Ph.D. TRAJECTORIES AND LABOUR MARKET MOBILITY

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AT FOUR UNIVERSITIES IN THE NETHERLANDS

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Ph.D. Trajectories and Labour Market Mobility

A Survey of Recent Doctoral Recipients at Four Universities in the Netherlands

Introduction

This report is a summary and analysis of the Ph.D. trajectories and employment outcomes of recent Dutch Ph.D. recipients at four universities in the Netherlands in 2008-2009. The research was conducted on behalf of the Netherlands Centre for Graduate and Research Schools in the Netherlands and the Institute of Education (IVLOS) at Utrecht University and was subsidized by the Dutch Ministry of Education, Culture and Science (*Ministerie van Onderwijs, Cultuur en Wetenschap,* OC&W). This report is an important source of information on Ph.D. candidates in the Netherlands. The most recent comprehensive study of Ph.D. candidates conducted prior to this research is from 1996 (Hulshof et al., 1996). Our study provides detailed information on the background of Ph.D. candidates, their Ph.D. trajectory, including supervision and the performance of Ph.D. candidates, as well as their initial employment after obtaining their Ph.D. The following chapters of this report provide important and intriguing information on the status of recent Ph.D. recipients in the Netherlands in 2008-2009. Our findings suggest several interesting developments that merit ongoing attention in the future, as discussed in the executive summary and in the chapter on policy recommendations.

Our sample consists of Ph.D. recipients at four universities: Delft University of Technology, Erasmus University Rotterdam, Utrecht University and Wageningen University and Research Centre. These four universities are representative of the broader variety of universities in the Netherlands, including a university focused on the technical sciences, a younger university with a more limited disciplinary agenda, a more traditional university with a broad disciplinary agenda and a university focused on the agricultural sciences. This supports our claim that many of our results have a high representative value. Nevertheless, the sample character of our study is an invitation to all 13 Dutch universities to extend the collection of empirical material about their Ph.D. candidates, their doctoral trajectories and employment outcomes.

Research Context

In recent years, the labour market status of Ph.D. recipients has been a continued subject of interest. Many of these discussions are of a serious nature, for example regarding the future prospects of postdoctoral researchers or unemployment benefits paid to Ph.D. candidates who have yet to finish the Ph.D. Now and then studies are published that shed a more favourable light on the career prospects of Ph.D. recipients (Sonneveld and Oost, 2006). In the Netherlands, in contrast to other countries, such as the United States and the United Kingdom, remarkably little factual data on Ph.D. recipients are available. Many reports are based on the opinions and experiences of certain groups of Ph.D. candidates or random samples of Ph.D. recipients at a specific stage in their career (Hoffius and Surachno, 2006; Keijzer and Gordijn, 2000). Policy-makers and those directly involved in doctoral education (Ph.D. recipients, thesis

supervisors, Ph.D. programmes and grant providers, such as the Netherlands Organisation for Scientific Research [NWO]) lack a comprehensive account of the labour market status of Ph.D. recipients.

In 2005, the Minister of Education, Culture and Science (OC&W) made a similar observation in the memorandum 'Valuing Research Talent' (*Onderzoekstalent op waarde geschat*) (MinOCW, 2005) and strongly recommended an annual labour market monitor. 'In addition to evaluations of the Ph.D. trajectories at each university, better quantitative and qualitative national information is needed nationally to determine the effectiveness of the system and the policy. [...] The information serves to provide greater insight into the careers of scholars, for example regarding the inflow, progression and outflow of academic staff. These data are now largely lacking' (MinOCW, 2005: 13). This report is an important first step in this direction and provides reliable quantitative information about the Ph.D. trajectories of recent doctoral recipients in the Netherlands.

Dutch interest in the career paths of Ph.D. recipients has recently also become part of international policy. In a joint memorandum, the Organisation for Economic Cooperation and Development (OECD), the United Nations Educational, Scientific and Cultural Organisation (UNESCO) and the European Union's statistical organisation EUROSTAT advocate an internationally coordinated collection of data about the career paths of Ph.D. recipients. The objective is described as follows:

> *Statistics on careers of doctorate holders (Statistics on CDH) are compiled in order to measure the demographic, employment, international and intra-sectoral mobility, career and salary characteristics of doctorate holders at national and international level.*
>
> *These statistics try to answer questions about the international mobility of highly skilled workers as such frequently characterized under the headings of brain drain / brain gain / brain circulation. In addition, issues of qualitative and quantitative adequacy of the education of doctorates for the labour market are concerned as well as if the national labour markets prevail to be the primary frame for this highly skilled group. They also address questions of how well the skills of the highest educated are used by the society as well as the attractiveness of different career paths on doctorate holders. Questions like these often are asked on a worldwide level. (UNESCO, Eurostat and OECD, 2006: 1)*

Conform to these international agreements, the Netherlands will be asked to gather this information in the near future. In light of these developments, this study is an initial attempt to provide more detailed information about Ph.D. recipients in the Netherlands.

Previous Research on Ph.D. Recipients in the Netherlands

In this brief section, we address previous studies of Ph.D. recipients in the Netherlands from

1990 until the present. Two studies concluded prior to 1990 from 't Veld-Langeveld (1953) and Buis (1983) have not been taken into account here because the current doctoral educational system changed during this time period, precluding several aspects of labour market comparisons between Ph.D. recipients from these years and the ones from our study. We therefore concentrate on studies that provide relevant comparisons.

Previous approaches and research highlights

In studies by Van der Neut and de Jonge (1993) as well as Hulshof, Verrijt and Kruijthoff (1996), the prominent focus has been on the added value of a Ph.D. (in comparison to a master's degree) in relationship to employment outcomes (Van der Neut and de Jonge, 1993; Hulshof et al., 1996). Two other studies by Keijzer and Gordijn (2000) and Hoffius and Surachno (2006) focused on Ph.D. candidates who had yet to enter the labour market and on postdoctoral researchers who had recently obtained their Ph.D.s. The emphasis here was on the expectations these young researchers have regarding their career prospects, in particular their opportunities to continue their research within academia.

All previous studies about Ph.D. candidates in the Netherlands devote little attention to international Ph.D. candidates and to Ph.D. candidates planning to go abroad after completing their Ph.D. Moreover, previous studies in general do not reflect any interest in the possible relationship between Ph.D. programme quality, labour market preparation initial employment outcomes.

Thus far, the study by Hulshof et al. (1996) is the most comprehensive and theoretical study and provides the most opportunities for comparison. The study was not intended to convey an isolated impression of initial employment outcomes but to gain an understanding of the respective changes that occur between first, second and third jobs held by Ph.D. recipients following graduation. The study by Hulshof and colleagues contains information contributed by Ph.D. recipients as well as employers.

We use their study to draw a number of conclusions about major developments between the 1990s and 2008-2009. Pivotal factors include the capacity of the Dutch labour market to absorb doctoral graduates (are there sufficient labour market opportunities for Ph.D. recipients?), demographic trends (gender, nationality and Ph.D. status – external Ph.D. candidate or *aio*[a]), sectors of employment, the nature of employment (temporary, permanent) and job content. The comparison is particularly interesting because Hulshof et al. report on a very early period

[a] It is possible to differentiate between three different types of Ph.D. status: a) the Ph.D. candidate that is employed by the university, formerly known in Dutch as an *assistent in opleiding* (*aio)*, b) the scholarship recipient (*beursaal*) and c) the external and/or dual Ph.D. candidate. In this report, we refer to *aios*, scholarship recipients and external candidates. See Chapter 1 for more information on this.

in the *aio* system of doctoral education, when relatively few *aios* were entering the labour market.

Over the years that followed, no new studies were conducted about the labour market status of Ph.D. recipients until 2006, when Sonneveld and Oost (2006) reported on the data disclosed by research and graduate schools about the labour market prospects of their Ph.D. recipients. Again in 2006, and following up on European initiatives, Hersevoort et al. (2007) conducted a preliminary exploration of the employment status of Ph.D. recipients residing in the Netherlands.

In sum, previous research about the labour market status of Ph.D. recipients in the Netherlands is irregular. Neither the Ministry of Education, Culture and Science, nor universities have a policy of conducting periodic surveys to determine where Ph.D. recipients work after receiving their Ph.D. This contrasts sharply with the standard practice in the United States, for example, where regular surveys of doctorate recipients have been organized since the 1950s. To compensate for this shortcoming, we have surveyed recent doctoral recipients at four universities in the Netherlands.

Research Questions

This study provides an overview of the initial employment outcomes of recent Ph.D. recipients in the Netherlands: we focus on the labour market position of Ph.D. recipients at the time of the doctoral defence. Based on previous research, we know however that these employment outcomes are likely to change. To gain further insight into these first years of employment following graduation, we asked respondents whether they would be willing to take part in a future study about their employment status three years from now. Such a follow-up study will go a long way in improving our knowledge of the employment outcomes in relation to doctoral education in the Netherlands.

Our study revolves around the following research questions:

- What are the most important characteristics of Ph.D. recipients in our sample?
- What academic trajectories did Ph.D. candidates follow prior to entering the Ph.D. trajectory and what professional and research experience did they acquire prior to starting their Ph.D. research?
- What are the most important features of the Ph.D. trajectories pursued?
- Did the Ph.D. recipients formally conduct their Ph.D. research at a graduate or research school?

- What are the initial employment outcomes of recent Ph.D. recipients from our sample?
- Do the characteristics of the Ph.D. recipients or their Ph.D. trajectories relate to these employment outcomes?
- How are Ph.D. recipients prepared to enter the labour market following graduation and which initiatives do they take in this respect?
- Is there evidence of a brain drain in the Netherlands that entails the departure of recent Ph.D. recipients? Is there evidence of a brain gain as a result of the arrival of international Ph.D. candidates coming here to conduct their Ph.D. research and staying on in the Netherlands after obtaining their Ph.D.?

Core Variables in the Study

The following core variables were the foundation for this study. On the one hand, these variables were determined by international agreements about the data to be gathered. On the other hand, a number of variables are included based on theoretical considerations.

- *Employment status*
  Provides insight into the labour market status at the time of the doctorate defence. Knowledge is acquired about international mobility, unemployment and the desired career trajectory of Ph.D. recipients.
- *Employment characteristics*
  Provides insight into the employers of Ph.D. recipients and the sectors where they work. It is especially important to distinguish between the progression into research and non-research positions as well as academic and non-academic positions.
- *Job characteristics*
  Elaborates on the job characteristics of Ph.D. recipients. Postdoctoral positions receive consideration. Particular attention is given to whether the qualifications obtained with the Ph.D. correspond to labour market requirements.
- *Labour Market Preparation*
  Conveys a general impression of how Ph.D. candidates prepared for their career in a general sense, outside of completing their Ph.D. We also consider the contribution of the Ph.D. programme and research or graduate school in this regard.
- *Educational characteristics of the Ph.D. programme*
  Reveals how the Ph.D. trajectory started and developed, Ph.D. recipients' subject-specific preparation for the labour market, the moment during the Ph.D. trajectory in which the Ph.D. plan was

fully elaborated, and the extent to which Ph.D. candidates were integrated into the academic community during their Ph.D. trajectory.

- *Educational Characteristics of Ph.D. recipients*
  Identifies personal attributes of Ph.D. recipients, such as international orientation, breadth of their scientific and scholarly activities (beyond the actual Ph.D. research) and scholarly output.

- *Demographic Characteristics of Ph.D. recipients*
  Supplies information about demographic characteristics, such as gender, marital status, educational level of parents, nationality and citizenship and reasons for coming to the Netherlands (for international Ph.D. candidates).

Data Collection

The research data were gathered using a web-based survey conducted between February 2008 and June 2009, following tests in a pilot stage in the autumn of 2007. The respondents – all Ph.D. candidates who applied for permission to defend their thesis – were contacted through the office of the *pedel*, the university office in charge of organising the doctoral defence, at the four participating universities and were invited to participate in the study. Additional information about the sampling procedure follows in Chapter 1.

Outline of the Report

This report consists of eight chapters. In Chapter 1, we describe the sampling procedures, as well as the main demographic and educational characteristics of our sample. This chapter is primarily descriptive; analyses of educational and employment outcomes are discussed in later chapters. Chapters 2 and 3 address the Ph.D. trajectory of Dutch Ph.D. recipients. First, in Chapter 2, we review the Ph.D. trajectory with respect to Ph.D. status, Ph.D. financing and the quality and performance of Ph.D. candidates and graduate schools. In Chapter 3, we analyse respondents' opinions of the educational trajectory quality, supervision and labour market preparation. Chapter 4 provides an overview of the initial employment status of Ph.D. candidates following graduation, examining differences in employment and occupations. In Chapter 5 we consider the international aspects of employment, known as *brain drain and brain gain*. We then take a closer look at what determines the labour market position of Dutch Ph.D. recipients in Chapter 6. In this chapter, we look at determinants of academic and non-academic employment, as well as determinants of permanent and temporary employment. Chapter 7 focuses on the sub-group of respondents that is unemployed but seeking employment following graduation. Finally, in Chapter 8, we provide several conclusions and policy recommendations. To simplify the reading of this report, information on the statistical tests performed in each of the chapters can be found in the endnotes of each chapter.

Executive Summary

This report is a summary and analysis of the Ph.D. trajectories and employment outcomes of recent Dutch doctoral recipients at four universities in the Netherlands in 2008-2009: Delft University of Technology, Erasmus University Rotterdam, Utrecht University and Wageningen University and Research Centre.

Research Questions

Our study revolves around the following research questions:

- What are the most important characteristics of Ph.D. recipients in our sample?
- What academic trajectories did Ph.D. candidates follow prior to entering the Ph.D. trajectory and what professional and research experience did they acquire prior to starting their Ph.D. research?
- What are the most important features of the Ph.D. trajectories pursued?
- Did the Ph.D. recipients formally conduct their Ph.D. research at a graduate or research school?
- What are the initial employment outcomes of recent Ph.D. recipients in our sample?
- Do the characteristics of the Ph.D. recipients or their Ph.D. trajectories relate to these employment outcomes?
- How are Ph.D. recipients prepared to enter the labour market following graduation and which initiatives do they take in this respect?
- Is there evidence of a brain drain in the Netherlands that entails the departure of recent Ph.D. recipients?
- Is there evidence of a brain gain as a result of the arrival of international Ph.D. candidates coming here to conduct their Ph.D. research and staying on in the Netherlands after obtaining their Ph.D.?

Respondents

In total, 1113 Ph.D. candidates were invited to take part in the research. 565 respondents completed at least one part of the survey, creating a response rate of 50.7 per cent at the beginning of the questionnaire. At the start of the final section of the survey, 443 respondents remained, providing a response rate of 39.8 per cent.

The data demonstrate that the majority of our respondents obtained their doctorate degree in the Natural Sciences (31%) followed by the Medical and Health Sciences (25%). The smallest category of respondents can be found in the Agricultural Sciences (7%) and the Humanities (6%).

Half of doctoral recipients surveyed were male (53%). Comparing this to the research results of Hulshof (1996; an average of 22% female Ph.D. recipients between 1990 and 1995) we can conclude that women's participation in doctoral education is on the rise. The mean age of our respondents was 34 years old. The majority of Dutch doctoral recipients were between the ages of 25 and 40 when completing their doctorate. Two-thirds of doctoral recipients surveyed were born in the Netherlands (67 per cent). This percentage is much higher than the 1 per cent average of foreign-born doctoral recipients reported by Hulshof et al. (1996; for the period 1990-1995).

Many respondents worked for some time before going on to obtain a doctorate degree. Nearly two-thirds (61%) of our respondents worked for pay or profit in the period between the awarding of their most recent master's degree or equivalent and the start of their Ph.D. trajectory. 82 per cent of external Ph.D. candidates and 73 per cent of Ph.D. scholarship recipients worked prior to starting a Ph.D., in comparison to 52 per cent of doctoral candidates with the status of *aio* (employed with the university for the Ph.D.).

Characteristics and Qualities of Ph.D. Trajectories

Among the respondents, 71.1 per cent reported that their main formal status was *aio*, with 5 per cent listing 'scholarship recipient' as their main Ph.D. status. The share of external or dual Ph.D. candidates was 23.9 per cent. Ph.D. recipients (*aios*, scholarship recipients and external or dual Ph.D. candidates) took an average of 64.2 months (five years and four months) to complete their Ph.D. trajectory. Those with *aio* appointments (369) took an average of 59.8 months to complete their Ph.D. The 26 scholarship recipients averaged 62.6 months to complete their Ph.D. and external and dual Ph.D. candidates took an average of 77.5 months to complete the Ph.D. trajectory.

Ninety per cent of respondents appointed as *aios* held full-time appointments of 37 hours or more a week. The average number of weekly hours worked was 37.4 hours. Ph.D. candidates who held jobs or combined the pursuit of their Ph.D. with other activities worked an average of 30.4 hours a week (in addition to pursuing their Ph.D.). Fifty-five of the 101 former external Ph.D. candidates (54.5%) was employed in academia (in their external job) during their Ph.D. trajectory. Fifteen per cent (14.9%) combined pursuing their Ph.D. with government jobs, nine per cent (8.9%) with work for non-profit organisations. Only eleven per cent of Ph.D. recipients (10.9%) combined the Ph.D. trajectory with working for corporate industry.

In addition to writing a Ph.D. thesis, the respondents also produced other academic accomplishments. Respondents reported an average of 5.52 conference papers and 4.25 journal articles, which is impressive. Books and book chapters elicit ongoing interest as well. Among the respondents, 169 (33.7%) wrote a chapter in a book, while 75 (14.9%) wrote a book during the Ph.D. trajectory. Altogether, 196 (39%) of the 502 respondents produced one or both of these products. That pursuing a Ph.D. involves more than writing a Ph.D. thesis is also reflected in the fact that 124 out of 502 Ph.D. recipients produced external reports during their Ph.D. trajectory.

The data show that Dutch Ph.D. recipients work in a setting where the international element is well represented. 71.7 per cent of Ph.D. recipients reported at least one member of the supervisory team spent at least one year gaining experience at an institute or university abroad (n=396). 49.1 per cent of respondents (n=438), had a supervisory team in which at least one supervisor was educated or trained abroad. Ph.D. candidates also worked in an international setting in relation to their fellow Ph.D. candidates: 55.5 per cent worked at a department or a research or graduate school where at least one quarter of the fellow Ph.D. candidates was of non-Dutch origin.

While Ph.D. research is carried out within the university setting, it is also possible that Ph.D. candidates formally conduct their research within a graduate or research school. The graduate and research schools can offer Ph.D. candidates educational programmes, research facilities, and financial support and in this way, a Ph.D. trajectory carried out under a graduate or research school differs from one carried out without this assistance. Many of our respondents were unsure whether their work was being carried out at a graduate or research school. 219 of the 512 respondents stated either that they did not know whether their research took place within a graduate or research school or reported that this had not been the case (altogether, this group thus comprises 42.8% of all respondents).

Education and Supervision

We asked the Ph.D. recipients to assess the Ph.D. programme they attended, the guidance and labour market preparation they received and to inform us about how they actually prepared for the next step in their career. In this way, we paved the way toward answering the question later on as to whether employment outcomes are related to features of the preceding Ph.D. trajectory. Taking a closer look at the efficiency and timing of the educational trajectory, we note that less than 40 per cent of Ph.D. recipients knew at the end of the first year which research questions he or she would want to answer. Further down the road, only 52 per cent knew before starting their second year which research data would be necessary to answer the research questions they intended to investigate during their Ph.D. trajectory.

Many Ph.D. recipients believe that their supervisors provided useful advice regarding subject choice and encouraged them to publish internationally. In contrast, guidance provided by supervisors to Ph.D. candidates in studying the literature and their interest in the timely completion of the Ph.D. trajectory scored poorly. 69 per cent of Ph.D. recipients believe that their supervisors provided good opportunities for establishing international contacts.

Labour Market Preparation

Dutch Ph.D. trajectories score favourably with respect to offering opportunities to acquire research experience outside one's own subject as well as preparation for positions in academia and the private sector. The Ph.D. programme and trajectory score poorly with respect to promoting the study of a wide range of subjects within the curriculum in preparation for a broad spectrum of labour market opportunities.

When asked about their expectations, Ph.D. candidates express the strongest agreement with statements indicating that they were expected by their university and supervisors to plan and prepare for their career after graduation on their own. The respondents disagree the most with statements indicating that supervisors and universities provide good information about future employment prospects and labour market preparation.

As perceived by Ph.D. candidates, supervisors arguably had the highest expectations of efforts by Ph.D. candidates that would yield products of direct interest to the supervisor (the publication of international, scientific articles and conference presentations). When activities primarily and perhaps even exclusively serve the interest of Ph.D. candidates, expectations from supervisors are the least explicit. We can formulate the results in an alternative manner: According to Ph.D. candidates, the expectations of supervisors are highest, when timely completion of the Ph.D. thesis is least likely to be compromised. Expectations among supervisors are remarkably low with respect to the acquisition of international and teaching experience on the part of Ph.D. candidates.

The Ph.D. programme, supervisors and institutes received decidedly low scores on providing labour market information, information about employment trajectories of previous Ph.D. recipients and career advice. Only a small percentage of respondents agreed or completely agreed with the statement that they received good career counselling (14%) or that they received relevant information about post-Ph.D. opportunities from their educational institution (31%).

In terms of job search strategies, the Internet and existing contacts were the most important channels for information and employment searches. Nearly one-third of the respondents (31.6%) contacted an employer directly. Interestingly, universities, a university career service

or other university source are virtually absent among the parties active in the employment search strategies of Ph.D. recipients.

The Labour Market Status of Dutch Ph.D. Recipients

Looking at employment following graduation, the data demonstrate that the employment rate of Dutch doctoral recipients is relatively high; 86 per cent of doctoral recipients surveyed are in employment at the moment of the defence. Another nine per cent of respondents are not working, three per cent of respondents are not seeking a job and two per cent of respondents answered 'don't know'. On average, recent doctoral recipients report having a contract for 38 hours a week, not taking into account possible over-time hours.

