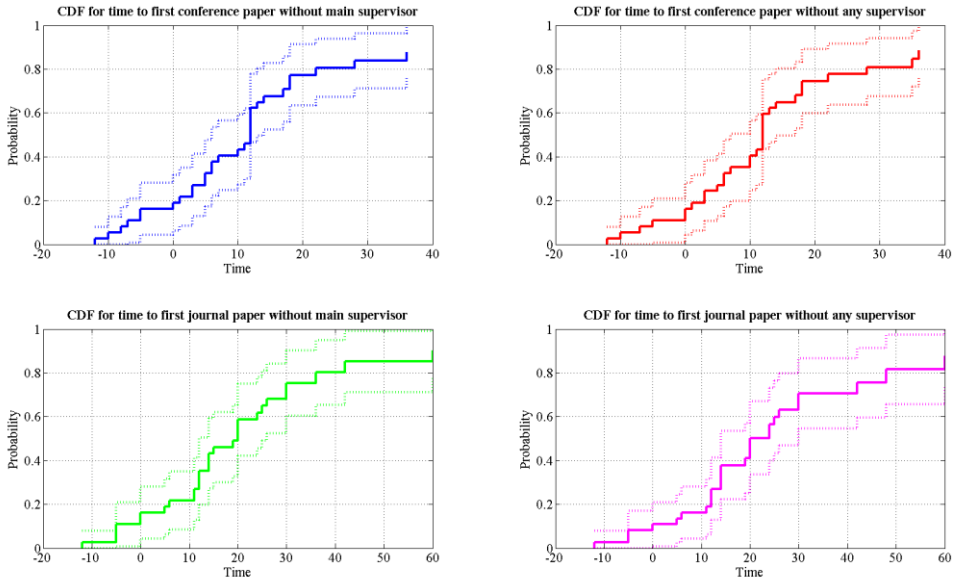

Figure 4 CDF of the Kaplan-Meier survival function excluding time reduction. Various scenarios with former supervisors are considered.

Quantitative Data Analysis

This section is sub-divided into one section dealing with the free-text comments of the respondents who graduated three to four years before the survey was performed and another section dealing with the free-text comments of the respondents who graduated more than five years ago.

Researchers who have graduated within 3-4 years

Several researchers that have graduated within the last three-four years did not consider themselves independent from their former supervisor scientifically and/or financially. Most of those people had remained at the same location. One answer regarding financial independence read: “No. I think the department name is closely related to my former supervisors and that is of great help. I also think that my former main supervisor is very good (i.e. much better than me) at attracting funding.” Hence, the somewhat lack of independence was not necessarily seen as a negative thing from the researchers perspective, but also in the light of benefiting from the former supervisors reputation. Another aanswer regarding scientific independence read: “My current work is orthogonal to my thesis work, and I try to add focus on new topics in the research groups I participate in, and steer our research in directions I find more pressing.” The same researcher’s comment regarding financial independence was: “I've been involved in writing applications but still with my supervisor, and although I try to focus parts of the applications on what I find important I'm still learning about the funding processes.”

The researchers who have graduated and then moved to another location commented in the line of: “My independence was almost immediate as I moved to a different university, although I continued to work with my PhD supervisor, and still do occasionally”. However, some of the researchers who has recently graduated and moved location commented on that

although they are independent from their former Ph.D. supervisor, they are more or less dependent on their new professor. This was exemplified in: “Yes, I am independent from my former supervisor, but I still depend on my current group leaders”.

Many of these researchers considered themselves independent to a higher degree scientifically than financially. That seems like a reasonable progression, since in most cases, scientific independence needs to be shown before financial independence is possible.