While there is a high rate of employment among Dutch doctoral recipients, many graduates have a job that is in some way not permanent. 49 per cent of our respondents answered that they have a job that is not permanent. Within this category of respondents working on a temporary contract, 76 per cent of them are working at a university. Only 24 per cent of doctoral recipients working on a temporary contract are employed outside the university. However, the permanency of employment is significantly related to the Ph.D. status of doctoral candidates. 79 per cent of external candidates are employed under a permanent contract, whereas only 35 per cent of former Ph.D. candidates with the status *aio* have a permanent contract following graduation.

Doctoral recipients in the Netherlands follow numerous career paths. Nearly all (97%) doctoral recipients are employed in a professional occupation.[b] 28 per cent of respondents indicated they were employed at a Dutch university following graduation. If we include Dutch university-affiliated medical centres, hospitals, and research institutes, this number rises however to more than 50 per cent. Nearly 12 per cent of recent doctoral recipients are employed with a international university or a university-affiliated organisation abroad. Taken together this means that 63 per cent of respondents are employed in academia either in the Netherlands or abroad. Another 3.6 per cent of respondents are working in a non-academic research institute. 15 per cent of respondents are working in the industry or business (for profit) sector, 7 per cent work in the non-profit sector and 6 per cent work within government, either in the Netherlands or abroad.

[b] The term 'professional' refers to both the skill-level and skill-specialisation required within an occupation, based on the International Standard Classification of Occupations used by the International Labor Organisation (ILO). This classification defines the group professional as including "occupations whose main tasks require a high level of professional knowledge and experience in the fields of physical and life sciences, or social sciences and humanities. The main tasks consist of increasing the existing stock of knowledge, applying scientific and artistic concepts and theories to the solution of problems, and teaching about the foregoing in a systematic manner. Most occupations in this major group require skills at the fourth ISCO skill level. This major group has been divided into four sub-major groups, 18 minor groups and 55 unit groups, reflecting differences in tasks associated with different fields of knowledge and specialisation" (ILO, 2009: http://www.ilo.org/public/english/bureau/stat/isco/isco88/publ4.htm).

The majority of doctoral recipients (66.1%) are primarily concerned with (applied) research in their current job. A smaller percentage of respondents are primarily concerned with development activities (8%) or professional services (8%). Another 10 per cent of respondents report that teaching is the activity they spend the most time on. According to our survey, 88 per cent of all doctoral recipients in the Netherlands now perform work that is in someway related to their Ph.D. degree.

In terms of job satisfaction, 34 per cent of graduates are very satisfied with their current employment; 52 per cent are satisfied. Only 4 per cent of respondents report being dissatisfied with their job and less than 1 per cent are very dissatisfied. The remaining 10 per cent of respondents were neutral about their reported job satisfaction.

Brain Drain and Brain Gain

In this survey we asked respondents where they intend to go following the completion of their Ph.D. Do they stay here, or do they move abroad? Of the 318 Dutch Ph.D. candidates who answered this question, 35 (11%) indicate they will move to another country, 45 (14.2%) indicate they are still undecided, and the overwhelming majority hopes to remain in the Netherlands (238; 74.8%).

Another question is how many of the international Ph.D. candidates, who have come to the Netherlands specifically to pursue their Ph.D., will remain here after completing their Ph.D. Of the 123 international Ph.D. candidates, 46 (37.4%) indicate they want to remain in the Netherlands, 25 (19.5%) are undecided, and 53 (43.1%) want to leave the Netherlands.

Contrary to what is occasionally feared from a purely Dutch perspective, the difference between ‘brain drain’ (Ph.D. completed in the Netherlands but leaving after the Ph.D. for another country) and ‘brain gain’ (an individual comes to the Netherlands to complete the Ph.D. and then stays) reveals a positive balance for ‘brain gain’ at the time of the survey (2.5% gain). Nonetheless, this conclusion merits one important reservation: a total of 69 Ph.D. candidates remain undecided about what they will do following graduation. In the worst case, if all undecided Ph.D. candidates were to leave, this would result in an absolute ‘brain drain’ of 34 Ph.D. candidates. In relative terms, a ‘brain gain’ of 9 per cent would remain. In the best case, if all undecided Ph.D. candidates decide to remain in the Netherlands, this will result in an absolute ‘brain gain’ of 35 persons. The relative ‘brain gain’ in this case would be 45 per cent. Naturally, every scenario in between these two extremes is possible as well.

Factors Influencing Initial Employment Outcomes

When looking at employment outcomes, we considered the most important predictors of working inside and outside academia. We have found only four significant predictors of non-academic employment and one significant predictor of academic employment. Gender is important: male doctoral candidates are one and a half times more likely to be employed outside academia. External Ph.D. candidates and candidates who started their own business are also more likely to be employed outside academia. Moreover, the more versatile the educational trajectory (in terms of subjects studied and/or extra research experience obtained during the Ph.D.) and the more labour market preparation Ph.D. candidates received from the university, the more likely a Ph.D. recipient is to work in academia. Lastly, Ph.D. candidates who are positive about the role of their supervisor and the way their supervisor prepared them for the labour market are more likely to be employed outside academia.

We also considered the most important predictors of permanent and temporary employment, both inside and outside academia. We have found a number of significant predictors of having a permanent contract, including age and the presence of children. External Ph.D. candidates are also more likely to be employed under a permanent contract than *aio*s in academia. Regarding academic performance, the higher the number of articles accepted for publication, the higher the probability of a permanent contract. In our sample, background characteristics, previous research experience and individual performance, such as age, children living in the household as well as publications submitted and accepted, are more important predictors of contract type inside and outside of academia than factors such as supervision and labour market preparation.

Spotlight on the Job Seekers

We also took a closer look at Ph.D. recipients who are not employed by the time of graduation but are seeking employment: the so-called job seekers. Despite being a relatively small group (44 respondents), we are able to discern a number of important characteristics that define this group. What matters in terms of unemployment (and job seeking) is: the Ph.D. status of the candidate, the field of study and performance during the Ph.D. trajectory.

When we look at the distribution of job seekers across the three Ph.D. statuses, we find that 38 of the 44 job seekers are *aio*s. These Ph.D. candidates who were employed on a university contract are more likely to be unemployed than scholarship Ph.D. candidates or external candidates. Two of the job seekers in our sample are scholarship recipients and four of the job seekers are external candidates.

In addition, we see an overrepresentation of doctoral candidates from the Natural Sciences in the job-seeking category of the unemployed. 14 per cent of all doctoral candidates from the Natural Sciences are seeking a job; this is five per cent higher than the average for all fields of study. Doctoral candidates who are unemployed and seeking a job at the time of the defence have a lower number of (co)authored conference papers, articles submitted for publication and articles accepted for publication than doctoral candidates with a job at the time of the defence.

Conclusion

This executive summary has provided a number of our most important conclusions. We now move on to a more detailed look at the data and an in-depth analysis of educational and employment outcomes of recent doctoral recipients at four universities in the Netherlands.

1 CHARACTERISTICS OF DOCTORAL RECIPIENTS AND THE BEGINNING OF THE Ph.D. TRAJECTORY

In this chapter we describe the demographic and educational characteristics of recent doctoral recipients in the Netherlands. To provide a complete view of doctoral recipients in the Netherlands, we present as much data as possible, including information on respondents who did not fully complete the questionnaire. Where possible, we compare our sample with other statistics and information about doctoral recipients in the Netherlands. Such a comparison allows us to make more general statements about the representativeness of our sample. The focus in this chapter is on a description of the major characteristics of recent doctoral recipients in the Netherlands—underlying relationships between various demographic and educational characteristics in relation to education and employment outcomes are investigated in later chapters. We start by discussing the sampling procedure, sample size and response rate before moving on to consider a number of demographic characteristics.

1.1 Sampling Procedure

Respondents for this survey were approached through the office of the *pedel*, the university office in charge of organising the doctoral defence, during the period February 2008 through June 2009 at the following four universities: Delft University of Technology, Erasmus University Rotterdam, Utrecht University and Wageningen University and Research Centre. When Ph.D. candidates registered for the defence of their Ph.D. thesis, they received an informational packet, which included a letter from the university Board of Governors (*College van Bestuur*) explaining the aim and objectives of this research project and asking for their participation.

Following their registration for graduation, the office of the *pedel* provided the Netherlands Centre for Graduate and Research Schools with the e-mail address of each Ph.D. candidate. These addresses were used to invite respondents to take part in the questionnaire. Respondents were approached within 10-14 days after registering for graduation and were provided a login and password for completing the online survey. If the respondent did not sign in and complete the survey, they were sent a reminder e-mail within another 10-14 days. One final reminder was sent to Ph.D. candidates who had not yet responded after another 10-14 days. In sum, respondents received a maximum of three e-mails asking them to take part in the survey.

The survey consisted of questions covering five areas of interest: the pre-Ph.D. situation, the Ph.D. trajectory, characteristics of the Ph.D. programme and supervision, expected employment situation and demographic information. The unique log-in code and password given to respondents allowed them to complete the web survey during multiple sessions if necessary. The average time needed to complete the questionnaire was 32 minutes.

All of the information collected in this survey, including the e-mail addresses gathered at the start of the research, remains confidential. All variables containing personal information such as name and address, name of supervisor or any other identifying variables have been removed for purposes of confidentiality.

1.2 Sample Size and Response Rate

In total, 1113 Ph.D. candidates were invited to take part in the research. 565 respondents completed at least one part of the survey, for a response rate of 50.7 per cent.

The response rate of 50.7 per cent reflects the response rate at the start of the survey. A number of respondents failed to complete the questionnaire in its entirety, however. Approximately 11 per cent of respondents stopped filling in the questionnaire prior to reaching the fifth and final section of the survey. At the start of the final section of the survey, 443 respondents remained, providing a response rate of 39.8 per cent. Throughout this report, when we discuss descriptive statistics, we use all of the available information on respondents. In other words, the sample size denoted by 'n' will vary for the various descriptive tables, graphs and analyses. No data have been imputed through missing analysis for the descriptive information. In later chapters, where more complex analyses are presented, we have used the statistical package Mplus (Muthen and Muthen, 2007), which uses full information maximum likelihood (FIML) to deal with missing data. In essence, Mplus uses all available data without employing listwise deletion, which is more common in statistical packages such as SPSS.

1.3 Sampling of Different Ph.D. Statuses

The Dutch system of doctoral education has evolved over the years, creating different forms of doctoral education. One of the unique features of this study is that we have investigated the Ph.D. trajectories of doctoral candidates across the various forms of education. It is possible to differentiate between three different types of Ph.D. status.

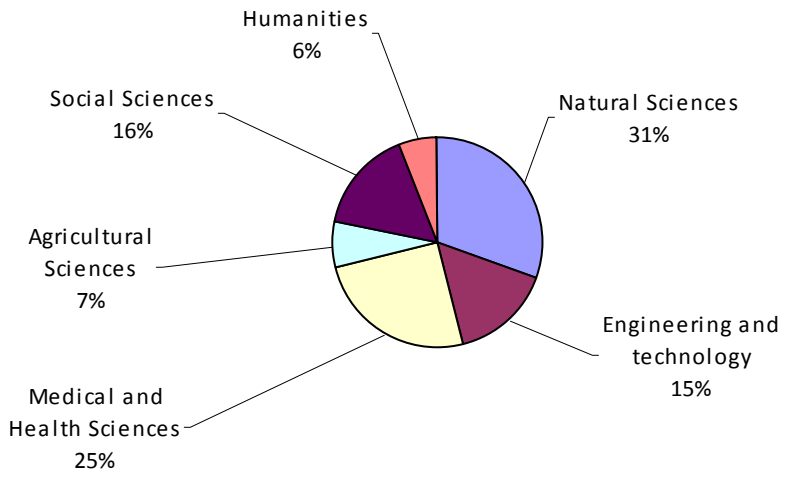
These include: a) the Ph.D. candidate that is employed by the university, formerly known in Dutch as an *aio*, b) the scholarship recipient (beursaal) and c) the external and/or dual Ph.D. candidates. Ph.D. candidates employed by the university have an employment contract for a specified duration. The employment contract specifies working conditions and salary, based on the collective agreement covering the Association of Universities in the Netherlands (see *www.vsnu.nl* for more information).

Scholarship recipients do not have an employment contract. Rather, they are provided a scholarship or stipend for a specified period of time. Lastly, external and/or dual Ph.D. candidates, often not accounted for in studies on doctoral education in the Netherlands, are an amalgamation. These Ph.D. candidates do not have a formal Ph.D. contract at the university, nor do they have a scholarship or stipend. Their status can take on different forms, for example an external candidate who works part-time on his or her Ph.D. thesis while having a job elsewhere or dual candidates, such as junior lecturers who work part-time at a university while working part-time on their Ph.D. thesis. There are also a number of external candidates who work on their Ph.D. thesis during retirement. Throughout this report, we will investigate differences in the Ph.D. trajectories and employment and educational outcomes among these different forms of doctoral education. We will refer to these three forms as 1) *aios* 2) scholarship recipients and 3) external candidates.

1.4 Field of Study

Before moving on to discuss the demographic characteristics of our respondents, we outline the major fields of study of our respondents. This differentiation in field of study will be used throughout the report to discuss variation in respondents across the different disciplines. The data demonstrate that the majority of our respondents obtained their doctorate degree in the Natural Sciences (31%) followed by the Medical and Health Sciences (25%). The smallest category of respondents can be found in the Agricultural Sciences (7%) and the Humanities (6%).

Figure 1.1 Primary Field of Study during the Ph.D. Trajectory



According to Statistics Netherlands (CBS, 2005), in 2005 72,000 individuals in the employed population (between 15-69 years of age) held a doctorate degree in the Netherlands. The distribution of these degrees across different fields shows that our sample is an overrepresentation of the Natural Sciences, Engineering and Agricultural Sciences, and an underrepresentation of the Humanities, the Social Sciences and the Medical and Life Sciences. It is important to note, however, that our sample is a reflection of doctoral recipients in 2008-2009, and not the general population of doctorate holders.

1.5 Demographic characteristics

1.5.1 Gender

Half of doctoral recipients surveyed were male (53%); the remaining 47 per cent were female. In 1995, only 22 per cent of doctoral recipients surveyed by the Ministry of Education, Culture and Science were female (Hulshof et al., 1996). This statistic is important because it demonstrates women's participation in doctoral education is on the rise. Recent educational statistics show that more and more women are taking part in higher education (OECD, 2009). More importantly, our results show that women's increased participation in education has permeated the highest level of educational attainment and is higher than in earlier studies of Dutch doctoral recipients (Hulshof et al. 1996, Hersevoort et al. 2007). The previously mentioned percentage of 22 per cent has more than doubled, showing an unequivocal increase in women's participation in doctoral education.

The percentage of male and female candidates is relatively equal across the three forms of doctoral education in the Netherlands with no significant differences.[1] Women are more highly represented among scholarship recipients (56% versus 44%) whereas men are more highly represented among *aios* (52% versus 48%) and external candidates (58% versus 42%).

The number of female doctoral recipients is significantly higher in certain fields of study.[2] The highest percentage of men, respectively the lowest percentage of women, can be found in Engineering and Technology (69 versus 31 per cent). There is also a higher percentage of male doctoral recipients in the Humanities (58 per cent), Agricultural Sciences (55 per cent) and the Natural Sciences (52 per cent). Women make up the majority of doctoral recipients in the Social Sciences, where 56 per cent of graduates are female.

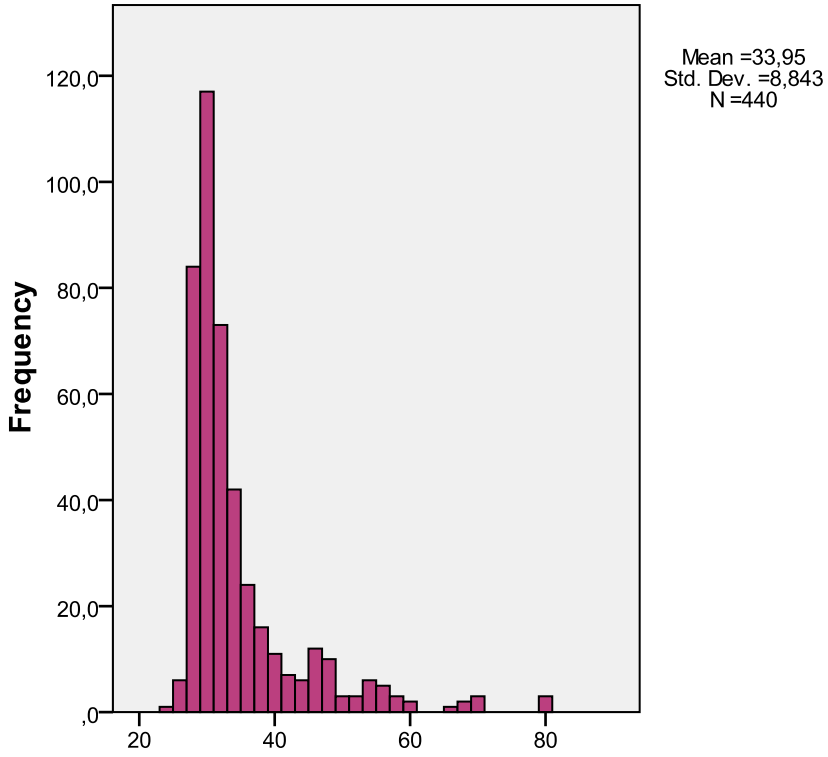
1.5.2 Age

The mean age of our respondents was 34 years old (see Figure 1.2). The majority of Dutch doctoral recipients were between the ages of 25 and 40 when completing their doctorate. However, as the distribution of ages demonstrates, some graduates were over the age of 40 when reaching the completion stage of their doctorate (10 per cent; ten graduates were over the age of 65). Again, we find a number of interesting differences in ages when taking a closer

look at the primary field of study. The Humanities have the highest average age of doctoral recipients: with an average age of 42 years, this is a significant difference in comparison to all other primary fields of study.[3] The Natural Sciences have the lowest mean age, 32 years old, however the age of Natural Science graduates does not differ significantly from the age of graduates in other fields of study. The remaining fields of study have the following mean ages: Medical and Health Sciences, 34 years old; Agricultural Sciences, 36 years old; Social Sciences, 35 years old and Engineering and Technology, 34 years old.

Some of the significant age differences between Ph.D. candidates is due differences in Ph.D. status. External candidates are, on average, much older than *aios* and slightly older than scholarship recipients. The average age of external candidates is 42 years old, whereas *aios* average 32 years of age and scholarship recipients 38 years of age.[4]

Figure 1.2 Distribution of Respondents by Age



1.5.3 Marital Status

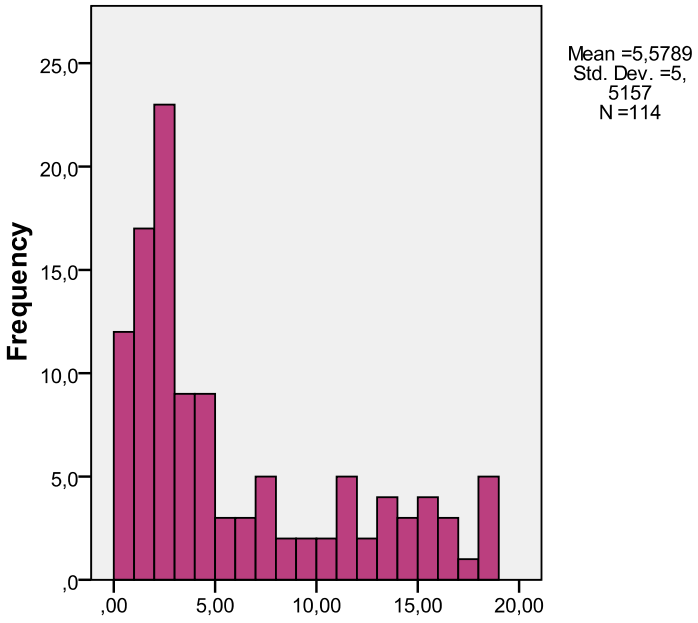
The majority of doctoral recipients in the Netherlands are either married or living with a partner. Fifty-nine per cent of respondents answered that they were either married or cohabitating with a partner at the start of their Ph.D., in comparison to a total of 41 per cent of respondents who have never been married (39%), are divorced (1%), widowed (0.5%) or separated (0.5%). Men make up two-thirds of all Ph.D. graduates married at the start of the Ph.D. tra-

jectory.[5] No other significant gender differences can be observed. We also asked respondents if they experienced a change in marital status during the Ph.D. trajectory. While 29 per cent of respondents answered yes, this change in marital status had no significant effect on either the Ph.D. trajectory or employment outcomes and is therefore not taken into consideration in later chapters.[6]

1.5.4 The Presence of Children

The majority of Dutch doctoral recipients were not caring for children during their Ph.D. trajectory. Only 26 per cent of our respondents reported having children in the household living with them at least 50 per cent of the time while working on their doctorate. Respondents in our sample had between one and four children living with them, and the average age of the youngest child living in the household was six years of age (see Figure 1.3). A significantly larger percentage of male doctoral candidates had children living with them than female doctoral candidates (65 per cent and 35 per cent respectively).[7]

Figure 1.3 Age of the Youngest Child in the Household



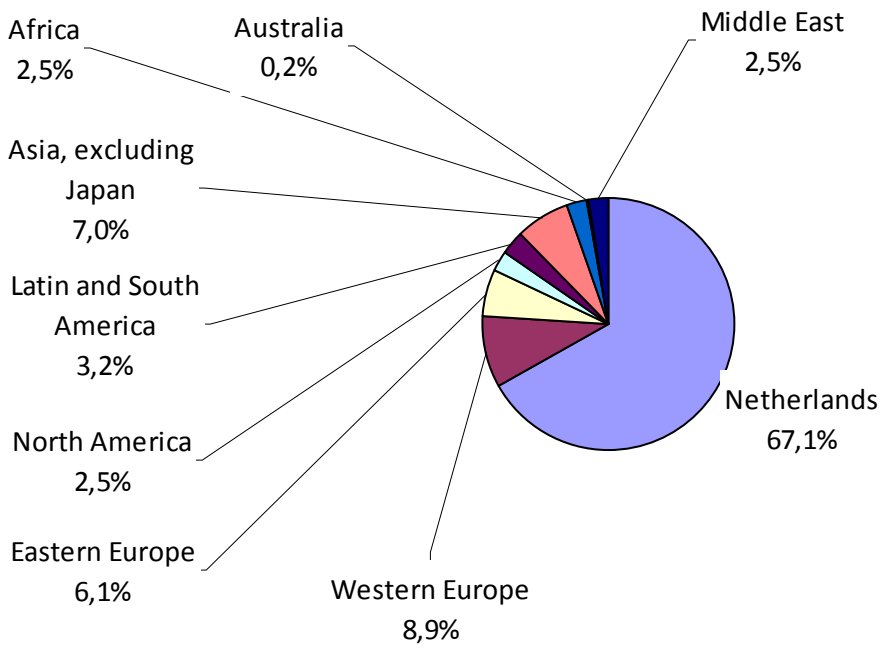
1.5.5 Nationality and Citizenship

Two-thirds of doctoral recipients surveyed were born in the Netherlands (67 per cent; see Figure 1.4). The number of doctoral recipients who do not have a Dutch passport is rising; in an earlier study by Hulshof et al. (1996) only a marginal percentage of doctoral recipients originated from outside the Netherlands. Doctoral recipients born in other countries were most often born in other Western European countries (including Germany: 2.3%; Italy: 2.0%; Belgium: 1.1%), Asian countries (including China: 2.3%; Indonesia: 1.6%; Vietnam: 1.1%) or

Eastern European countries (including Romania: 1.6%; Poland: 1.4%; Bulgaria: 1.1%). Less than five per cent of doctoral recipients surveyed are from North America, Latin and South America or Africa. The percentage of Dutch doctoral recipients with a Dutch passport, 72.3 per cent, is slightly higher than the percentage of doctoral recipients born in the Netherlands, a result of some graduates having been born outside the Netherlands but either having or having obtained a Dutch passport. There are no significant gender differences among doctoral candidates born in the Netherlands and those born in other countries.[8]

However, we do observe differences in the status of Ph.D. candidates and the country of birth.[9] A significantly higher percentage of doctoral candidates born outside the Netherlands have the Ph.D. status of scholarship recipient: 12 per cent versus 2 per cent of candidates born in the Netherlands. Candidates born in the Netherlands are most often Ph.D. candidates based on the formal status of *aios*; 74 per cent of candidates born in the Netherlands versus 66 per cent of candidates born outside the Netherlands. The remaining 22 per cent of candidates born outside the Netherlands has the status of external Ph.D. candidate (versus candidates born in the Netherlands, of which 24 per cent are external candidates).

Figure 1.4 Respondents' Country of Birth



There are interesting differences in the percentage of foreign-born doctoral recipients and the field of the doctorate degree.[10] There are fewer international Ph.D. recipients in the Medical and Health Sciences (19 per cent), the Social Sciences (22 per cent) and the Humanities (29 per cent). In these fields, doctoral recipients either born in the Netherlands or with a Dutch

passport are in the majority. The highest number of international Ph.D. recipients can be found in Engineering and Technology, where 49 per cent of doctoral recipients are not Dutch. There is also a high percentage of foreign-born Ph.D. graduates in the Agricultural Sciences (45 per cent) and the Natural Sciences (40 per cent foreign-born graduates). We take a closer look at the migration of doctoral recipients into and out of the Netherlands, so-called brain drain and brain gain, in Chapter 5.

1.5.6 Parent's Educational Background

Respondents in our sample did not generally have parents with a doctorate degree (see Table 1.1). However, many respondents do indicate that either one or both of their parents had completed some form of higher education, whether equivalent to a bachelor or a master's degree.

Table 1.1 Parent's Educational Background (n=440)

Type of education	Number of respondents whose father had completed…	Number of respondents whose mother had completed…
Compulsory school or less	29 (6.6)	49 (11)
Completed secondary school	129 (29.3)	192 (43.6)
Higher education diploma/degree, BA	118 (26.8)	123 (28.0)
Higher education diploma/degree, MA	112 (25.5)	48 (10.9)
Higher education diploma/degree, Ph.D.	36 (8.2)	8 (1.8)
Not applicable	11 (2.5)	14 (3.2)
Don't know	5 (1.1)	6 (1.4)
Total	440 (100.0)	440 (100.0)

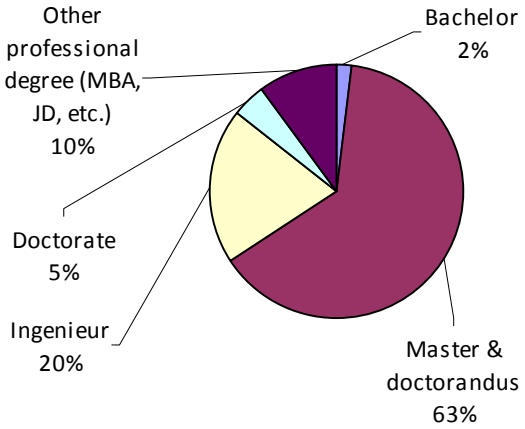
1.6 The Start of the Ph.D. Trajectory

Having looked at a number of demographic characteristics, we now turn to a description of recent doctoral recipients at the start of the Ph.D. trajectory.

1.6.1 Previous Degree and Field of Study

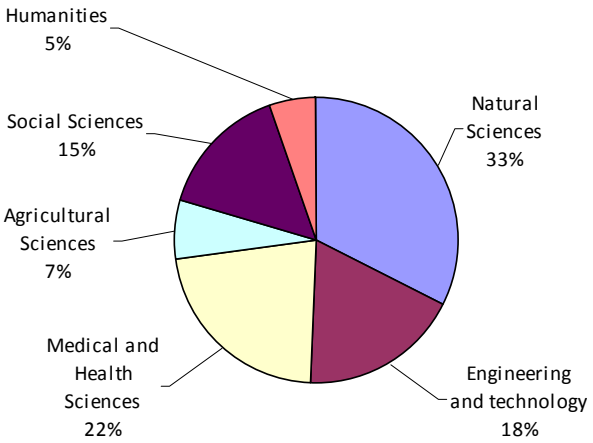
The majority of respondents in our sample followed a master's degree programme or Dutch *doctorandus* degree before entering into the Ph.D. trajectory (see Figure 1.5). A smaller number of respondents acquired an *ingenieur's* degree or some other professional degree, such as an MBA or JD degree, and only a minority of respondents moved on directly from a bachelor's degree or had already obtained an earlier doctorate degree.

Figure 1.5 Degree Obtained Prior to Ph.D. Trajectory



Respondents in our sample come from a variety of educational backgrounds (see Figure 1.6).

Figure 1.6 Primary Field of Study prior to Ph.D. Trajectory



Approximately one-third of the doctoral recipients surveyed obtained their most recent degree in the Natural Sciences; the field producing the smallest percentage of doctoral candidates is the Humanities (5%). The field of study followed prior to the doctorate degree varies by gender. A higher percentage of Ph.D. candidates coming from the field of Engineering and Technology as well as the Humanities are male (71 per cent versus 29 per cent and 63 per cent versus 37 per cent respectively). In contrast, a greater percentage of Ph.D. candidates coming from the Medical and Health Sciences are female (60 per cent versus 40 per cent). Moreover, there are significant differences in the field of study prior to the Ph.D. degree and the Ph.D. status of our respondents.[11] The largest number of external Ph.D. candidates obtained their most recent degree in the Medical and Health Sciences (30 per cent; see Table 1.2). The largest percentage of Ph.D. scholarship recipients obtained their most recent degree in the Natural Sciences and this is also true of Ph.D. candidates with the status of *aios*.

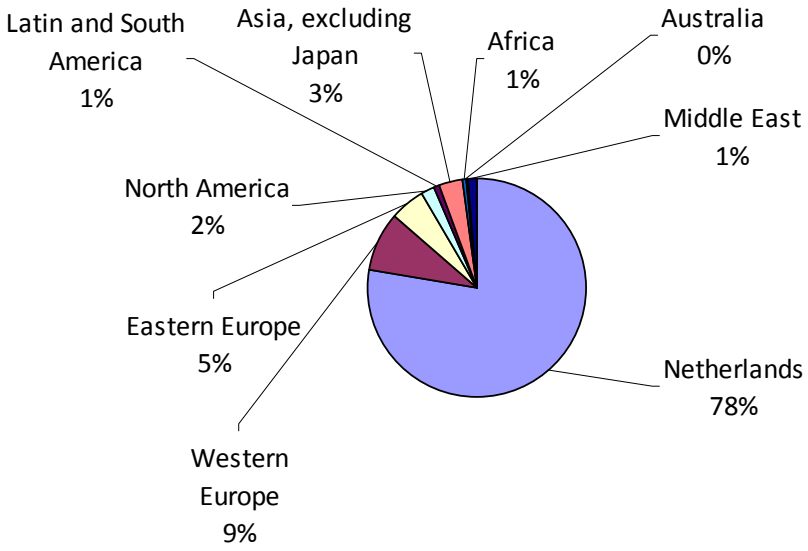
Table 1.2 Primary Field of Study prior to Ph.D. Trajectory and Ph.D. Status (n=519)

	Natural Sciences	Engineering and technology	Medical and Health Sciences	Agricultural Sciences	Social Sciences	Humanities	Total
Aio	138 (37.4)	73 (19.8)	75 (20.3)	14 (3.8)	55 (14.9)	14 (3.8)	369 (100.0)
Scholarship recipient	12 (46.2)	1 (3.8)	5 (19.2)	5 (19.2)	1 (3.8)	2 (7.7)	26 (100.0)
External Ph.D. candidate	20 (16.1)	18 (14.5)	37 (29.8)	16 (12.9)	21 (16.9)	12 (9.7)	124 (100.0
Total	170 (32.8)	92 (17.7)	117 (22.5)	35 (6.7)	77 (14.8)	28 (5.4)	519 (100.0)

1.6.2 Location of Previous Education

The educational trajectory followed by the majority of our respondents prior to their doctorate was followed in the Netherlands (see Figure 1.7). A minor percentage of respondents followed educational trajectories in Western and Eastern Europe as well. Less than 10 per cent of our respondents completed their pre-doctoral training outside of Europe.

Figure 1.7 Country in which Pre-doctorate Educational Training Obtained

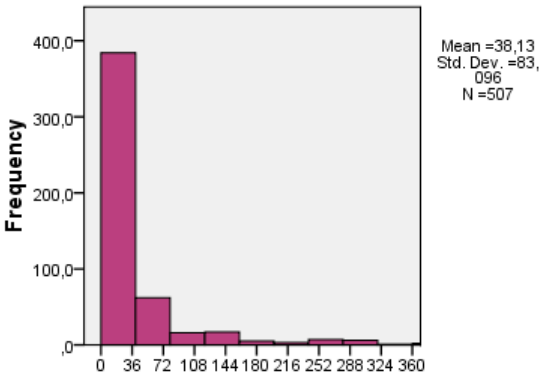


1.6.3 Educational Trajectories

Approximately ten per cent of doctoral recipients follow a linear pattern in their educational trajectories, continuing on from a master's or similar degree directly on to their doctorate degree. In Figure 1.8, we see the distribution of the number of months between obtaining the most recent degree and the start of the Ph.D. trajectory. The median number of months is

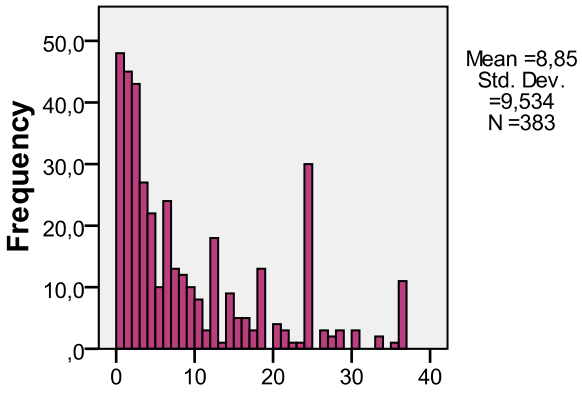
eight, the median being a more appropriate measure here than the average, which is skewed at 38 months, resulting from the wide variation in time between a master's degree or equivalent and the start of the doctorate degree.

Figure 1.8 Number of Months between Most Recent Degree and Start of Ph.D. Trajectory



In Figure 1.9, we take a closer look at the largest column in Figure 1.8, respondents who started their doctorate within 36 months after receiving their most recent degree. More than half (59%) of the respondents in our sample went on to do a doctorate degree within 12 months of finishing their most recent degree. The remaining respondents in our sample vary greatly in the amount of time it took before they entered into a Ph.D. trajectory. Most of this variation is due to differences in Ph.D. status. While doctoral candidates with the status of *aio* went on to do their doctorate within an average of 17 months, this period of time lengthens for Ph.D. scholarship recipients (53 months) and for external candidates (92 months).

Figure 1.9 Number of Months between Most Recent Degree and Start of Ph.D. Trajectory, restricted to 0-36 months



Female Ph.D. candidates had, on average, a shorter period of time between their most recent degree and their doctorate degree (see Figures 1.10 and 1.11). The women in our sample went on to do their doctorate degree within an average of 31 months after obtaining their

master's degree or equivalent, versus 44 months among the men in our sample. However, these gender differences are not significant; the higher average among men is in part a consequence of the higher number of outliers among male respondents.

Figure 1.10 Number of Months between Most Recent Degree and Start of Ph.D. Trajectory, Female Ph.D. candidates

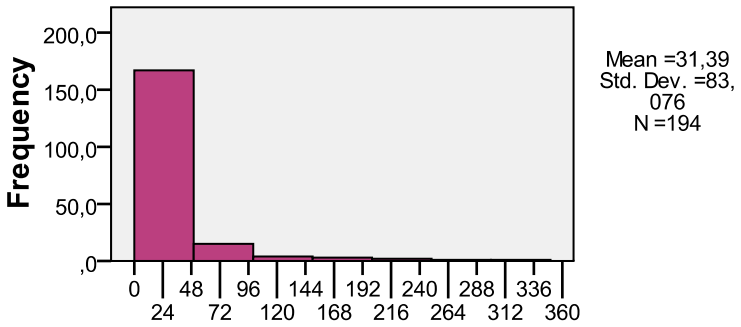
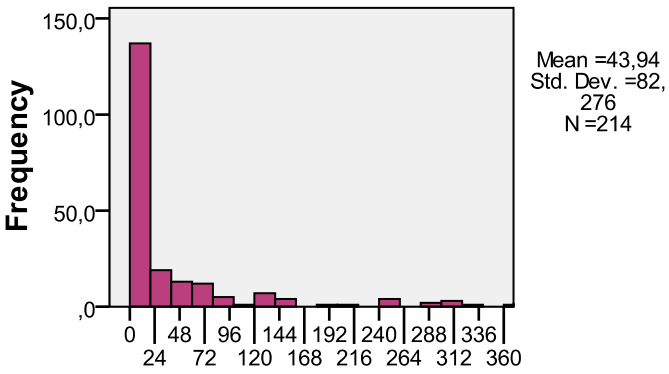


Figure 1.11 Number of Months between Most Recent Degree and Start of Ph.D. Trajectory, Male Ph.D. candidates



1.7 Prior Employment

Many respondents worked for some time before going on to obtain a doctorate degree. Nearly two-thirds (61 per cent) of our respondents worked for pay or profit in the period between the awarding of their most recent master's degree or equivalent and the start of their Ph.D. trajectory. Here we also see significant differences based on Ph.D. status.[12] 82 per cent of external Ph.D. candidates and 73 per cent of Ph.D. scholarship recipients worked prior to starting a Ph.D., in comparison to 52 per cent of doctoral candidates with *aio* status. 21 per cent of those employed were working at a Dutch university (see Table 1.3); 23 per cent were working

in the industry or business (for profit) sector. The majority of Ph.D. graduates who worked prior to starting their Ph.D. degree were employed within a professional occupation.[c]

Table 1.3 Type of Employment prior to Ph.D. Trajectory (n=318)

Type of Employer	Number (percentage) of respondents
Dutch university	66 (20.8)
Dutch university-affiliated hospital or medical centre	32 (10.1)
Dutch Royal Academy-affiliated research institute	2 (0.6)
Dutch university-affiliated research institute	13 (4.1)
Foreign university	23 (7.2)
Foreign university-affiliated hospital or medical centre	3 (0.9)
Foreign royal academy-affiliated research institute	4 (1.3)
Foreign university-affiliated research institute	11 (3.5)
Foreign national government	6 (1.9)
Foreign provincial government	2 (0.6)
Foreign local government	1 (0.3)
Dutch national government	13 (4.1)
Dutch local government	3 (0.9)
Not for profit organisation	19 (6.0)
Industry or business (for profit)	73 (23.0)
Self-employed	11 (3.5)
Other - Specify	10 (3.1)
Non-academic hospital	11 (3.5)
Non-academic research institute	11 (3.5)
Total	318 (100.0)

See Table 1.4 for a list of employment based on the International Standard Classification of Occupations (ISCO '88; 1-digit).

Table 1.4 Previous Employment based on ISCO '88 1-digit Occupation[d]

Type of Occupation	Number (percentage) of respondents
Legislators, Senior Officials and Managers	4 (1.3)
Professionals	273 (86.7)
Technicians and associate professionals	18 (5.7)
Clerks	5 (1.6)
Service workers and shop and market sales workers	11 (3.5)
Skilled agricultural and fishery workers	1 (0.3)
Elementary occupations	3 (1.0)
Total	315 (100.0)

Three-fourths of respondents who were employed before starting their doctoral degree were working in the Netherlands (see Figure 1.12). If respondents were not working in the Netherlands, they were most often working in other countries in Western Europe or Asia, followed by

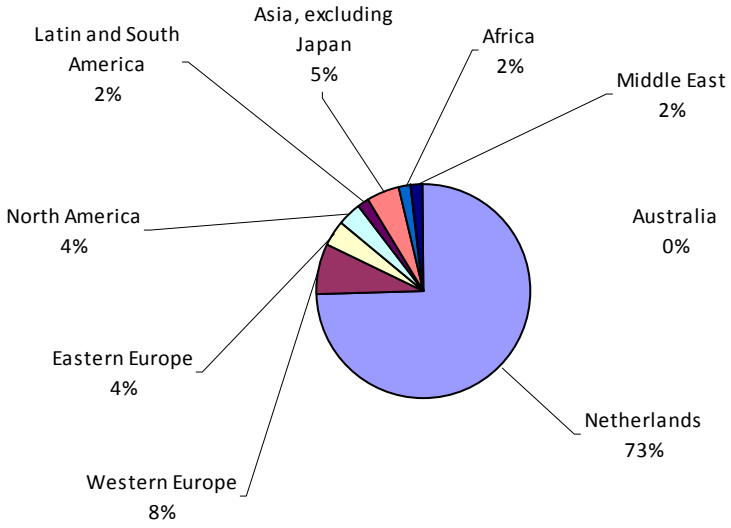
[c] The term 'professional' refers to both the skill-level and skill-specialisation required within an occupation, based on the International Standard Classification of Occupations used by the International Labor Organisation (ILO). This classification defines the group professional as including "occupations whose main tasks require a high level of professional knowledge and experience in the fields of physical and life sciences, or social sciences and humanities. The main tasks consist of increasing the existing stock of knowledge, applying scientific and artistic concepts and theories to the solution of problems, and teaching about the foregoing in a systematic manner. Most occupations in this major group require skills at the fourth ISCO skill level. This major group has been divided into four sub-major groups, 18 minor groups and 55 unit groups, reflecting differences in tasks associated with different fields of knowledge and specialisation" (ILO, 2009: http://www.ilo.org/public/english/bureau/stat/isco/isco88/publ4.htm).

[d] See Appendix 1 for a complete and more detailed list of ISCO-88 occupations.

Eastern Europe and North America. Only a small amount of respondents were working in Latin and South America, the Middle East, Africa or Australia.

More than half (52 per cent) of Dutch doctoral recipients obtained some form of research experience prior to working on their Ph.D. The remaining 48 per cent of our respondents had no prior work experience as a researcher before the start of the Ph.D. trajectory. However, these percentages vary a great deal depending upon the primary field of study. Agricultural Science graduates reported the most research experience: 75 per cent of respondents in the Agricultural Sciences field reported having prior research experience before starting their Ph.D. Agricultural Science graduates are closely followed by graduates in Engineering and Technology, where 70 per cent of graduates report having prior research experience. Interestingly, the field of study with the highest mean age of respondents, the Humanities, is also the field where respondents report the lowest amount of prior research experience (20 per cent). In the remaining fields, 49 per cent of Natural Science graduates, 46 per cent of Medical and Health Science graduates and 59 per cent of Social Science graduates reported having prior research experience before starting the Ph.D.

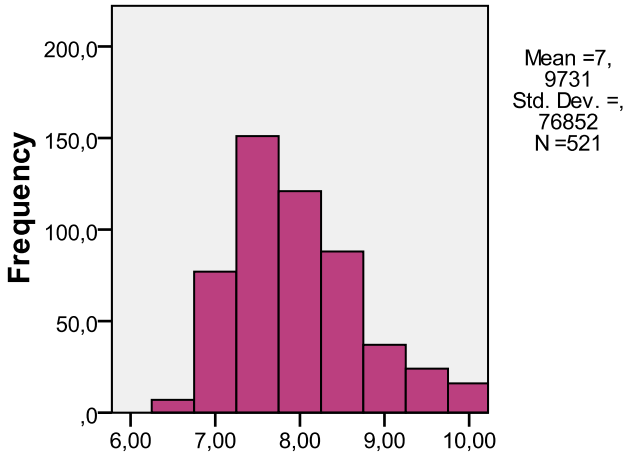
Figure 1.12 Country of Previous Employment



1.8 Prior Academic Performance

We asked respondents about the average grade received during the degree trajectory prior to beginning work on their Ph.D. Given the variation in grading systems across different countries, we asked respondents to report their average grade on a scale of 1 to 10, with 1 being the lowest and 10 being the highest. The mean score among our respondents was an 8 (see Figure 1.13). 24 per cent of the respondents reported graduating cum laude in their most recent degree before starting the Ph.D. trajectory.

Figure 1.13 Distribution of Average Grade (Obtained for most recent degree prior to the Ph.D.)



1.9 Conclusion

In this chapter, we have introduced our sample and described both their demographic characteristics as well as their previous academic and employment histories. Some of the most interesting results include:

- The twofold increase in women's participation in doctoral education since 1995;
- The increase in doctoral candidates coming from countries outside the Netherlands; and
- The significant differences in employment histories among the various statuses of Ph.D. candidates.