Several people who have graduated within three years had yet not published full journal papers without their PhD supervisor. However, still they considered themselves fully independent when asked about scientific and financial independence. One person motivated the answer about scientific independence as: “I am the one leading the work in the projects I am involved in. I then report to my supervisor who has no time over to be involved in wet work or planning. So I am 100% independent in decision making, but only 25% independent in what projects to pursue as my funding comes from my supervisor.” The same person then answered no to the question about independence in financing with the motivation: “It will probably not be possible to get money from Swedish agencies while I remain at my "home" department.” Another participant motivated the answer with “Well I was never given too much supervision or guidance even when I asked for it during my PhD. Thus, my PhD training resulted in very high level of independence.” These researchers may have understood the question about independence somewhat different than we originally meant with the question. From our perspective independence in research requires formulating the aims and projects, as well as to obtain the necessary funding to carry out those projects.

In general, those that are not currently working at the same institution as their former supervisor commented on that their independence both scientifically and financially have increased as a result of changing institutions. However, related to financing, several people that have changed university commented on that they could not (even if they wanted) benefit from their former supervisors ability to attract money.

Researchers who have graduated more than 5 years ago

Those that had received their PhD over five years ago, often considered themselves independent to a larger extent than those that had received their doctorate more recently. However, even some of those that had stayed at the same institution as their PhD supervisor stated in some cases that although the research ideas are their own, the projects are often in collaboration with the former supervisor since he is the head of the group/department. As an example: “I do have my own research in which my former supervisors have no word, but I am trying to cooperate with my group, of course, where he is the head “, and about financial independence: “Not really. We are working in the same group, and he is the group leader.”

Conclusions

From the performed survey, a few conclusions may be drawn based on the quantitative statistical analysis. First of all, it is not necessarily so that researchers publish papers without their main Ph.D. supervisor, even at a significant time after graduation. This can be due to several reasons, one being the dependence of funding related to the supervisor and another reason being the inclusion of the department or research group head in all publications. Interestingly,

this is underlined by the fact that a few respondents considered themselves being independent from their supervisor even without publishing anything on their own.

The qualitative analysis showed that, even if this could not be statistically proven, a higher degree of independence (at least as experienced by the respondents) was achieved by switching groups. It is also quite clear that the lack of independence is not necessarily considered as a negative thing in the eyes of the respondents. The time after graduation is also an important factor in the experience of independence, with a longer time leading to a higher degree of perceived independence.

It is however recommended that this study is repeated on a larger population to enable a higher degree of statistical significance and to better enable a comparison between researchers from various disciplines and from individuals staying in the same and changing research groups respectively.

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Appendix A

Dear colleague,

We are five researchers from various disciplines within the Faculty of Engineering at Lund University whom are currently taking this year's "docent" course. Within this course we have chosen to perform a project on the topic of independent research. More specifically, we would like to answer: What is the average time required, after graduating with a Ph.D., before post-graduate researchers ("forskare", "forskarassistenter", "postdoktorer" and "biträdande lektorer") becomes independent from their former Ph.D. supervisors? We have chosen to measure this degree-of-independence by determining the number of years it takes for a post-doctoral researcher to publish his or her first publication without scientific influence of the former Ph.D. supervisor.

Therefore, we would very much appreciate if you, as soon as possible, but not later than September 22, could answer the questions below. All answers are treated anonymously.

1. When did you receive your Ph.D. (year and month)?

2. Did you receive your Ph.D. at the same department as the one you are currently working in?

3. How many months, calculated from the date of the Ph.D. defense, passed before you published your first scientific work where your supervisors are not co-authors? Consider the publication date and not the submission date.

a) First conference paper without your main supervisor.
b) First conference paper without your main supervisor and assistant supervisors.
c) First journal paper without your main supervisor.
d) First journal paper without your main supervisor and assistant supervisors.

4. Is there any time that you think is reasonable to subtract from the answers above, such as post-doc service at another department, industrial service, parental leave, etc.? If yes, how many months in total?

5. Do you consider yourself independent from your former Ph.D. supervisors with respect to your scientific work? If yes, to what extent?

6. Do you consider yourself independent from your former Ph.D. supervisors with respect to research funding? If yes, to what extent?

Thank you for your participation,
Christian Hulteberg, Hanna Isaksson, Joachim Rodrigues, Fredrik Rusek, Christian Sohl