In the coming chapters, we will explore these and other differences discussed in this chapter in more detail.

Appendix 1.1: Classification of Occupations using ISCO-88

Code	*ISCO-88 title*
100	*Legislators, Senior Officials and Managers*
200	*Professionals*
21	*Physical, mathematical and engineering science professionals*
211	*Physicists, chemists and related professionals*
212	*Mathematicians, statisticians and related professionals*
213	*Computing professionals*
214	*Architects, engineers and related professionals*
22	*Life science and health professionals*
221	*Life science professionals*
222	*Health professionals (except nursing)*
223	*Nursing and midwifery professionals*
23	*Teaching professionals*
231	*College, university and higher education teaching professionals*
232	*Secondary education teaching professionals*
233	*Primary and primary education teaching professionals*
234	*Special education teaching professionals*
235	*Other teaching professionals*
24	*Other professionals*
241	*Business professionals*
242	*Legal professionals*
243	*Archivists, librarians and related information professionals*
244	*Social science and related professionals*
245	*Writers and creative or performing artists*
300	*Technicians and associate professionals*
400	*Clerks*
500	*Service workers and shop and market sales workers*
600	*Skilled agricultural and fishery workers*
700	*Craft and related trades workers*
800	*Plant and machine operators and assemblers*
900	*Elementary occupations*
000	*Armed forces*

Source: International Standard Classification of Occupations (ISCO-88).

Notes

[1] Chi-square =2.072 (2DF); p=.355; n=440.
[2] Chi-square =18.113 (5DF); p=.003; n=440.
[3] Significant differences in average age across fields of study: F (5, 431)=5.571; p<.001; n=440; corrected with Bonferroni. Individual t-scores for each field of study are available from the authors upon request.
[4] These are significant differences; F (2, 431) =55.934; p<.001; n=440.
[5] Chi-square =14.972; 6DF; p=.020; n=440.
[6] For reasons of space, these analyses are not included here. The analyses are available from the authors upon request.
[7] Chi-square =9.058; 1 DF; p=.003; n=440.
[8] Chi-square =0.051; 1 DF; p=.821; n=440.
[9] Chi-square=18.290; 2 DF; p<.001; n=440.
[10] Chi-square=27.730; 5 DF; p<.001; n=440.
[11] Chi-square=49.062; 10 DF; p<.001; n=519.
[12] Chi-square=34.806; 2 DF; p<.001; n=519.

2 BEING PREPARED: PROPERTIES AND QUALITIES OF Ph.D. TRAJECTORIES IN RELATION TO LABOUR MARKET OPPORTUNITIES

In this chapter we explore aspects of the Ph.D. trajectory that precede respondents' entry into the labour market. This exercise serves mainly to enable us to examine later on whether the way Ph.D. recipients structure their Ph.D. trajectory relates to their initial employment outcomes. The as yet untested hypothesis is that Ph.D. candidates, their supervisors, the Ph.D. programmes in which they participate and their academic performance may influence the career prospects of Ph.D. candidates. Regarding this final point, our research has certain limitations. Because we approached Ph.D. candidates before they defended their Ph.D. thesis, whether they obtained their Ph.D. *cum laude* was not yet known. Academic quality in this respect is expressed in terms of Ph.D. duration and other products in addition to the thesis (especially articles in international, scientific journals). In this chapter and chapter 3 we will answer the following research questions:

- Have the Ph.D. candidates been appointed at the university primarily to work on their Ph.D. (i.e. full-time or part-time) or did they pursue their Ph.D. in conjunction with other types of duties (known as dual or external Ph.D. candidates)? (Chapter 2).
- Which products did Ph.D. candidates generate in addition to the Ph.D. thesis (conference papers; international, scientific articles; teaching duties; etc)? (Chapter 2).
- How did Ph.D. candidates prepare themselves to enter the labour market? (Chapter 3).
- Which strategies did Ph.D. candidates employ in orientating themselves to and accessing the labour market? (Chapter 3).

2.1 The Status of Ph.D. candidates during the Ph.D. Trajectory

As we have already indicated in Chapter 1, it is possible to differentiate between three different types of Ph.D. status. In the table below, we offer an overview of the main formal status of our respondents.

2.1.1 Main Formal Status during the Ph.D. trajectory

As can been seen in Table 2.1, 71.1 per cent of respondents reported that their main formal status was '*aio'* with five per cent listing 'scholarship recipient' as their main Ph.D. status. The share of external or dual Ph.D. candidates was 23.9 per cent.

Table 2.1 Main Formal Status during the Ph.D. trajectory

	Number (Percentage)
Aio	369 (71.1)
Scholarship recipient	26 (5.0)
External Ph.D. candidate	124 (23.9)
Total	519 (100.0)

2.1.2 How many sources of financing did Ph.D. candidates use?

Table 2.2 lists the number of financial sources that Ph.D. candidates use in pursuing their Ph.D. trajectory. Next, we itemize the financing sources most prevalent in the Dutch Ph.D. system. 74.4 per cent of candidates completed his or her Ph.D. with only one source of financing. Unlike in the past, a large group of Ph.D. candidates (25.6%) received financing from multiple sources. We have listed the most prevalent financial sources below (in some cases including relevant combinations). We asked the respondents who reported using multiple financial sources to report their primary financial source.

Among the 133 respondents who answered this question, the top three primary financial sources were: Appointment as *aios* or Ph.D. candidate (51.1%, mentioned 68 times), grant/scholarship (22.6%; mentioned 30 times) and other job – full-time or part-time (9%; mentioned 12 times). The top three secondary financial sources mentioned by respondents were: grant/scholarship (28.7%; mentioned 38 times), other job – full-time or part-time (15.1%; mentioned 20 times) and spouse's, partner's or family support (14.3%; mentioned 19 times).

Table 2.2 Number of Financial Sources during the Ph.D. Trajectory (n=521)

Number of sources	Number (Percentage)
1	388 (74.4)
2	89 (17.5)
3	30 (5.4)
4	7 (1.5)
5	6 (1.0)
6	1 (0.2)
Total	521 (100.0)

2.1.3 Another financial aspect: 1st, 2nd or 3rd flow

The Ph.D. trajectory may be influenced by the source of financial support. We distinguish between 1st, 2nd and 3rd flow financing, referring to the source of official financing behind a Ph.D. project. In the case of 2nd or 3rd flow financing, for example, the Ph.D. candidate starts the Ph.D. trajectory with a clear project synopsis, which might affect the duration of the Ph.D. trajectory (see Chapter 2.2). To this end, we asked former *aios* and scholarship recipients to indicate the source of financing for their Ph.D. research. This yielded the result presented in Table 2.3.

Table 2.3 Main source of Financial Support for Ph.D. Employment/Scholarship (n=386)

Source	Number (Percentage)
First flow of funds - financing from a university	165 (42.7)
Second flow of funds - financing provided by NWO/KNAW	130 (33.7)
Third flow of funds (Public) - contract research funded by a government, a government ministry, or the EU	77 (19.9)
Third flow of funds (Private) - contract research funded by a company or other funding source	75 (19.4)

Financial support for Dutch Ph.D. positions is distributed as follows: 42.7 per cent of the Ph.D. candidates received financial support from the first flow, 33.7 per cent of the Ph.D. candidates had contributions from the second flow of financing and 39.3 per cent of the Ph.D. candidates had third-flow funding as a source of financing.

The total clearly exceeds 100 per cent. This is because several Ph.D. candidates obtained funding toward their Ph.D. research from multiple sources. Table 2.4 confirms this observation. Sixty-two respondents have reported more than one funding source. The most prevalent combination of funding is the first and third flow of financial support (29 combinations), followed by the combination of first and second flow (11), second and third flow (8) and third flow public with third flow private (8).

Table 2.4 Number of Funding Sources Mentioned: (listed according to 1st, 2nd and 3rd flow Source of funds [n=386])

Number of different sources	Number (Percentage)
No source mentioned	7 (1.8)
1 source	317 (82.1)
2 sources	56 (14.5)
3 sources	6 (1.6)
Total	386 (100.0)

2.2 Duration of the Ph.D. Trajectory

Ph.D. recipients (*aios*, scholarship recipients and external or dual Ph.D. candidates) took an average of 64.2 months (five years and four months) to complete their Ph.D. trajectory (see Figure 2.1). Looking at the duration of the Ph.D. trajectory across different Ph.D. statuses, those candidates with *aio* appointments (369 respondents) took an average of 59.8 months to complete their Ph.D. (see Table 2.5). We have compared this duration with the usual duration of an appointment as a full-time *aio*, which is generally 48 months. We checked this approximation by calculating the average duration of an *aio* appointment for our respondents, which is 50.3 months: two months longer than the standard 48-month appointment. The discrepancy arises from the fact that some *aios* hold part-time appointments. This extended duration has also been adjusted to take into account *aios* who have been away on sick leave or maternity leave or who have taken time off for childcare, for example.

Figure 2.1 Difference between Starting Ph.D. and Graduation in Months

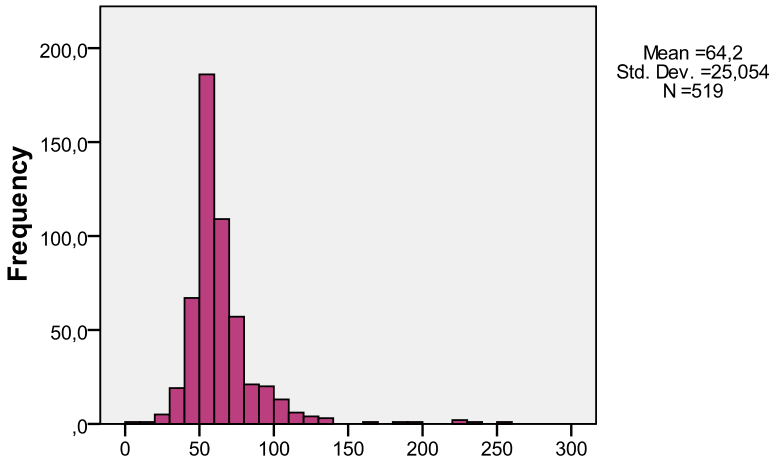


Table 2.5 Average Duration of Ph.D. Trajectory Based on Ph.D. Status

Formal status Ph.D. trajectory	Mean (SD)	Number (percentage)
Aio	59.84 (15.40)	369 (71.1)
Scholarship recipient	62.62 (16.73)	26 (5.0)
External Ph.D. candidate	77.53 (40.50)	124 (23.9)
Total	64.20 (25.05)	519 (100.0)

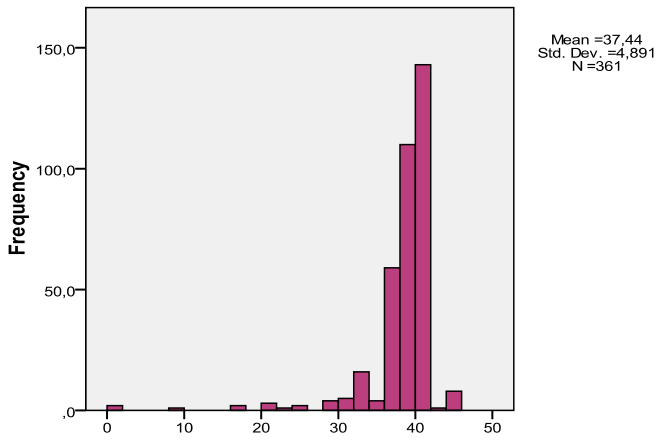
On average, *aios* have a university appointment for 50 months and therefore complete their Ph.D. nine months after their appointment ends (including the time that elapses between approval of their thesis manuscript by the Ph.D. committee and the public defence). Accordingly,

they spend about five months less on their Ph.D. than the average Ph.D. candidate. The 26 scholarship recipients averaged 62.6 months to complete their Ph.D. External and dual Ph.D. candidates (who do not hold *aio* appointments or receive a Ph.D. scholarship) took an average of 77.5 months to complete the Ph.D. trajectory. Note, however, that Ph.D. duration covers a very broad range in this group. The group of external and dual Ph.D. candidates comprises Ph.D. candidates who take considerably longer or finish much faster. The bulk of these Ph.D. candidates take 37 to 118 months to complete the Ph.D. thesis. This differs considerably from the *aios*, for example, where the majority takes between 44.4 and 75.2 months to complete the Ph.D.

2.3 Full-time or Part-time Aio Appointments

In each category of Ph.D. candidates, *aios* who conduct research toward their thesis on a full-time basis need to be distinguished from those who work on a part-time basis. We only have this information about *aios* because they have contractual appointments that stipulate the number of hours they are expected to devote to their Ph.D. research each week. This arrangement differs from the circumstances of external Ph.D. candidates and scholarship recipients. The time they have to work on their Ph.D. research varies depending on their other responsibilities and their allocation of time tends to be highly unpredictable (see Hello and Sonneveld, 2010). Ninety percent of respondents appointed as *aios* held full-time appointments of 37 hours or more a week (see Figure 2.2). The average number of weekly hours worked was 37.4. We note, however, that a full-time appointment does not necessarily allow for all working hours to be devoted to the Ph.D. research, due to the fact that a great many *aios* have teaching duties.

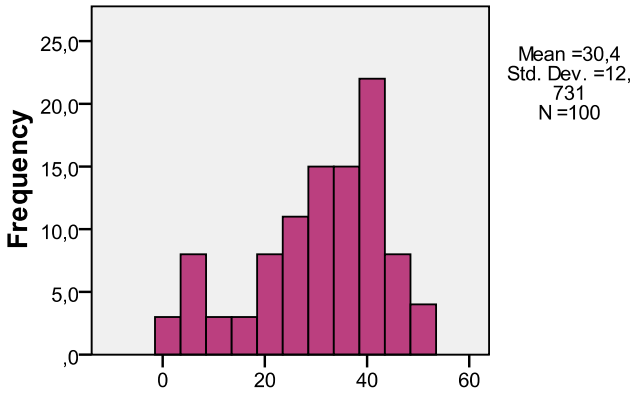
Figure 2.2 Number of Contractual Hours per Week



2.4 Ph.D. candidates who balanced obtaining a Ph.D. with other activities (including employment elsewhere)

While *aios* were able to devote their energy almost entirely to their Ph.D. research, this did not hold true for external or dual Ph.D. candidates who held jobs or combined the pursuit of their Ph.D. with other activities. These 100 respondents worked an average of 30.4 hours a week (in addition to pursuing their Ph.D.). Again, this group encompasses a broad range. The majority of these Ph.D. candidates worked between 17.7 and 43.1 hours in addition to pursing their Ph.D. Figure 2.3 reveals that a large group of these Ph.D. candidates combines pursuing a Ph.D. with a substantial number of working hours at a different job. Fifty-five of the 100 external Ph.D. candidates (55%) were externally employed in academia—in a job separate from their Ph.D. research. Fifteen external Ph.D. candidates combined the pursuit of a Ph.D. with government jobs and nine with work for non-profit organisations. Only eleven of the external Ph.D. recipients combined the Ph.D. trajectory with working for corporate industry.

Figure 2.3. External Employment During the Ph.D. Trajectory



2.5 Scholarly accomplishments in addition to the Ph.D. thesis: expectations

In Chapters 6 and 7 we explore the relationship between academic accomplishments and labour market opportunities. One question, for example, is whether the Ph.D. candidates who have established their reputation by publishing articles in international, scientific journals start their careers differently from their peers who have achieved less notoriety in this respect. Before we review academic scholarship in addition to the Ph.D. thesis, however, we will consider which types of additional output were expected from the Ph.D. candidates, as perceived by the candidates themselves.

Respondents have been asked about their own expectations, the perceived expectations of their supervisor and the perceived expectations of the research school. In other words, the results and conclusions presented below are consistently based on the perceptions of the Ph.D. candidates themselves. Each mention of 'the expectations of the supervisor or research school' should be read as: 'the expectations of the supervisor or the research school as experienced by the Ph.D. recipient during the Ph.D. trajectory'. Supervisors and institutes or graduate and research schools have not been consulted in this study. Additional research addressing the congruence between the expectations of Ph.D. candidates and those of supervisors and research or graduate schools would be worthwhile.

2.5.1 Expectations regarding additional scholarly accomplishments

Table 2.6 depicts the answers to the following question: in addition to writing a Ph.D. thesis, certain accomplishments may be expected from Ph.D. candidates during their Ph.D. trajectory. Mark each item that you, your supervisor(s) or your research school or institute expected of you. These items have been listed in descending order based on the perceived expectations of supervisors.

The table can be summed up as follows: Ph.D. candidates believe their supervisor(s) have the highest expectations in terms of: Presentation of your work at an international conference; more than two scholarly articles in an international, scientific journal and gaining teaching experience in the Netherlands. Disregarding 'other accomplishments', expectations were lowest in terms of: requesting a patent, gaining teaching experience abroad and gaining other work experience abroad.

According to the perceptions of the respondents, Ph.D. candidates are more intent than their supervisors on acquiring research experience outside their own institute during the Ph.D. trajectory. A remarkably small share of the respondents expected to request a grant for follow-up research during the Ph.D. trajectory (17.4%). They believed that a more modest share of their supervisors had such expectations (only 11.7%).

Patterns of expectations are the same with respect to acquiring other types of professional experience in the Netherlands and abroad. These results yield the impression that Ph.D. candidates and, according to the perceptions of the respondents, supervisors, are very focused on the Ph.D. trajectory. Moreover, it suggests they have minimal expectations of acquiring more general professional experience and preparing for the period after completing the Ph.D. by drafting grant applications for follow-up research.

Table 2.6 Percentage of Ph.D. Candidates Who Perceived Extra Expectations During the Ph.D. Trajectory by Supervisor(s), School/Institute or Ph.D. Candidate (n=461)

Extra accomplishments expected during your Ph.D. trajectory	Expected by your supervisor(s)	Expected by the research school or institute (formally or informally)	Expected by Ph.D. candidate
Presentation of your work at an international conference	78.1	44.7	82.0
More than two scientific articles in an international, scientific journal	55.7	29.3	62.9
Gaining teaching experience in the Netherlands	33.0	24.1	44.0
Gaining research experience outside your research institute, abroad	17.4	5.4	34.1
Two scientific articles in an international, scientific journal	27.5	14.1	31.0
One scientific article in an international, scientific journal	30.6	16.9	30.8
Gaining research experience outside your research institute, but within the Netherlands	11.3	6.3	23.4
Submitting a subsidy/grant request for further research following graduation	11.7	3.5	17.4
Gaining other work experience in the Netherlands	4.1	1.7	12.6
Gaining other work experience abroad	3.9	1.9	11.5
Gaining teaching experience abroad	1.5	1.9	7.4
Other accomplishments	5.4	4.3	6.3
Requesting a patent	1.9	0.7	3.9

The respondents believed that they expected more of themselves in terms of additional accomplishments in all respects than their supervisors and their research school or institute did. In other words, according to the perceptions of the respondents, Ph.D. candidates expect more from themselves in all areas than do their supervisors. Table 2.7 reflects this.

Table 2.7 Number of Different Types of Expectations Reported by Ph.D. Candidate

Expectation on side of…	Mean (SD)
Supervisor	2.82 (1.69)
School	1.55 (1.59)
Ph.D. candidate	3.67 (2.14)

According to the perceptions of the respondents, a supervisor has, on average, 2.8 additional expectations (in addition to the Ph.D. thesis) of his or her Ph.D. candidate. Ph.D. candidates have, on average, more expectations: 3.7. Graduate and research schools lag behind considerably with 1.5 extra expectations. Ph.D. candidates not only have higher expectations of

themselves but also have more varied expectations as well. According to the Ph.D. candidates, supervisors and research schools or institutes have virtually no expectations whereas the respondents had clear expectations (for example: gaining [other] work experience abroad or in the Netherlands).

According to the perceptions of the respondents, supervisors expected more accomplishments in addition to the Ph.D. thesis from *aios* than from grant recipients and external Ph.D. candidates. No difference exists between the latter two groups in this respect. Graduate or research schools have higher expectations of *aios* than they do of external Ph.D. candidates. *Aios* expect to accomplish more in addition to their Ph.D. thesis than external Ph.D. candidates do.

According to the Ph.D. candidates, research schools and institutes score lower than supervisors and Ph.D. candidates in all areas. The only clear expectations research schools and institutes have of their Ph.D. candidates, concerns presentations at international conferences, publication of more than two international, scientific journal articles and acquiring research experience in the Netherlands.

If we compare the perceived expectations of supervisors and Ph.D. candidates, the most comparable expectations with relatively high scores are: Writing more than two scholarly articles in international, scientific journals and presentation of work at an international conference. The greatest differences with respect to expectations between supervisors and Ph.D. candidates are in the areas related to acquiring research and teaching experience outside the Ph.D. setting.

As perceived by Ph.D. candidates, supervisors arguably had the highest expectations of efforts by Ph.D. candidates that would yield products of direct interest to the supervisor (publication of international, scientific articles and conference presentations). When activities primarily and perhaps even exclusively serve the interest of Ph.D. candidates, expectations from supervisors are the least explicit. The data suggest supervisors also have remarkably modest expectations with respect to the submission of funding proposals for follow-up research. Yet if approved, and if Ph.D. candidates conduct this research within a supervisor's research group, these grants would benefit supervisors and their research groups.

We can formulate the results in an alternative manner: According to Ph.D. candidates, the expectations of supervisors are highest, when timely completion of the Ph.D. thesis is least likely to be compromised. Expectations among supervisors are remarkably low with respect to the acquisition of international and teaching experience on the part of Ph.D. candidates. Now that we have reviewed the expectations of Ph.D. candidates, perceived expectations of supervisors and perceived expectations of research and graduate schools, we now look at the actual outcomes of these expectations in terms of academic performance.

2.6 Additional Scholarly Accomplishments: Reality

The expectations of Ph.D. recipients have certainly come true with respect to publishing. Ph.D. candidates publish an impressive average of 5.52 conference papers and 4.25 journal articles during the Ph.D. trajectory (see Table 2.8). As the data in the table demonstrate, however, the scores vary considerably. The publication of books and book chapters elicit ongoing interest. Among the respondents, 169 published a chapter in a book, while 75 respondents published a book during their Ph.D. trajectory. Altogether, 196 of the 502 respondents produced one or both of these products.

That pursuing a Ph.D. involves more than writing a Ph.D. thesis is also reflected by the fact that 124 out of 502 Ph.D. recipients produced external reports during their Ph.D. trajectory. Of the Ph.D. recipients who answered this output-related question (n=502), 93.8 per cent reported having at least one publication in addition to their Ph.D. thesis. Therefore, very few candidates did not publish a single conference paper, article or external report in addition to writing their Ph.D. thesis.

Despite these impressive publication accomplishments, some Ph.D. candidates did not produce a single article in an international, scientific journal (67 of 502 respondents; 13.3%) or published only one article (48 respondents; 9.6%).

Table 2.8 Scientific Output, Besides Ph.D. Thesis (n=502)

	Mean (SD)
Papers (co)authored for presentation at regional, national or international conferences (not counting presentations of the same work more than once)	5.52 (4.75)
Posters presented at regional, national or international conferences	2.96 (3.02)
Articles (co)authored, submitted for publication in an international, scientific journal	4.73 (4.46)
Articles, (co)authored, accepted for publication or published in an international, scientific journal	4.25 (4.48)
Books or monographs, (co)authored, published or accepted for publication	0.25 (0.93)
Book chapters/other publications, (co)authored, published or accepted for publication	0.70 (1.58)
External reports, (co)authored, published or accepted for publication	0.95 (3.00)

2.6.1 Self-employment

There are other opportunities for Ph.D. candidates to distinguish themselves in anticipation of entering the labour market, for example through entrepreneurship. We asked Ph.D. recipients to indicate whether they had started a business during their Ph.D. trajectory. Seventeen Ph.D. recipients (3.4% of the 499 respondents who answered this question) had done so.

2.6.2 Patents

Outside of publication efforts Ph.D. candidates in certain fields can also benefit from applying for patents. Twenty-eight respondents in our survey (5.6%) have applied for a total of 35 patents, of which 21 were approved, with 5 patents resulting in commercial products.

2.7 Characteristics and Attributes of the Ph.D. Programme

Alongside academic performance, we also asked respondents about characteristics and attributes of the Ph.D. programme they followed. In this section, we review Ph.D. programmes and Ph.D. supervision, considering both the actual characteristics of the supervision and programme and qualitative assessments from the Ph.D. recipients.

2.7.1 Where Did the Ph.D. Programme Take Place?

While Ph.D. research is carried out within the university setting, it is also possible that Ph.D. candidates formally conduct their research within a graduate or research school. Graduate and research schools can offer Ph.D. candidates educational programmes, research facilities, and financial support and in this way, a Ph.D. trajectory carried out under a graduate or research school differs from one carried out without this assistance. The Dutch research and graduate school system has been in place since the late 1980s. We asked the respondents to list the research or graduate school where they pursued their Ph.D. and of the 452 respondents who were able to answer this question, 64.8 per cent answered they had conducted their Ph.D. research at a research or graduate school, whereas 35.2 per cent reported their research had taken place outside a graduate or research school. In addition, 60 respondents indicated they did not know the answer to this question. In short, if we consider the total group of 512 respondents, 219 (42.8%) stated that they did not know whether their research took place within a graduate or research school or reported that this had not been the case.

There are a number of interesting differences between *aios*, grant recipients and external Ph.D. candidates in this regard. A higher than average share of *aios* conducted research at a graduate or research school (70.9% in comparison to the overall average of 64.8%); the share of scholarship recipients was only 54.2 per cent and that of external Ph.D. candidates only 41.5 per cent. In other words, graduate and research schools have a far more limited role in the academic experience of external Ph.D. candidates. As for scholarship recipients, it seems strange that their situation differs from that of the *aios* in this respect.

2.7.2 Changes of Topic, Supervisor and Institute during the Ph.D. Trajectory

If Ph.D. candidates are confronted with a change of topic, change of supervisor or a change in research or graduate school during the Ph.D. trajectory, it can be disadvantageous to them,

causing an increase in the duration of the Ph.D. trajectory, for example. To ascertain the extent to which changes such as these affected the Ph.D. trajectory, we have asked Ph.D. recipients about these issues. Their responses (n=513) are summarized in Table 2.9.

Table 2.9 Change of Main/Daily Supervisor, Institute or Thesis Topic (n=513).

Change of ……	Number (Percentage)
Main supervisor	55 (10.7)
Daily supervisor	79 (15.4)
Hosting institute/graduate school	35 (6.8)
Thesis topic[5]	41 (8.0)

Altogether, 26 per cent of Ph.D. recipients switched supervisors (daily and/or main) or research institute during their Ph.D. trajectory. Several respondents explained the reasons for the change in supervisor, institute or topic (see Table 2.10). Based on the answers provided in Table 2.10, most changes in supervision are for reasons unrelated to problems between supervisors and Ph.D. candidates. Rather, changes in employment or in the supervisor's personal circumstances are the dominant causes of a change in supervision.

Table 2.10 Reasons for the Change in Supervisor and/or Institute (n=131) or Topic (n=41))

Change of …	Reasons for change
Supervisors: main supervisor daily supervisor	change in supervision team due to new staff members being hired (4x) expiration/termination of contract, illness, passing away of supervisor, retirement (6x) change of supervisor's employment (12x) major problems in relationship between supervisor and Ph.D. candidate (7x)
Institute	planned change of institute by Ph.D. candidate (10x)
Topic	major failure in experiment project turned out to be unfeasible delay in data collection new focus due to results obtained and new ideas research proposal, written by supervisors, was rejected by funding organisation broadening of perspective (from national to international) work in first year did not lead to publishable results political reasons change because of interesting data generated by a peripheral project original topic was very vague switch of theoretical perspective

2.7.3 International Aspects of Supervision and the Research Setting

Another important aspect of the Ph.D. trajectory concerns internationalisation. We asked Ph.D. recipients whether their supervisors had international experience as well as how high the per-

[5] This refers to major changes; minor changes to the thesis topic are not included.

centage of international Ph.D. candidates was at their department or Ph.D. programme. The data show that Dutch Ph.D. recipients work in a setting where the international element is well represented. 71.7 per cent of the Ph.D. recipients reported at least one member of the supervisory team spent at least one year gaining experience at an institute or university abroad (n=396). 49.1 per cent of respondents (n=438), had a supervisory team in which at least one supervisor was educated or trained abroad. Ph.D. candidates also worked in an international setting in relation to their fellow Ph.D. candidates: 55.5 per cent worked at a department or a research or graduate school where at least one quarter of the fellow Ph.D. candidates was of non-Dutch origin. 37.4 per cent of the Ph.D. recipients reported that the share of international colleagues ranged from 1 to 25 per cent. A very small share (7.2%) of the Ph.D. recipients worked in a purely Dutch Ph.D. setting.

2.8 Conclusion

In this chapter, we have presented the main characteristics of the Ph.D. trajectories of our respondents. Our most important conclusions are the following:

- Among the respondents, 71.1 per cent reported that their main formal status was *aio*, with 5.0 per cent listing 'scholarship recipient' as their main Ph.D. status. The percentage of external or dual Ph.D. candidates was 23.9 per cent.
- On average, Ph.D. recipients (*aios*, grant recipients and external or dual Ph.D. candidates) took 64.2 months (five years and four months) to complete the Ph.D. trajectory.
- Of the total of 512 respondents, 219 stated that they did not know whether their research took place within a graduate or research school or reported that this had not been the case (altogether, this group thus comprises 42.8% of all respondents).
- Ninety percent of respondents appointed as *aios* held full-time appointments of 37 hours or more a week. The average number of weekly hours worked was 37.4.
- Ph.D. candidates who held jobs or combined the pursuit of their Ph.D. with other activities worked an average of 30.4 hours a week (in addition to pursuing their Ph.D.).
- In addition to writing a Ph.D. thesis, respondents also produced other academic accomplishments. Respondents reported an impressive average of 5.52 conference papers and 4.25 journal articles per Ph.D. recipient.
- In terms of publications, books and book chapters elicit ongoing interest. 169 respondents published a book chapter and 75 published a book. Altogether, 196 of the 502 respondents produced one or both these products.

- Pursuing a Ph.D. involves more than writing a Ph.D. thesis, which is reflected by the fact that 124 out of 502 Ph.D. recipients also produced external reports.
- Internationalisation, measured by the international experience of supervisors and the presence of international Ph.D. candidates working at the research or graduate school, is amply present.

3 EDUCATION, SUPERVISION AND LABOUR MARKET PREPARATION

This chapter is, on the one hand, about how Ph.D. candidates assessed the Ph.D. programme they attended, the supervision they received and labour market preparation and, on the other hand, about how they actually prepared for the next step in their career.

In this chapter we examine various features of the PhD programme and labour market preparation. We will answer the following questions:

- How well were the Ph.D. recipients integrated into their graduate community?
- Did they succeed in managing their PhD project?
- Did they find a balance between focusing on their own research and preparing themselves for a broader set of career options?
- Have they been supported in developing their intellectual autonomy?
- Have they been prepared for their entry into the labour market?

According to previous studies, several indicators reflect the quality of the Ph.D. programme and labour market preparation: integration into the academic community (also internationally; see Golde 2000, Bowen and Rudenstine 1992); sound management of the Ph.D. trajectory (by the thesis supervisor, as well as by the Ph.D. candidate) (Bowen and Rudenstine 1992, Rennie and Brewer 1987, Hockey 1991, Sonneveld and Oost 2006, Berger and de Jonge 2005); broad scope of the programme (benefiting labour market versatility) (Bowen and Rudenstine 1992, Moss Kanter 1989, Hills et al., 2003); promotion of academic independence (harmonized direction from thesis supervisors, for example) (Rennie and Brewer 1987, Bowen and Rudenstine 1992, Lovitts 2008); and quality of preparation for the labour market (through career information, for example, or support provided for developing future research proposals) (Bowen and Rudenstine 1992, Moss Kanter 1989, Oost and Sonneveld 2006, Austin 2002).

3.1 Educational characteristics of the Ph.D. Trajectory

We presented Ph.D. recipients with 29 statements related to the Ph.D. trajectory and labour market preparation (the statements appear in the appendix to this chapter). The respondents were asked to indicate to what extent they agreed with each statement, with 1 denoting "completely agree," 2 "agree," 3 "neutral," 4 "disagree" and 5 "completely disagree."[13] The score for each statement is listed in the Appendix of this chapter. The lower the average score, the more respondents agreed with the statement.

We start by looking at the educational characteristics of the Ph.D. trajectory that score the highest (see Table 3.1) and the lowest (see Table 3.2) based on average scores for these statements. If a statement averaged a score between one and two, this means that, on average, respondents agree (completely) with the statement. We interpret this as a positive signal with regards to this aspect of the educational trajectory, supervision, labour market preparation etc. Averages above three indicate a position ranging from neutral to disagree (completely) with the statement. Following these top five, we will list the five statements eliciting the strongest disagreement among the respondents in Table 3.2.

Table 3.1 Top Five Statements Agreed with the Most

	Number (Percentage) of respondents	Mean (SD)
My supervisor(s) encouraged me to publish in international, scientific journals during my Ph.D. trajectory.	412	1.58 (0.91)
My supervisor(s) emphasized my independence.	401	1.91 (0.85)
I am highly likely to maintain professional contact with a number of my former Ph.D. colleagues.	395	1.92 (0.88)
After clarifying my research questions, I succeeded in determining which methods of data collection would be needed to gather the necessary data.	383	2.01 (0.77)
My Ph.D. supervisor(s) were of the opinion that the primary responsibility for finding a job after the Ph.D. defence lies with the Ph.D. candidate.	373	2.03 (0.95)

Table 3.2 Top Five Statements Disagreed with the Most

	Number (Percentage) of respondents	Mean (SD)
Thanks to good career counselling, I was able to orientate myself to the labour market possibilities for doctoral recipients.	353	3.55 (0.99)
The institute where I undertook my Ph.D. research provided clear information regarding the labour market status of its doctoral graduates.	376	3.45 (1.03)
During my Ph.D. trajectory, my supervisors provided me with excellent information about post-Ph.D. career opportunities.	381	3.36 (0.99)
During my Ph.D. trajectory, my educational programme provided me with relevant information about post-Ph.D. career opportunities.	407	3.16 (1.08)
My supervisor(s) offered me a job after completion of my Ph.D.	342	3.15 (1.49)

Here, as in Chapter 2, we emphasize that our report conveys the perceptions of the participating Ph.D. recipients. The Ph.D. candidates feel that supervisors attribute a great deal of importance to international publications and that supervisors strongly emphasize Ph.D. candidates are personally responsible for their careers following the completion of their Ph.D. We do note, however, that the standard deviation from the average is greatest for the statement “My supervisor(s) offered me a job after completion of my Ph.D.” This means that the experiences of

the respondents vary the most here. This is illustrated by the fact that 40 per cent of the respondents to this question indicated that they agreed (completely).

Moreover, the data presented in Table 3.2 demonstrates that if the view is that universities should be involved in the labour market preparation of their Ph.D. candidates, the conclusion might be that they are doing poorly. Respondents did not always feel they were provided relevant information about post-Ph.D. career opportunities. We now move on to address some aspects of the educational trajectory, supervision and labour market preparation more extensively.

3.1.1 Quality of the Educational Trajectory

Taking a closer look at the efficiency of the educational trajectory in terms of the timing and the scope of the trajectory, we note that less than 40 per cent of Ph.D. recipients knew at the end of the first year which research questions he or she would want to answer (item 22). Further down the road, only 52 per cent knew before starting their second year which data would be necessary to answer the research questions (item 5). In contrast, the Ph.D. trajectories score favourably with respect to offering opportunities to acquire research experience outside one's own subject (62.1%) as well as preparation for positions in academia and the private sector (57.9%, items 9 and 30). The Ph.D. programme and trajectory score poorly with respect to promoting the study of a wide range of subjects within the curriculum in preparation for a broad spectrum of labour market opportunities and study opportunities abroad (39.3% and 38.2%, respectively, items 3 and 21).

3.1.2 Quality of Supervision

The mediocre interest of supervisors in actively pursuing Ph.D. candidates' future opportunities by supporting new grant applications or by supplying information about career opportunities is reflected in the respondents' belief that supervisors strongly emphasize the independence and personal responsibility of Ph.D. candidates in finding a job (items 29, 2 and 10). 80 per cent and 75 per cent, respectively, of respondents (completely) agree with the statements expressing personal responsibility. 40 per cent of respondents (completely) agree with the statement asserting that the supervisor offered them a job following Ph.D. completion.

Respondents were positive about some aspects of Ph.D. supervision. Many Ph.D. recipients believe that their supervisors provided useful advice regarding subject choice (74.4%) and encouraged them to publish internationally (88.3%, items 26 and 12). However, guidance provided by supervisors to Ph.D. candidates in studying the literature, and interest in timely completion of the Ph.D. trajectory scored poorly, with only 51 per cent and 44 per cent, respectively, agreeing that this part of the system was satisfactory (items 27 and 17).

3.1.3 Ph.D. Candidates and Building an Academic Network

We also asked respondents about their supervisor's assistance in building a network. 69 per cent of Ph.D. recipients believe that their supervisors provided good opportunities for establishing international contacts. The Ph.D. recipients expressed far less favourable assessments of their supervisors with respect to increasing their chances of finding a job after completion of their Ph.D. through joint publications with the supervisor (41.7%, item 8). Supervisors also received mediocre scores with respect to increasing the chances of contacts with potential employers by attending conferences together with Ph.D. candidates (47.5%, item 18).

In regards to the Ph.D. candidate's own network, a substantial group of Ph.D. recipients (81.8%) expects to remain in touch with their fellow former Ph.D. candidates after completing their Ph.D. However, this orientation toward fellow Ph.D. candidates is not reflected in the responses from the Ph.D. recipients to statements about working with fellow Ph.D. candidates during the Ph.D. trajectory (54.0%) or participating in group projects during the programme (46.8%, items 28, 13 and 6).

3.1.4 Labour Market Preparation

When asked about labour market preparation, 53 per cent of respondents made clear that they felt their supervisors would support them in their endeavours to continue their career in academia. However, less than half the respondents stated their supervisors helped them obtain financing for research following the Ph.D. trajectory (in or outside the Netherlands, 43.8% and 41.7%, respectively, items 19, 24 and 23). Moreover, the Ph.D. programme, supervisors and institutes received decidedly low scores on providing labour market information, information about employment trajectories of previous Ph.D. recipients and career advice. These scores were between 14 per cent (career advice) and 31 per cent (information from the graduate school; items 7, 11, 4 and 14).

3.2 Scrutinizing the Main Educational Characteristics

Next, we plotted the 29 items addressed above on nine scales, which we will use in chapters 6 and 7 to explore whether a relationship exists between the perceptions Ph.D. candidates have regarding labour market preparation, the quality of the Ph.D. programme and individual employment outcomes. These 29 statements have been selected based on theoretical and practice-based assumptions about how they relate to one another (see the introduction of this chapter).[14]

We distinguished a total of five overarching themes, measuring nine aspects of the educational trajectory, supervision and labour market preparation. We list the underlying items as included and numbered in the appendix to this chapter.

I. Supervisor and Ph.D. and integration into the broader academic community

1 Role of the supervisor in building the Ph.D. candidate's network (items 1, 8, 12, 18)

2. Role of the supervisor in supporting and preparing the Ph.D. candidate for the labour market (items 10, 11, 19, 23, 24)

II. Programme quality

3. Ph.D. candidate's insight into steps to be taken during the research trajectory (items 5, 20, 22 and 25)

4. Quality of supervisory guidance in writing and finishing the Ph.D. thesis (items 17, 26 and 27)

5. Versatility of educational trajectory (in terms of subjects studied and/or extra research experience obtained during the Ph.D.) and labour market preparation (items 3, 9, 15, 21 and 30)

6. Intensity of contact with other Ph.D. candidates (preventing isolation during Ph.D. trajectory, items 6, 13 and 28)

III. Informative preparation for the labour market

7. Quality of preparatory labour market information provided by supervisor/graduate school/university (items 4, 7, 11 and 14)

IV Independence

8. Individual responsibility of Ph.D. candidate for finding a job following Ph.D. completion (items (2, 16)

V Internationalization (each of these numbers has appeared previously above)

9. Research experience abroad and support in obtaining international research funding after the Ph.D. (items 21 and 23)

Statistical analysis was used to confirm the theoretically suspected correlation between these items.[15] This means that we are now able to depict the average scores for the characteristics of the educational and supervisory trajectory for theoretically-related groups of items (see Table 3.3).

Table 3.3 reveals the following. Ph.D. candidates express the strongest agreement with statements indicating that they were expected by their university and supervisors to plan and prepare for their career after graduation on their own. Statements asserting that supervisors provided good opportunities to establish international contacts via conferences and publications received relatively high scores. The same holds true for the statements asserting that Ph.D. candidates felt they had sufficient academic contact with their peers.

Respondents disagreed the most with statements indicating that supervisors and universities provide good information about future employment prospects and labour market preparation. On average, supervisors receive neutral scores here, but the informative labour market preparation from the institute or university averages between a neutral response to and a rejection of the statements asserting that the university devotes sufficient attention to this matter. This

negative impression is illustrated by Table 3.4 depicting the items with the lowest score from the table included in the appendix.

Table 3.3 Main Educational Characteristics (Mean Scores)

	Number of respondents[16]	Mean (SD)
1. Role of the supervisor in building the Ph.D. candidate's network	413	2.32 (0.83)
2. Role of the supervisor in supporting and preparing the Ph.D. candidate for the labour market	406	2.95 (0.90)
3. Ph.D. candidate's insight into steps to be taken during research trajectory	413	2.56 (0.82)
4. Quality of supervisory guidance in writing and finishing the Ph.D. thesis	412	2.53 (0.84)
5. Versatility of educational trajectory and labour market preparation	412	2.62 (0.70)
6. Intensity of contact with other Ph.D. candidates (preventing isolation during Ph.D. trajectory)	412	2.45 (0.84)
7. Quality of preparatory labour market information provided for by supervisor/graduate school/university	409	3.31 (0.84)
8. Individual responsibility of Ph.D. candidate for finding a job following graduation	390	2.18 (0.81)
9. Research experience abroad and support in obtaining international research funding following Ph.D. completion	337	2.91 (1.15)

Table 3.4 Lowest Scoring Educational Characteristics (in percentages)

	Completely agree	Agree	Completely agree + Agree combined[17]	Neutral	Disagree	Completely Disagree
During my Ph.D. trajectory, my educational programme provides me with relevant information about post-Ph.D. career opportunities.	5.4	25.8	31.2	26.0	32.9	9.8
During my Ph.D. trajectory, my supervisors provided me with excellent information about post-Ph.D. career opportunities.	2.1	18.6	20.7	32.8	33.9	12.6
I visited conferences with my supervisor(s), which improved my contacts with potential employers.	14.5	33.0	19.2	19.2	21.6	11.7
The institute where I undertook my Ph.D. research provided clear information regarding the labour market status of its doctoral graduates.	2.4	16.0	18.4	33.2	30.6	17.8
Thanks to good career counselling, I was able to orientate myself to the labour market possibilities for doctoral recipients.	2.0	12.5	14.4	32.6	34.6	18.4

3.3 Role of Courses in Labour Market Preparation

Ph.D. candidates can prepare for their entry into the labour market in various ways. In Chapter 2 we reviewed their scholarly output in addition to writing the Ph.D. thesis, output that will

enhance their curriculum vitae. In addition, Ph.D. candidates may add to their credentials through courses and training sessions. To what extent have they used these opportunities? 495 respondents answered the question about whether they had attended work-related training during the previous years. Only 45 per cent confirmed that they had. The majority of respondents who undertook work-related training pursued training in their occupational field (see Table 3.5; 67.6%). 47.4 per cent also attended general professional training. A much smaller percentage of respondents (16.6% and 24.2%, respectively), undertook management or supervisory training, and other work related training.

We then asked respondents to explain why they attended training sessions and 251 respondents answered this follow up question. Most respondents reported that they undertook training to gain further skills or knowledge in their occupational field (84.5%). Many respondents also undertook training to learn skills or knowledge needed for a recently acquired position (39.4%), to improve opportunities for promotion, advancement or a higher salary (31.1%) or because it was required or expected by the employer (28.7%). A smaller percentage of respondents attended courses or training for licensing or certification (19.1%) or to facilitate a change in occupation (16.7%).

Table 3.5 Number (Percentage) of Respondents Who Undertook Work-related Training, (n=253)[18]

Type of training	Number (Percentage)
Management or supervisory training	42 (16.6)
Training in your occupational field	171 (67.6)
General professional training (e.g. public speaking, business writing, word processing, spreadsheet use, etc.)	120 (47.4)
Other work-related training	39 (24.2)

3.4 Job Search Strategies

We asked Ph.D. recipients which strategies or information sources they used when they were actively searching for a job in their final year. Altogether, 488 respondents answered these questions, and 65 per cent of respondents were actively seeking employment in the final year of their Ph.D. trajectory. The following table shows which strategies or information sources the Ph.D. recipients used (see Table 3.6). Internet and existing contacts were the most important channels for information and employment search strategies. Nearly one-third of the respondents (31.6%) contacted the employer directly. Interestingly, universities, either a university career service or other university source, are virtually absent among the parties active in the search strategies of Ph.D. recipients.

Table 3.6 Strategies or information sources used in seeking employment (n=488)

Strategy/Source of Information	Number (percentage) of respondents
Advertisements on the internet	197 (40.4)
Work contacts/networks	178 (36.5)
Approached employer directly	154 (31.6)
Advertisements in newspaper or other print media	103 (21.1)
Career fairs or information session	71 (14.5)
Posted résumé on the internet	70 (14.3)
Family/friends	69 (14.1)
University career service	60 (12.3)
Other university source (e.g., faculty, lecturer)	59 (12.1)
Employment agency	32 (6.6)
Other	24 (4.9)

3.5 Conclusion

In this chapter, we have examined various features of the Ph.D. programme, supervision and labour market preparation of the Ph.D. recipients. Our most important conclusions are the following:

- Taking a closer look at the efficiency and timing of the educational trajectory, we note that less than 40 per cent of Ph.D. recipients knew at the end of the first year which research questions he or she would want to answer.
- Further down the road, only 52 per cent knew before starting their second year which data would be necessary to answer the research questions.
- Ph.D. trajectories score favourably with respect to offering opportunities to acquire research experience outside one's own subject as well as preparation for positions in academia and the private sector.
- The Ph.D. programme and trajectory score poorly with respect to promoting the study of a wide range of subjects within the curriculum in preparation for a broad spectrum of labour market opportunities.
- Many Ph.D. recipients believe that the supervisors provided useful advice regarding subject choice and encouraged them to publish internationally.
- Guidance provided by supervisors to Ph.D. candidates in studying the literature and their interest in timely completion of the Ph.D. trajectory scored poorly.
- 69 per cent of Ph.D. recipients believe that their supervisors provided good opportunities for establishing international contacts.
- Ph.D. candidates express the strongest agreement with statements indicating that they were expected by their university and supervisors to plan and prepare for their career after graduation on their own.

- The respondents disagree the most with statements indicating that supervisors and universities provide good information about future employment prospects and labour market preparation.
- The Internet and existing contacts were the most important channels for information and employment search strategies. Nearly one-third of the respondents (31.6%) contacted an employer directly.
- Interestingly, universities, a university career service or other university source, are virtually absent among the parties active in the employment search strategies of Ph.D. recipients.

Appendix 3.1: Ph.D. Recipients, the Quality of the Ph.D. trajectory and Labour Market Preparation

The table below lists responses to the 29 statements and these are listed by the combined percentages for completely agree and agree (column three). These combined scores are then listed in declining order. Statement 12 (My supervisor(s) encouraged me to publish in international, scientific journals during my Ph.D. trajectory) thus elicits the strongest agreement among respondents, while statement 14 (Thanks to good career counselling, I was able to orient myself to the labour market possibilities for Ph.D. recipients) elicits the least agreement.

Item number		Completely agree	Agree	Completely agree + Agree	Neutral	Disagree	Completely Disagree
12.	My supervisor(s) encouraged me to publish in international, scientific journals during my Ph.D. trajectory.	61.2	27.2	88.3	6.3	3.2	2.2
25.	After clarifying my research questions, I succeeded in determining which methods of data collection would be needed to gather the necessary data.	21.1	63.7	84.9	10.2	3.4	1.6
28.	I am highly likely to maintain professional contact with a number of my former Ph.D. colleagues.	33.9	47.8	81.8	11.9	5.1	1.3
29.	My supervisor(s) emphasized my independence.	34.7	45.4	80.0	15.7	3.0	1.2
2.	My Ph.D. supervisor(s) were of the opinion that the primary responsibility for finding a job after the Ph.D. defence lies with the Ph.D. candidate.	32.4	42.1	74.5	16.6	7.8	1.1
26.	My supervisor/s gave good advice on topic selection and refinement.	25.4	49.0	74.4	15.9	6.0	3.7
1.	My Ph.D. supervisor(s) provided good opportunities for establishing international contacts.	29.3	39.3	68.5	19.0	7.6	4.9
16.	I thought it was necessary to receive support from my educational programme, or Ph.D. supervisor(s) in finding a job after graduation.	20.7	42.9	63.6	20.7	13.0	2.7
20.	From the start of my Ph.D. trajectory, I had a clear idea of the theoretical and/or societal relevance of my research topic.	16.3	47.0	63.3	19.0	13.9	3.9
9.	During my Ph.D. trajectory, I gained extra research experience, including experience on research projects outside of my own thesis topic.	20.4	41.6	62.1	14.2	18.0	5.7
15.	I researched a very specific topic for my Ph.D., which decreased my labour market chances following graduation.	14.9	43.4	58.4	24.7	13.4	3.6
30.	My Ph.D. trajectory prepared me for jobs in both the academic and private sectors.	17.1	40.8	57.9	21.7	18.4	2.0
13.	Within my Ph.D. research, it was necessary for me to work with other Ph.D. candidates, both within and outside my graduate or research school.	19.9	34.1	54.0	18.4	20.5	7.1

Item number		Completely agree	Agree	Completely agree + Agree	Neutral	Disagree	Completely Disagree
19.	It was clear from the beginning that, if I wanted a position in academia, my supervisor(s) supported me in obtaining such a position.	16.3	36.5	52.8	24.8	14.9	7.5
5.	Prior to the start of the second year of my Ph.D. trajectory, I had a clear idea which data I would need to answer my research questions.	13.4	38.8	52.1	16.1	22.9	8.8
27.	I received excellent guidance in my search for relevant literature.	14.1	36.9	51.0	26.7	15.8	6.4
18.	I visited conferences with my supervisor(s), which improved my contacts with potential employers.	14.5	33.0	47.5	19.2	21.6	11.7
6.	I took part in numerous group projects during my Ph.D. trajectory.	13.6	33.2	46.8	18.3	28.3	6.7
17.	My supervisor(s) felt it was important for me to finish my thesis in a timely manner, particularly in relation to my job prospects following graduation.	9.1	35.1	44.2	27.6	20.9	7.2
24.	My supervisor(s) fully supported my efforts to obtain research funding to continue doing research in the Netherlands following my Ph.D. trajectory.	17.0	26.8	43.8	31.7	17.9	6.7
23.	My supervisor(s) fully supported my efforts to obtain research funding to do research abroad following my Ph.D. trajectory.	17.4	25.2	42.7	32.1	17.4	7.8
8.	My chances of finding a job were increased because my Ph.D. supervisor(s) allowed me to publish with him/her while I was a doctoral candidate.	14.3	27.4	41.7	27.7	20.3	10.3
10.	My supervisor(s) offered me a job after completion of my Ph.D.	19.6	20.8	40.4	10.2	24.3	25.1
3.	The breadth of the Ph.D. educational programme, in terms of subjects studied, was an excellent preparation for a broad scale of labour market possibilities.	6.8	32.6	39.3	35.7	19.5	5.5
22.	At the end of the first year of my Ph.D. trajectory, I knew precisely which research questions I wanted to answer.	8.9	30.3	39.2	19.5	32.8	8.6
21.	During my Ph.D. trajectory, study opportunities abroad prepared me for employment possibilities outside the Netherlands.	14.5	23.7	38.2	22.1	31.2	8.5
7.	During my Ph.D. trajectory, my educational programme provided me with relevant information about post-Ph.D. career opportunities.	5.4	25.8	31.2	26.0	32.9	9.8
11.	During my Ph.D. trajectory, my supervisors provided me with excellent information about post-Ph.D. career opportunities.	2.1	18.6	20.7	32.8	33.9	12.6
4.	The institute where I undertook my Ph.D. research provided clear information regarding the labour market status of its doctoral graduates.	2.4	16.0	18.4	33.2	30.6	17.8
14.	Thanks to good career counselling, I was able to orientate myself to the labour market possibilities for doctoral recipients.	2.0	12.5	14.4	32.6	34.6	18.4

Notes

[13] Three items have been recoded, so that the score for this question may in turn be scored from agree to disagree. This concerns items 7, 15 and 16.
[14] For the computation of subscales we used the following rules for dealing with missing data (computed in order of appearance):

- if all items are system missing: case deleted (n=112)
- if 'don't know' more than 50 per cent of the items: case deleted (n=30)
- if 'don't know' and system missing are more than 50 per cent of the items: case deleted (n=10)
- total sample size is now n=413 and is used to create subscales.

[15] Confirmative factor analysis in Mplus has been used to investigate the correlation between the items. These results are available from the authors upon request.
[16] The variation in sample size is due to missing values on separate items.
[17] In the column *Completely agree + Agree,* we have added the percentages of these two scores.
[18] n=161 for the question on 'other work-related training'.

4 THE LABOUR MARKET STATUS OF DUTCH DOCTORAL RECIPIENTS

In this chapter, we describe the initial labour market status of recent doctoral recipients in the Netherlands. We look at employment, unemployment, contract type, working hours, occupations and income. In that manner, we attempt to answer the following research question:

- What is the initial labour market position of recent doctoral recipients?

4.1 Employment following Graduation

The employment rate of Dutch doctoral recipients is relatively high; 86 per cent[6] of doctoral recipients surveyed are in employment at the moment of the defence (see Table 4.1).

Table 4.1 Employment Status and Ph.D. Status (n=478)

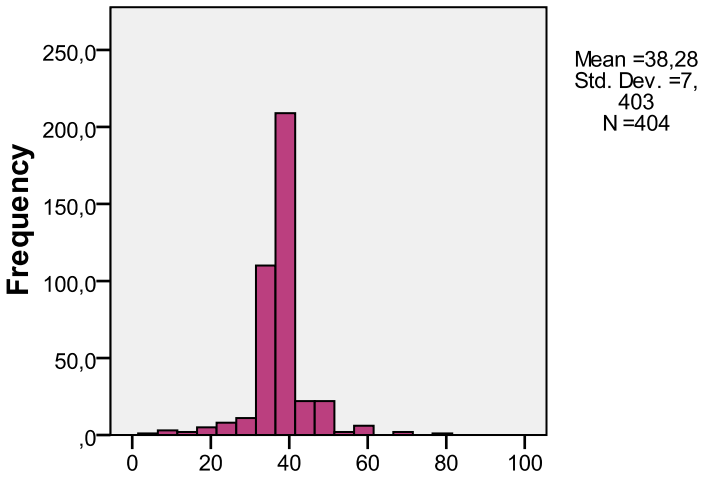
	Aio	Scholarship recipient	External Ph.D. candidate	Total
Working full-time, or have/had accepted a full-time job offer	220 (64.5)	16 (61.5)	73 (65.8)	309 (64.6)
Working full-time but seeking a different job	28 (8.2)	3 (11.5)	7 (6.3)	38 (7.9)
Working part-time but seeking full-time work	12 (3.5)	0 (0.0)	4 (3.6)	16 (3.3)
Working part-time but NOT seeking full-time work	24 (7.0)	0 (0.0)	13 (11.7)	37 (7.7)
Working full-time or part-time in more than one job	7 (2.1)	1 (3.8)	3 (2.7)	11 (2.3)
Not working but seeking full-time work only	22 (6.5)	2 (7.7)	1 (0.9)	25 (5.2)
Not working but seeking part-time work only	1 (0.3)	0 (0.0)	1 (0.9)	2 (0.4)
Not working but seeking any work (Full-time or part-time)	15 (4.4)	0 (0.0)	2 (1.8)	17 (3.6)
Not working and unavailable for study or paid work	4 (1.2)	0 (0.0)	0 (0.0)	4 (0.8)
Not working and unavailable for paid work	2 (0.6)	2 (7.7)	5 (4.5)	9 (1.9)
Don't know	6 (1.8)	2 (7.7)	2 (1.8)	10 (2.1)
Total	341 (100.0)	26 (100.0)	111 (100.0)	478 (100.0)

These results are similar to earlier data from Hulshof et al. (1996), which demonstrates that unemployment has remained unproblematic for most doctoral recipients.[7] Another nine per cent of respondents are not working, three per cent of respondents are not seeking a job and

[6] This percentage increases to 88 per cent if we exclude respondents who answered 'don't know' from the calculation.
[7] We do note, however, that one of the issues raised by Hulshof and colleagues (1996) was not concerned with unemployment directly following graduation, but rather with the labour market position of doctoral recipients some years following graduation. Whether or not doctoral recipients transition into stable employment in the long-term remains an important issue for further research.

two per cent responded ‘don’t know’. We discuss the reasons given for not working below. On average, recent doctoral recipients report having a contract for 38 hours a week, not taking into account possible over-time hours (see Figure 4.1). Again, these results are similar to the earlier study on Dutch doctoral recipients by Hulshof et al. (1996) where the majority of respondents also reported having a full-time job.

Figure 4.1 Expected Weekly Working Hours, Excluding Meals and Overtime Hours



The employment rate among Dutch doctoral recipients is much higher than in the Dutch working population; according to Statistics Netherlands, the employment rate for 2008 was 68 per cent for persons aged 15 to 64 (CBS, 2009). After accounting for educational level, our sample is three per cent higher than the employment rate for persons in the Dutch population with a higher educational level. Of all persons with at least a university education in the Netherlands, 83 per cent are currently employed (CBS, 2009).

4.1.1 Temporary versus Permanent Employment

While there is a high rate of employment among Dutch doctoral recipients, many graduates have a job that is in some way not permanent. 49 per cent of our respondents answered that they have a job that is not permanent. This rate of temporary employment represents an increase in temporary contracts under doctoral recipients. In 1996, two-thirds of doctoral recipients had a permanent contract (Hulshof et al., 1996), whereas this percentage has now decreased to 51 per cent. 92 per cent of respondents in a non-permanent job are working under a fixed contract. Within this category of respondents working on a temporary contract, 76 per cent of them are working at a university. Only 24 per cent of doctoral recipients working on a temporary contract are employed outside the university. However, the permanency of em-

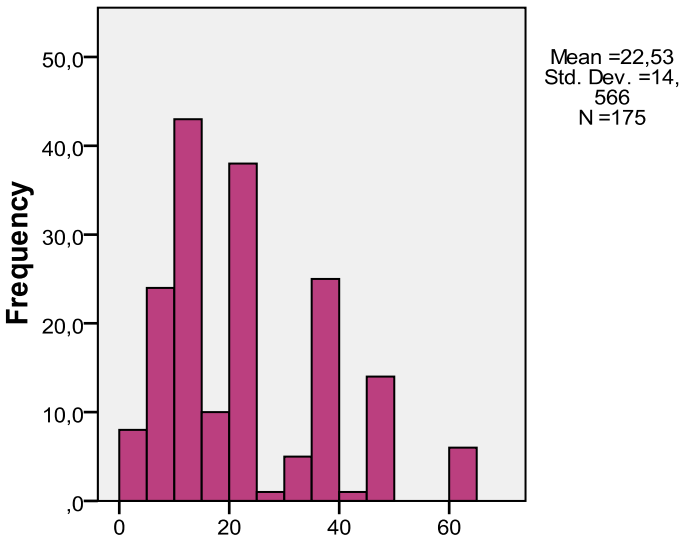
ployment is significantly related to the Ph.D. status of doctoral candidates.[19] 79 per cent of external candidates are employed under a permanent contract, whereas only 35 per cent of Ph.D. candidates with the status *aio* have a permanent contract following graduation (see Table 4.2).

Table 4.2 Number (Percentage) of Graduates with Permanent and Temporary Contracts, by Ph.D. Status (n=404)

	Permanent	In some way not permanent	Total
Aio	99 (34.5)	188 (65.5)	287 (100.0)
Scholarship recipient	11 (52.4)	10 (47.6)	21 (100.0)
External Ph.D. candidate	76 (79.2)	20 (20.8)	96 (100.0)
Total	186 (46.0)	218 (54.0)	404 (100.0)

The duration of fixed contracts varies greatly (see Figure 4.2). On average, doctoral recipients work on a fixed contract of two years. However, 40 per cent of doctoral recipients surveyed indicated they had a fixed contract for 12 months or less. Less than one third (30 per cent) of respondents had a contract for longer than two years. These results are in line with the study by Hulshof et al. (1996), which reported a similar rate of permanent contracts among external candidates (80%) and for *aios* this percentage was, on average 41 per cent (Hulshof et al., 1996).

Figure 4.2 Duration of Fixed Contract (in months)



4.1.2 Self-employment

Few respondents are self-employed following graduation; six per cent of the doctoral recipients surveyed reported being self-employed at the time of the defence.

4.1.3 Unemployment and Non-employment following Graduation

Most respondents were employed by the time of their defence; however 11.9 per cent of respondents were not employed by this time (9.2% unemployed but seeking employment + 2.7% unemployed but not seeking employment). When we look at the occurrence of unemployment across primary fields of study, we see that graduates in the Natural Sciences report a higher percentage of unemployment (14 per cent not working but seeking employment) and non-employment (3 per cent not working and not available or not seeking employment) than the average nine per cent of unemployed, respectively 3 per cent of non-employed among all graduates. Taking a closer look at the occurrence of unemployment in the Natural Sciences, we see that 25 per cent of come from the Biological Sciences. We return to this issue in chapter 7.

The following table (see Table 4.3) shows the various reasons given by respondents for not working (n=56; 1 respondent did not answer the follow-up question.) The table includes both respondents seeking employment (the unemployed) and respondents not seeking employment (the non-employed). As we can see from the table, the reason given most often (13 respondents; 32 per cent) is that no suitable job is available. Of the 43 respondents who are seeking work (the unemployed), 17 cannot find a suitable job, six respondents are starting later in the year and six report not wanting to work. The respondents who answered 'other' (23%) were most often still looking for a job, wanted to wait until the Ph.D. was fully finished or were planning on travelling for some period before looking for employment. We take a closer look at the job seekers in Chapter 7.

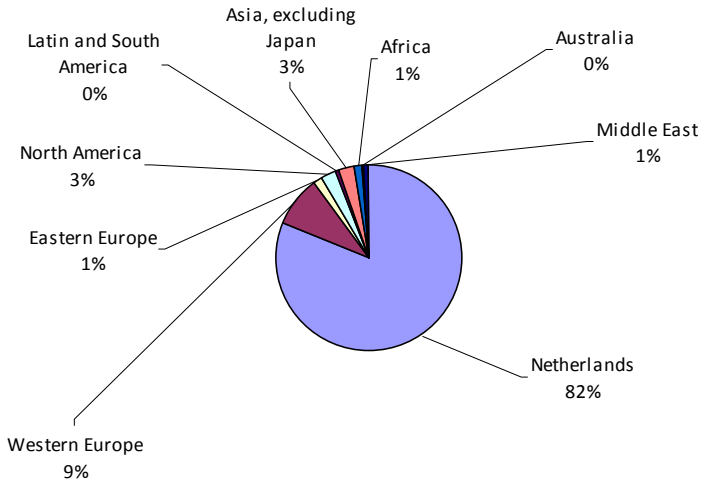
Table 4.3 Reasons for Not Working at the Moment of the Ph.D. Defence (n=56)

Reason	Number (Percentage)
Retired	3 (5.4)
Laid off from a job	2 (3.6)
Student	2 (3.6)
Family responsibilities	1 (1.8)
Chronic illness or permanent disability	1 (1.8)
Suitable job not available	18 (32.1)
Did not need or want to work	7 (12.5)
Starting a new job at later date	9 (16.1)
Other	13 (23.2)
Total	56 (100.0)

4.2 International Labour Market Mobility

A substantial number (19%) of doctoral recipients works outside the Netherlands following graduation (see Figure 4.3). The most popular employment destinations include Western Europe (nine per cent), with Germany, Belgium and the UK the most common choice, followed by North America and Asia (both three per cent).

Figure 4.3 Location of Employment following Graduation



4.3 Type of Employment and Occupation

Doctoral recipients in the Netherlands follow numerous career paths (see Table 4.4). 28 per cent of respondents indicated they were employed at a Dutch university following graduation. If we include Dutch university-affiliated medical centres, hospitals, and research institutes, this number rises however, to more than 50 per cent. Nearly 12 per cent of recent doctoral recipients are employed with a foreign university of a university-affiliated organisation abroad. In sum, 63 per cent of the respondents are employed within academia, either in the Netherlands or abroad. These results are similar to findings from Huslhof et al. (1996), who show that in 1996, roughly half of all doctoral recipients were employed at a university or research institute. The percentage of respondents working for the industry or business (for profit) sector has also remained relatively stable: 15 per cent in 2008-2009 versus 16 per cent in the period 1990-1995 (Hulshof et al., 1996). 7 per cent of respondents report working in the non-profit sector and 6 per cent work within government, either in the Netherlands or abroad.

It is interesting to note that of the six per cent of doctoral recipients who are self-employed (26 respondents), more than half (14 respondents) combine their self-employment with another job and therefore do not report self-employment as their main form of employment.

Table 4.4 Type of Employment (n=417)

Type of Employer	Number (percentage) of Respondents Employed in the Netherlands	Number (percentage) of Respondents Employed Abroad	Total Number (percentage) of Respondents
Dutch university	115 (27.6)	2 (0.5)	117 (28.1)
Dutch university-affiliated hospital or medical centre	66 (15.8)	1 (0.2)	67 (16.0)
Dutch Royal Academy-affiliated research institute	8 (1.9)	0 (0.0)	8 (1.9)
Dutch university-affiliated research institute	22 (5.3)	0 (0.0)	22 (5.3)
Foreign university	1 (0.2)	30 (7.2)	31 (7.4)
Foreign university-affiliated hospital or medical centre	0 (0.0)	1 (0.2)	1 (0.2)
Foreign royal academy-affiliated research institute	0 (0.0)	8 (1.9)	8 (1.9)
Foreign university-affiliated research institute	0 (0.0)	8 (1.9)	8 (1.9)
Foreign national government	0 (0.0)	4 (1.0)	4 (1.0)
Foreign local government	0 (0.0)	1 (0.2)	1 (0.2)
Dutch national government	17 (4.1)	0 (0.0)	17 (4.1)
Dutch local government	1 (0.2)	0 (0.0)	1 (0.2)
Not for profit organisation	22 (5.3)	7 (1.7)	29 (7.0)
Industry or business (for profit)	54 (12.9)	9 (2.2)	63 (15.1)
Self-employed	9 (2.2)	4 (1.0)	13 (3.1)
Other - Specify	6 (1.4)	0 (0.0)	6 (1.4)
Non-academic hospital	6 (1.4)	0 (0.0)	6 (1.4)
Non-academic research institute	11 (2.6)	4 (1.0)	15 (3.6)
Total	338 (81.1)	79 (18.9)	417 (100.0)

It is not surprising that almost all of the doctoral recipients surveyed are employed in professional occupations (see Appendix 4.2).[8] 97 per cent of our respondents indicated they worked

[8] The term 'professional' refers to both the skill-level and skill-specialisation required within an occupation, based on the International Standard Classification of Occupations used by the International Labor Organisation (ILO). This classification defines the group professional as including "occupations whose main tasks require a high level of professional knowledge and experience in the fields of physical and life sciences, or social sciences and humanities. The main tasks consist of increasing the existing stock of knowledge, applying scientific and artistic concepts and theories to the solution of problems, and teaching about the foregoing in a systematic manner. Most occupations in this major group re-

in some type of professional occupation (ISCO '88 1-digit), one-third of which are involved in higher education. Life science professionals make up 16 per cent of the respondents, followed by health professionals (12 per cent) and physicists, chemists and other related professions (12 per cent). Two per cent of respondents reported working in a technical or associate profession, and less than one per cent of doctoral recipients are employed in the occupation of Legislator, Senior Officials and Managers.

4.4 Academic Employment

As we have seen in the previous section, a large proportion of doctoral recipients from the Netherlands continue their career at a Dutch or foreign university, or otherwise university-affiliated hospital, medical centre or research institute. Nearly two-thirds of the respondents (65 per cent) reported having some teaching activities in their main job. No respondents outside of academia (including universities, university affiliated research centres or university medical centres) reported having teaching activities in their main job.

Academic employment is a well-trodden career path for many doctoral recipients and a career in academia almost certainly requires a doctoral degree (Van der Neut and De Jonge, 1993). Ph.D. graduates and postdoctoral researchers often prefer to continue their career in academia (Hoffius and Surachno, 2006; Keijzer and Gordijn, 2000). This preference has been attributed to a high level of job satisfaction, in particular due to flexible working times, intellectual stimulation and a high degree of independence in their job. However, both Ph.D. graduates and postdoctoral researchers are rather negative regarding career opportunities in academia, in part due to the initial period of employment consisting of numerous temporary contracts (Hoffius and Surachno, 2006).

These conclusions from Hoffius and Surachno (2006) and Keijzer and Gordijn (2000) are relevant to our findings here. The type of faculty rank held by recent doctoral recipients in academia varies (see Table 4.5). 39 per cent of doctoral recipients who stay on in academia are employed in a postdoctoral position. Hoffius and Surachno (2006) finds that not all doctoral recipients who obtain a postdoctoral position after graduation go on to obtain a more permanent position at a university. Other authors point out that increased career preparation, in the form of pedagogical training, management training, or training on obtaining external funding for career development, is often missing from the Ph.D. and postdoctoral trajectory, leaving some young researchers ill-prepared for an academic career (Keijzer and Gordijn, 2000).

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quire skills at the fourth ISCO skill level. This major group has been divided into four sub-major groups, 18 minor groups and 55 unit groups, reflecting differences in tasks associated with different fields of knowledge and specialisation" (ILO, 2009: http://www.ilo.org/public/english/bureau/stat/isco/isco88/publ4.htm).

Table 4.5 Type of Academic Position Held by those Employed in Academia (n=261)

Academic position	Number (percentage) of respondents
Research faculty, scientist, associate or fellow	58 (22.2)
Teaching faculty	33 (12.6)
Management	8 (3.1)
Post-doc (e.g., postdoctoral fellow or associate)	102 (39.1)
Research assistant	6 (2.3)
Teaching assistant	10 (3.8)
Other	22 (8.4)
Medical profession	22 (8.4)
Total	261 (100.0)

Looking at our sample, a total of 17 per cent of recent doctoral recipients are immediately employed in some form of professor position following graduation (14 per cent as assistant professor, two per cent as associate professor and one per cent as professor). 12 per cent of respondents who did not list a faculty rank (faculty rank not applicable, don't know or 'other') report an academic position of research faculty or scientist. A further eight per cent of respondents who did not list a faculty rank are employed in a medical profession within academia.

4.4.1 Work Activities

We also asked respondents about the main activities performed at work. Table 4.6 shows the primary work activities reported by respondents in employment. The majority of doctoral recipients (53%) are primarily concerned with applied research in their current job. A smaller percentage of respondents are primarily concerned with development activities (8%) or professional services (8%). Another 10 per cent of respondents report that teaching is the activity they spend the most time on.

4.4.2 Teaching Activities

Looking more closely at teaching activities, it is interesting to note that of the five respondents who reported having an associate professorship, all five report having teaching responsibilities for at least 25 per cent of the time. Of the 36 assistant professors, only two report having no teaching activities. The remaining 34 assistant professors all report having teaching activities, and the majority of them (72 per cent) report teaching takes up at least 25 per cent of their time. Lastly, 50 per cent of respondents who report working as postdoctoral researchers also report having teaching activities. However, their reported teaching load is lower than that of associate and assistant professors; of the 53 postdoctoral researchers with teaching activities, 47 of them (89 per cent) report having less than 25 per cent teaching loads.

Table 4.6 Primary Activities Performed at Work (n=174)

Activity	Number (percentage) of respondents
Basic research - study directed toward gaining scientific knowledge primarily, for its own sake	9 (5.2)
Applied research - study directed toward gaining scientific knowledge to meet a recognized need	93 (53.4)
Basic as well as applied research	13 (7.5)
Development - using knowledge gained from research for the production of materials, devices	13 (7.5)
Design of equipment, processes, structures, models	3 (1.7)
Computer applications, programmeming, systems development	1 (.6)
Employee relations - including recruiting, personnel development, internal training	1 (.6)
Managing or supervising people or projects	2 (1.1)
Production, operations, maintenance (e.g. chip production, operating lab equipment)	2 (1.1)
Professional services (e.g. health care, counselling, financial services, legal services)	13 (7.5)
Sales, purchasing, marketing, customer service, public relations	1 (.6)
Quality or productivity management	1 (.6)
Teaching	18 (10.3)
Other	4 (2.3)
Total	174 (100.0)

4.5 From Ph.D. to Employment

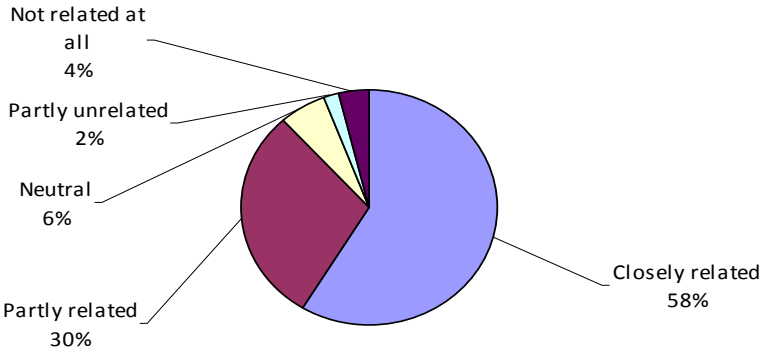
One issue confronting doctoral recipients is whether to continue in a field similar to their Ph.D. According to our survey, 88 per cent of all doctoral recipients in the Netherlands now perform work that is (in someway) related to their Ph.D. degree (see Figure 4.4). Two per cent of respondents indicate that their current work is only partly related to their Ph.D. degree and only four per cent of respondents feel that their work is in no way related to their obtained degree.

We asked those respondents who felt their work was in some way not related to their Ph.D. degree which factors influenced their decision to work outside their Ph.D. field. This is a small category of individuals, so we are cautious when considering the greater representativeness of the following reasons: a change in career/professional interests (6 respondents; 25 per cent); a job in doctoral research field not available (5 respondents; 21 per cent); working conditions (2 respondents; 8 per cent); pay, promotion opportunities (1 respondent; 4 per cent); family-related reasons (1 respondent; 4 percent).

The remaining 38 per cent of respondents working in a field not related to their Ph.D. research cite other, varied reasons for not working in a field linked to their doctoral research. Few re-

spondents provided further explanation of their answer of 'other', however, a few examples include 'no future in my Ph.D. topic', 'continuation of study', and 'already worked in that field'.

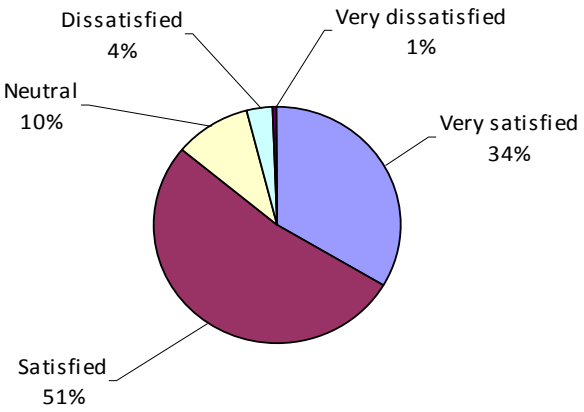
Figure 4.4 Relation of current employment to Ph.D. degree



4.5.1 Job Satisfaction

We not only asked doctoral recipients about the connection between their Ph.D. field and current employment, we also inquired about their satisfaction with their principal job (see Figure 4.5). 34 per cent of graduates are very satisfied with their current employment; 52 per cent are satisfied. Only 4 per cent of respondents report being dissatisfied with their job and less than 1 per cent are very dissatisfied. The remaining 10 per cent of respondents were neutral about their job satisfaction. Most doctoral recipients are also optimistic about staying with their current employer. When asked whether they still expect to be employed in this position six months after the Ph.D. defence, 84 per cent of respondents answered in the affirmative.

Figure 4.5 Job Satisfaction



4.5.2 Income

On average, Dutch doctoral recipients earn 2239 Euros a month, after taxes. As Figure 4.6 shows, most salaries are distributed around the 2000 euro mark. While there are some initial income differences between male and female doctoral recipients (2470 Euros net monthly income versus 1962 Euros net monthly income) once we account for differences in age, working hours and Ph.D. status for men and women, this gender wage gap disappears (see Figure 4.7). On average, *aios* earn 2310 Euros each month. For scholarship recipients, income is lower: 1131 Euros a month. External candidates report an average monthly income of 2247 Euros. The most important determinants of income in our sample are age and working hours.[20]

Figure 4.6 Net Monthly Income

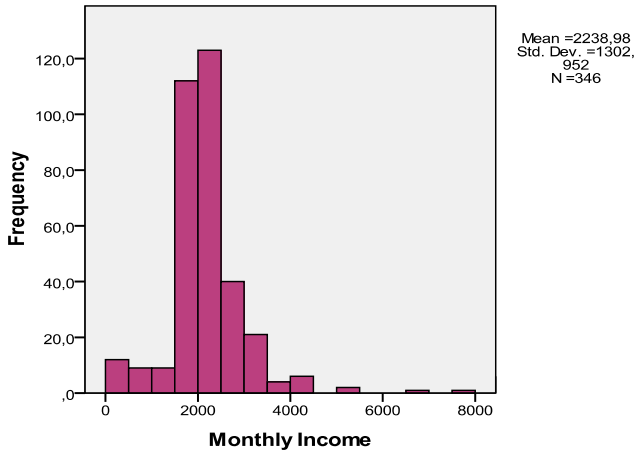
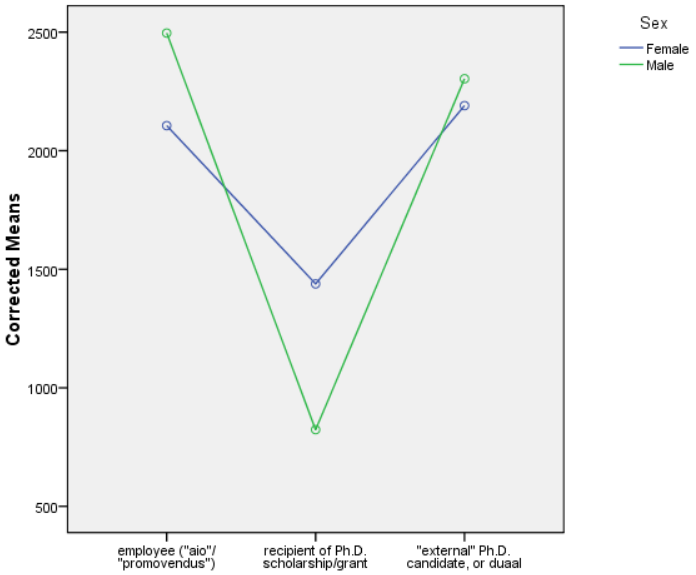


Figure 4.7 Net Monthly Income based on Gender and Ph.D. Status (after correcting for age, working hours and Ph.D. status)



4.6 Conclusion

In this chapter, we have taken a first look at the labour market outcomes of recent doctoral recipients. The most important conclusions of this chapter include:

- Doctoral recipients have an above-average employment rate: 86 per cent of all recent graduates are employed.
- 63 per cent of the respondents are employed within academia, either in the Netherlands or abroad.
- Nearly half (49%) of all graduates are employed under a temporary contract; this reflects an increase in temporary contracts during the past 15 years (Hulshof et al., 1996).
- Nearly all (97%) doctoral recipients are employed in a professional occupation; 51% of them are employed at a Dutch university or research centre.
- Most doctoral recipients are satisfied with their employment: 86 per cent report being either satisfied or very satisfied with their current job.

In the coming chapters, we investigate the employment outcomes discussed in this chapter further, looking at the relationship between various academic achievements and expectations and the employment outcomes discussed above.

Appendix 4.1 Employment based on ISCO '88 1- and 2-digit Occupations

Occupation	Number (Percentage) of respondents
Legislators, Senior Officials and Managers	3 (0.7)
Physicists, chemists and related professionals	47 (11.5)
Mathematicians, statisticians and related professionals	13 (3.2)
Computing professionals	16 (3.9)
Architects, engineers and related professionals	25 (6.1)
Life science professionals	65 (15.9)
Health professionals (except nursing)	50 (12.3)
Nursing and midwifery professionals	3 (0.7)
College, university and higher education teaching and/or research professionals	134 (32.8)
Special education teaching professionals	2 (0.5)
Other teaching professionals	2 (0.5)
Business professionals	10 (2.5)
Legal professionals	2 (0.5)
Archivists, librarians and related information professionals	1 (0.2)
Social science and related professionals	21 (5.1)
Writers and creative or performing artists	4 (1.0)
Technicians and associate professionals	9 (2.2)
Elementary occupations	1 (0.2)
Total	408 (100.0)

Notes

[19] Chi-square=58.144; 2DF; p<.001; n=404.
[20] The analyses are not included here for space reasons; the results of these analyses can be obtained from the authors.

5 BRAIN DRAIN/BRAIN GAIN AND OTHER INTERNATIONAL ASPECTS OF PURSUING A Ph.D. IN THE NETHERLANDS

Pursuing a Ph.D. degree is becoming an increasingly international experience. Progressively more individuals come to the Netherlands to pursue a Ph.D., and individuals completing a Ph.D. in the Netherlands no longer necessarily remain in the Netherlands following the awarding of their degree. In this chapter, we take a closer look at internationalisation. We start by reviewing the position of international Ph.D. candidates among Ph.D. recipients in the Netherlands. We address their backgrounds:

- Which countries are they from?
- What was their disciplinary background?
- Did they have experience with research before they started their Ph.D. project?
- What are their employment goals following graduation?

The answer to this last question figures in the broader context of the 'brain drain' or 'brain gain' question. 'Brain drain' refers to respondents receiving their doctoral degree in the Netherlands and then leaving the country. In contrast, 'brain gain' means that the Netherlands manages to attract international Ph.D. candidates who stay on afterwards and thus enhance the Dutch knowledge economy.

5.1 Number of International Ph.D. Candidates

123 international Ph.D. candidates (Ph.D. candidates without Dutch citizenship) responded to the question about their nationality. They account for 27.8 per cent of respondents (123 out of 442 respondents).

5.2 Countries of Origin

To remind our readers where international Ph.D. candidates come from, we repeat an observation mentioned earlier in this report. Two-thirds of the Ph.D. recipients surveyed were born in the Netherlands (67%; see Figure 1.4). Ph.D. recipients born in other countries are most likely to come from elsewhere in Western Europe, Asia or Eastern Europe. Less than five percent of the Ph.D. recipients surveyed comes from North America, Latin and South America or Africa. The share of Dutch Ph.D. recipients with Dutch citizenship is slightly higher (72.3%), as some graduates were born outside the Netherlands but either have or have obtained Dutch citizenship.

5.3 Scholarly Background of International Ph.D. Candidates (discipline of most recent degree)

We start here by looking at the distribution of international Ph.D. candidates and Dutch Ph.D. candidates in relation to the previous field of study before starting doctoral training. Out of the total of 442 Ph.D. candidates answering the question regarding the discipline of their most recent degree, 123 (27.8%) were international Ph.D. candidates and 319 (72.2%) were Dutch citizens. With respect to these overall data, international Ph.D. candidates are more heavily represented in the Natural Sciences (32.4%), Engineering (43.8%) and Agricultural Sciences (48.4%). International Ph.D. candidates account for a smaller proportion in the Humanities (20.8%), Social Sciences (19.1%) and Medical and Health Sciences (8.5%).

5.4 Doctoral Field of Study for International Ph.D. Candidates

Understandably, the pattern described above also applies to the discipline in which candidates pursue their Ph.D. Once again, 123 of the 442 Ph.D. candidates who responded to this question were international Ph.D. candidates (27.8%) and 319 (72.2%) were Dutch Ph.D. candidates. During the doctoral trajectory, international Ph.D. candidates are more heavily represented in the Agricultural Sciences (45.2%), Engineering (40.8%) and the Natural Sciences (35.1%). These disciplines are followed by the Humanities (25.0%), Social Sciences (20.5%) and Medical and Health Sciences (11.6%).

5.5 International Ph.D. Candidates and Preparation for Ph.D. Research

We asked Ph.D. recipients whether they had worked as researchers prior to starting their Ph.D. research. Among the 73 international Ph.D. candidates answering this question, 49 reported that they had previously worked as researchers (67.1%). In comparison, 48.1 per cent of Dutch Ph.D. candidates had obtained previous research experience.

If we consider the reasons why international Ph.D. candidates come to the Netherlands, then the data demonstrate that the academic reputation of the institute or supervisor is the primary incentive for international Ph.D. candidates to come to the Netherlands (see Table 5.1). According to our data, the quality of the Ph.D. programme is not decisive for international candidates.

Table 5.1 Why Do International Ph.D. Candidates Come to the Netherlands? (n=94)

	Number (Percentage)
Educational opportunities in the Netherlands	8 (8.5)
Job or economic opportunities	11 (11.7)
Scientific or professional infrastructure in my field	19 (20.2)
Scientific reputation of institute/supervisor	48 (51.1)
Other	8 (8.5)
Total	94 (100.0)

5.6 Ph.D. Status of International Ph.D. Candidates

If we consider differences in the Ph.D. status of international and Dutch Ph.D. candidates, then we see that international Ph.D. candidates are more heavily represented than Dutch Ph.D. candidates in the category 'scholarship recipient'. Whereas international Ph.D. candidates make up 27.8 per cent of the total number of respondents to the question about Ph.D. status, they account for 64.0 per cent of the number of Ph.D. candidates receiving a scholarship or grant (n=25). Overall, however, the total number of Ph.D. candidates receiving grants is small (25 of 442 respondents). If we restrict ourselves to looking at just international Ph.D. candidates, the data demonstrate that international respondents with *aio* status are a clear majority (65.9%) compared to the external Ph.D. candidates (21.1%) and scholarship recipients (13%).

5.7 International Ph.D. recipients and the Labour Market

The total group of job seekers (44) includes 16 international Ph.D. candidates (36.4%), whereas international Ph.D. candidates account for 27.3 per cent of the total number of respondents who answered the question about labour market status. Yet while the data suggest that international Ph.D. recipients are overrepresented in the job seekers category, this finding is not significant. The total proportion of international Ph.D. recipients seeking jobs in relation to the total number of international Ph.D. recipients is small (13.4%); the corresponding proportion of Dutch Ph.D. recipients seeking jobs in relation to the total number of Dutch Ph.D. recipients is 8.2 per cent.

5.8 Country of Employment Following Ph.D. Completion

Internationalisation is always an important theme in discussions about the Ph.D. system, both in the Netherlands and abroad. Do Ph.D. candidates have close ties with international academia, does the Netherlands attract international Ph.D. candidates, and how many Ph.D. candidates move abroad after completing their Ph.D.? These are common questions in regards to internationalisation. In Chapter 2, we showed that Ph.D. candidates completing their Ph.D.s in the Netherlands are featured extensively in international publications and at international con-

ferences. In preparing to enter the labour market, however, the data show that they are not very active internationally in terms of research and study visits abroad. In this section we examine to what extent Ph.D. recipients intend to continue living in the Netherlands after completing their Ph.D. 77 per cent of all respondents intend to remain in the Netherlands after completing their Ph.D. (see Table 5.2). Western Europe and North America ranked next, with 8.9 and 6.0 percent, respectively.

Table 5.2 Intend to Live in the Netherlands or another Country

	Number (Percentage)
Netherlands	284 (77.0)
Western countries	55 (14.9)
Eastern Europe	4 (1.1)
Other	26 (7.0)
Total	369 (100.0)

5.9 Brain Drain and Brain Gain

National governments sometimes express concern about investments in doctoral education due to brain drain—where Ph.D. recipients leave the country following completion of their Ph.D. This is partly an economic concern but is also motivated by the fear that the country of Ph.D. completion is not considered to be sufficiently attractive academically to entice Ph.D. recipients to stay and work there.

At first glance in the Netherlands, the loss due to brain drain might appear considerable. Among the total of 441 respondents answering the question, 88 (20%) stated that they did not intend to remain in the Netherlands after obtaining their Ph.D. degree. Sixty-nine Ph.D. recipients (15.6%) indicated that they were not yet able to answer this question. However, we need to consider this issue separately for Ph.D. candidates from the Netherlands as well as for Ph.D. candidates.

35 of the 318 Dutch Ph.D. candidates (11%) indicate they will move to another country, 45 (14.2%) indicate they are still undecided, and the overwhelming majority hopes to remain in the Netherlands (238; 74.8%). Of the 123 international Ph.D. candidates, 46 (37.4%) indicate they want to remain in the Netherlands, 25 (19.5%) are undecided, and 53 (43.1%) want to leave the Netherlands.

We can interpret the above data in terms of ‘brain drain’ (completing the Ph.D. in the Netherlands but moving to another country afterwards) and ‘brain gain’ (coming to the Netherlands for the Ph.D. and remaining in the Netherlands afterwards). A higher rate of ‘brain drain’ in

comparison to ‘brain gain’ would result in a loss of knowledge. ‘Brain gain’, entailing the arrival of international Ph.D. candidates at the start of the Ph.D. trajectory, could be countered by a possible ‘brain drain’ of international Ph.D. recipients departing following completion of their Ph.D. Every international Ph.D. candidate who came here to pursue a Ph.D. and stays afterwards contributes to ‘brain gain’. Every Dutch Ph.D. recipient who leaves after completing a Ph.D. contributes to ‘brain drain’. The question is whether the group of international Ph.D. candidates coming here and remaining following Ph.D. completion is larger than the group of departing Dutch Ph.D. recipients. We answer this question below, based on data presented in Table 5.3.

There are 123 international Ph.D. candidates (non-Dutch citizens) at the end of the Ph.D. trajectory. Seventeen of them already lived in the Netherlands prior to starting the Ph.D., and 106 respondents came to the Netherlands either for the purpose of pursuing a Ph.D. (91) or for other reasons (15). Accordingly, there was a ‘brain gain’ at the start of the Ph.D. trajectory of 106 people.

Table 5.3 Intention to Stay in the Netherlands Following Ph.D. Completion

		Yes	No	Don't know	Total
No Dutch passport	Number (Percentage)	46 (37.4)	53 (43.1)	24 (19.5)	123 (100.0)
Dutch passport	Number (Percentage)	238 (74.8)	35 (11.0)	45 (14.2)	318 (100.0)
Total	Number (Percentage)	284 (64.4)	88 (20.0)	69 (15.6)	441 (100.0)

At the end of the Ph.D. trajectory, forty-six international Ph.D. candidates intended to leave the Netherlands; twenty-four were still undecided. Looking at the row of ‘No Dutch passport’ in Table 5.3, we see that the ‘brain gain’ thus dwindles following Ph.D. completion from 106 of the 123 international Ph.D. candidates who came to the Netherlands to pursue a doctoral degree to 46 people (37% of 123, see Table 5.3). On the other hand, some Dutch citizens intend to leave the Netherlands after completing their Ph.D.: a total of 35 Ph.D. candidates, or 11 per cent of all Dutch Ph.D. candidates.

Moreover, this table can be interpreted in two different ways: looking at absolute or relative numbers. In the first case (absolute numbers) this means that the absolute number of international Ph.D. candidates remaining here (46) exceeds the number of Dutch citizens leaving the Netherlands (35). In absolute numbers, the ultimate ‘brain gain’ equals 11 out of a total of 441 respondents, which is a 2.5 per cent gain.

The relative gain, however, is still greater, since Dutch Ph.D. candidates outnumber international Ph.D. candidates in relative terms.[21] If the number of international Ph.D. candidates equalled that of Dutch Ph.D. candidates, with 11 per cent of Dutch candidates leaving, and 37 per cent of international Ph.D. candidates staying, the relative gain would be 26 per cent. In sum, contrary to what is occasionally feared, the difference between 'brain drain' and 'brain gain' reveals a positive balance for 'brain gain' at the time of the survey, in both absolute and relative terms.

Nonetheless, this conclusion merits one important reservation: a total of 69 Ph.D. candidates remain undecided about what they will do following graduation. In the worst case, if all undecided Ph.D. candidates were to leave, this would result in an absolute 'brain drain' of 34 Ph.D. candidates.[22] In relative terms a 'brain gain' of 12 per cent would remain.[23] In the best case, if all undecided Ph.D. candidates decide to remain in the Netherlands, this will result in an absolute 'brain gain' of 35 persons.[24] The relative 'brain gain' in this case would be 46 per cent.[25] Naturally, every scenario in between these two extremes is possible as well.

Finally, by the time Ph.D. candidates submit their Ph.D. thesis to the doctoral defence committee, a substantial share of the Ph.D. candidates remains undecided as to their future country of residence. The answer to the question as to whether there is a 'brain drain' or a 'brain gain' depends largely on what this undecided group ultimately does. In relative terms, every scenario yields a 'brain gain'. A true 'brain gain', however, will obviously materialize if international Ph.D. candidates who remain outnumber Dutch Ph.D. candidates who leave. And it is this absolute increase that may be greatly influenced at the final stage of the Ph.D. trajectory: The period following the submission of the Ph.D. thesis to the doctoral defence committee. Taking into account the possible return of some departing Dutch Ph.D. recipients to the Netherlands following a temporary period of employment abroad (e.g. in connection with a temporary post-doc position) further complicates matters. Additional research is needed to improve our understanding of brain drain and brain gain over the long term.

5.10 Who leaves the Netherlands?

When considering brain drain, we are interested in who leaves the Netherlands. Are they the Ph.D. recipients whose marks were higher than average in pursuing their Ph.D. and were more likely to graduate cum laude? Are they mainly Ph.D. candidates who have published more international, scientific articles by the end of their Ph.D. trajectory? Do those who leave take less time to complete their Ph.D. research? Are those who leave more experienced researchers prior to starting their Ph.D. research? In other words, are those Ph.D. candidates who leave mainly academically superior Ph.D. recipients?

We performed a comparative review of Dutch Ph.D. candidates who stayed and those who left and registered no statistically significant differences with respect to graduating with honours (cum laude) in the degree obtained prior to the Ph.D., average marks attained prior to the Ph.D. programme, research experience obtained prior to starting the Ph.D. project, duration of the Ph.D. trajectory and articles published.[26] The same holds true for international Ph.D. candidates, with one exception. International Ph.D. candidates who leave outperform international Ph.D. candidates who stay with respect to articles published in international, scientific journals (averaging 4.3 articles versus 3 articles).

Those intending to leave the Netherlands after completing their Ph.D., do so primarily for economic and career opportunities. Only 13.6 per cent of candidates leaving intend to leave for academic reasons (see Table 5.4).

Table 5.4 Reasons for Leaving the Netherlands Following Ph.D. Completion

	Number (percentage)
Family-related reasons	10 (11.4)
Educational opportunities elsewhere	4 (4.5)
Job or economic opportunities elsewhere	35 (39.8)
Sent by employer	11 (12.5)
Scientific or professional infrastructure in my field	12 (13.6)
Political factors	3 (3.4)
Other	13 (14.8)
Total	88 (100.0)

5.11 Conclusions

In this chapter we have taken a closer look at internationalisation, reviewing the position of international Ph.D. candidates in comparison to Dutch Ph.D. candidates. We conclude this chapter by presenting some of the most interesting results:

- 123 international Ph.D. candidates (Ph.D. candidates without Dutch citizenship) responded to the question about their nationality. They account for 27.8 per cent of respondents (123 out of 442).
- International Ph.D. candidates are more heavily represented in the Natural Sciences (32.4%), Engineering (43.8%) and Agricultural Sciences (48.4%).
- 73 international Ph.D. candidates (67.1%) had research experience prior to starting the Ph.D. The corresponding percentage for Dutch citizens was 48.1 per cent.

- Among the responses from those indicating that they knew the country where they intended to reside following the defence of the Ph.D. thesis, the Netherlands scored the highest (77.0%). Western Europe and North America ranked next, with 8.9 and 6.0 per cent, respectively.

- Of the 318 Dutch Ph.D. candidates, 35 (11%) indicated they will move to another country, 45 (14.2%) indicate they are still undecided, and the overwhelming majority hopes to remain in the Netherlands (238; 74.8%).

- Of the 123 international Ph.D. candidates, 46 (37.4%) indicate they wish to remain in the Netherlands, 25 (19.5%) are undecided, and 53 (43.1%) want to leave the Netherlands.

- The difference between ‘brain drain’ (completing the Ph.D. in the Netherlands but leaving afterwards for another country) and ‘brain gain’ (coming to the Netherlands for the Ph.D. and staying here afterwards) reveals a positive balance for ‘brain gain’ at the time of the survey (2.5% gain). Nonetheless, we are aware that a total of 69 Ph.D. candidates remain undecided about what they will do following graduation, which could affect these results.

Notes

[21] Looking across the rows in Table 5.3, the ratio of Dutch citizens who intend to stay in comparison to those who want to leave is 74 per cent versus 11 per cent. In contrast, the ratio of international candidates who want to stay equals 37 per cent versus 43 per cent of those who want to leave.

[22] 35 international Ph.D. candidates + 45 Dutch Ph.D. candidates leaving the Netherlands minus 46 international Ph.D. candidates remaining in the Netherlands.

[23] 43% + 20% of the international Ph.D. candidates departs, and 37% remains, while 11% + 14% of the Dutch citizens leaves and 75% stays. 37% - 25% =12% 'brain gain'.

[24] 46 + 24 non-Dutch citizens who stay, minus 35 Dutch persons who stay.

[25] 43% of international Ph.D. candidates leave, and 37% + 20% stays; 11% of the Dutch citizens leave, and 75% + 14% stay (89%), yielding 57% - 11% =46% 'brain gain'.

[26] A table depicting these results is not included for space reasons. The results are available from the authors.

6 PREDICTING THE INITIAL EMPLOYMENT OUTCOMES OF RECENT DOCTORAL RECIPIENTS

In this chapter, we investigate which factors are related to the initial labour market outcomes of doctoral recipients. The labour market position of unemployed graduates is not considered here; for an analysis of the job seekers see Chapter 7. We are therefore concerned with the following research question:

- How can we explain the initial labour market position of recent doctoral recipients in the Netherlands?

There are two ways of approaching the issue of the initial employment outcomes of doctoral recipients. On the one hand, we are interested in whether doctoral recipients go on to academia or to employment in the private sector. On the other hand, we want to know whether graduates are employed in temporary or permanent employment. There is a significant relationship between these two aspects of employment (see Table 6.1).[27] The most obvious relationship can be found between university employment and temporary contracts. Looking at Table 6.1, we see that 65 per cent of respondents who are employed within a university setting do not have a permanent contract, against 34 per cent of respondents who are employed in a non-university setting with a non-permanent contract.

In this chapter, however, we start by looking at academic versus non-academic employment separately. Following, we investigate the probability of having a permanent or temporary contract, broken down into academic and non-academic employment. Each of the two sections consists of three analytical steps: 1) considering the influence of individual background characteristics; 2) considering the influence of previous research experience, academic performance, entrepreneurship and Ph.D. status; and 3) considering the influence of Ph.D. supervision, labour market preparation and the quality of the educational trajectory (see Chapter 3 for an explanation of sub-scales used in this chapter to measure these concepts).

Table 6.1: Number (Percentage) of Doctoral Candidates in Academic vs. Non-academic Employment and Permanent vs. Temporary Employment (n=386)

Contract type	University employer	Non-university employer	Total
Permanent	89 (34.6)	85 (65.9)	174 (45.1)
In some way not permanent	168 (65.4)	44 (34.1)	212 (54.9)
Total	257 (100)	129 (100)	386 (100)

At this stage in the chapter, we provide an important note to the readers of this report: in this chapter, we investigate complex relationships in regards to the initial employment outcomes of recent doctoral recipients in the Netherlands. To do this well, complex statistical analyses are needed. We realise, however, that not all readers are interested in the technical details of these analyses. However, it is important to include these details to substantiate our results and allow for empirical replication.

In all of the analyses, we start by considering our empirical model. Afterwards, we provide a rather technical specification of the model and the results, which is intended to inform the more statistical readers of this report. However, for the non-statistically minded readers, we also provide a non-technical interpretation of our results in a conclusion at the end of each section. In other words, a reader can skip over the technical details of these statistical analyses without missing any important conclusions. Most of these technical details will be presented in a slightly different font, to help readers differentiate between the purely technical aspects of this chapter and the more substantive conclusions we are discussing. For a full explanation of the analyses carried out here, including the measurement of the variables used in each model, see the Appendix at the end of this chapter.

A final note regarding the tables included in this chapter: We report the results of our analyses in odds ratios, testing whether the odds ratio differs from one, not zero. In other words, the null hypothesis is that the predictors we are investigating will not differ from one, or in statistical terms: $OR_b=1$. We only report the odds ratios and the significance of these odds ratios for space reasons.[9] A simple way to interpret the findings in the tables is, for example, if we compare men and women and the probability of having a permanent contract, an odds ratio of 1 would mean there are no differences between men and women for the probability of having a permanent contract, whereas an odds ratio of three would mean that men are three times more likely than women to have a permanent contract. Odds ratios of less than one, for example, an odds ratio of 0.3 would mean that women are 1/0.3 times more likely to have a permanent contract than men. Statistical significance is reported as follows: *=p-value<.10; **=p-value<.05; ***=p-value<.01.

6.1 Academic versus Non-academic Employment

6.1.1 Introduction

In this section, we look at the most important predictors of academic versus non-academic employment. As the reader will recall, 66.3 per cent of all respondents reported being employed with a university, university medical centre or (academic or non-academic) research institute (see Chapter 4). But what individual characteristics of the Ph.D. trajectory determine

[9] The full results, including standard errors and p-values can be obtained from the authors upon request.

whether an individual works in academia or outside academia? The results of these analyses are presented below. Readers not interested in the technical details can proceed to the conclusion of this section.

6.1.2 Technical details

We estimated the probability of being in non-academic employment (academic employment is the reference category) based first on a combination of demographic factors (marital status, children in the household, living in the Netherlands, citizenship, gender and age), followed by previous research experience, Ph.D. status and individual performance during the Ph.D. trajectory (articles submitted, articles accepted, publication expectations, starting a business [entrepreneurship]) and lastly based on scales measuring labour market preparation, supervision and the educational trajectory. See the Appendix for a detailed discussion of these variables.

6.1.2.1 Background Characteristics

Taking a closer look at table 6.2, we see that only gender has a significant effect on the probability of working outside academia. Male doctoral recipients are one and a half times more likely than female doctoral recipients to be employed outside academia following graduation. None of the remaining variables has a significant effect on the probability of working in a non-academic position.

Table 6.2 Probability of Non-academic Employment (n=415)

	OR (odds ratio)
Marital Status	0.902
Presence of children in the household	1.374
Living in the Netherlands	1.200
Citizenship	0.904
Gender	1.549*
Age	1.005

6.1.2.2 Previous Research Experience and Individual Performance

The estimates presented in Table 6.3 reveal that Ph.D. status and entrepreneurship have a small but significant effect in predicting non-academic employment. External Ph.D. candidates are one and a half times more likely than *aios* to be employed outside academia. Not surprisingly, those respondents who started their own business are seven times more likely to be employed outside academia in comparison to respondents who did not start their own business. The remaining variables are not significant predictors of employment outside of academia.

Table 6.3 Probability of non-academic employment (n=435)

	OR (odds ratio)
Previous research experience	0.975
Ph.D. Status	1.591*
Articles submitted	0.973
Articles accepted	1.005
Individual publication expectations	0.941
Supervisor publication expectations	0.946
Institute publication expectations	0.921
Entrepreneurship	7.741*

6.1.2.3 Labour Market Preparation, Supervision and Educational Trajectory

From Table 6.4 we see that the only scales that significantly affect the probability of having a job outside academia are the scales measuring the role of the supervisor in supporting and preparing the Ph.D. candidate for the labour market and the versatility of the educational trajectory (in terms of subjects studied and extra study and research opportunities) and labour market preparation. The role of the supervisor in supporting and preparing the Ph.D. candidate for the labour market is particularly important. For every one point increase on the scale, in other words the more supervision and labour market preparation a Ph.D. graduate received, they are 2.4 times more likely to have a job outside of academia. Ph.D. candidates who followed a versatile educational trajectory and received labour market preparation from their university have a slightly higher probability of working in academia. These results are puzzling and further research is necessary to look at the relationship between supervision and labour market status more closely. The other variables measured here do not have a significant effect on the probability of working outside of academia in comparison to academic employment.

Table 6.4 Probability of Non-academic Employment (n=256)

	OR (odds ratio)
Role of the supervisor in creating the Ph.D. candidate's network	1.228
Role of the supervisor in supporting and preparing the Ph.D. candidate for the labour market	2.423***
The Ph.D. candidate's insight into steps to be taken during research trajectory	1.197
The quality of supervisory guidance in writing and finishing the Ph.D. thesis	0.858
The versatility of the educational trajectory and labour market preparation	0.602*
The intensity of contact with other Ph.D. candidates (preventing isolation during Ph.D. trajectory)	1.117
The quality of preparatory labour market information provided for by the supervisor/graduate school/university	0.788
Individual responsibility of the Ph.D. candidate in finding a job following graduation	0.745
Research experience abroad and support in obtaining international research funding post-Ph.D.	0.899

6.2 Conclusions Academic versus Non-academic Employment

In this section, we considered the most important predictors of working inside and outside academia. We have found only four significant predictors of non-academic employment and one significant predictor of academic employment.

- Gender is important: male doctoral candidates are more likely to be employed outside academia.
- External Ph.D. candidates and candidates who started their own business are more likely to be employed outside academia.
- Ph.D. candidates who followed a versatile educational trajectory and received labour market preparation from the university are more likely to work in academia.

- Ph.D. candidates who are positive about the role of their supervisor and the way their supervisor prepared them for the labour market are more likely to be employed outside academia. Again, we reiterate that these final two results are puzzling and that more research is needed to take a closer look at the relationship between supervision and labour market status.

6.3 Temporary versus Permanent Contract broken down into Academic and Non-academic Employment

6.3.1 Introduction

In this section, we consider the probability of having a permanent versus temporary contract, while accounting for differences in academic and non-academic employment. As noted in the introduction of this chapter, contract type is closely related to academic and non-academic employment. Ph.D. candidates who have gone on to work in academia have a much higher propensity to be employed under a temporary contract. Of the respondents employed by the time of the defence, 63 per cent were employed in academia. Within this group, 65 per cent (168 respondents) had a temporary contract. Within the group employed outside academia (129 respondents), 66 per cent had a permanent contract. A greater number of respondents are employed in academia, but the prevalence of permanent versus temporary contracts is completely opposite for non-academic employment. We now investigate what other factors influence the probability of having a temporary contract. Again, readers not interested in the technical details can skip to the conclusions of this section.

6.3.2 Technical details

We estimated the probability of having a permanent contract for respondents in academic and non-academic employment (a temporary contract is the reference category) based first on a combination of demographic factors, followed by research experience, Ph.D. status and individual performance and lastly based on labour market preparation, supervision and the educational trajectory. See the Appendix for a detailed discussion of these variables.

6.3.2.1 Background Characteristics

Estimating the effect of background characteristics on the probability of a permanent contract in both academic and non-academic employment shows that having a child is strongly associated with having a permanent contract both in academic and in non-academic employment (see Table 6.5). Doctoral recipients with children are 3.5 times as likely to have a permanent contract outside academia in comparison to doctoral recipients without children; in academic employment they are twice as likely to have a permanent contract. Age is also a significant predictor of a permanent contract in academia. Lastly, gender is an important factor outside of academia as far as contract type is concerned. Male doctoral recipients have a significantly greater chance of having a permanent contract than female doctoral recipients in non-academic employment. While it is understandable that age is a significant predictor of a permanent contract, as work experience also increases with age, a number of other results, such as differences between individuals with children and gender differences, raise theoretical and empirical questions that require further investigation. For example, is self-selection evident, with Ph.D. recipients with children choosing employment in the private sector because of assumed employment contract differences? Is the gender difference in permanent employment outside

academia evidence of continued gender differences in employment, even in the highest echelons? These questions require more research in the future.

Table 6.5 Probability of a Permanent Contract (n=347)

Academic Employment		OR (odds ratio)
	Marital Status	0.902
	Presence of children in the household	2.185*
	Living in the Netherlands	0.672
	Citizenship	1.076
	Gender	1.301
	Age	1.138***
Non-academic Em-ployment		
	Marital Status	1.218
	Presence of children in the household	3.459**
	Living in the Netherlands	0.544
	Citizenship	1.082
	Gender	3.833**
	Age	1.035

6.3.2.2 Previous Research Experience and Individual Performance

In the next step of the analyses, we measure the effect of previous research experience and individual performance on the probability of having a permanent contract in academic versus non-academic employment. The results of this analysis are shown below (see Table 6.6).

Previous research experience is not significantly associated with contract type in academic or non-academic employment. Rather, there is a significant relationship between Ph.D. status and the probability of having a permanent contract, both inside and outside academia. Recalling that Ph.D. status, as measured here, analyses the differences between *aios* and external Ph.D. candidates, with *aios* as the reference category, the results demonstrate that external Ph.D. candidates are 1.9 times (1.863) more likely to have a permanent contract than *aios* outside academia. Within academia, external candidates are 2.7 times (2.658) more likely to have a permanent contract.

Table 6.6 Probability of Having a Permanent Contract (n=358)

Academic Employment		OR (odds ratio)
	Previous research experience	1.092
	Ph.D. Status	2.658***
	Articles submitted	0.969
	Articles accepted	1.124*
	Individual publication expectations	0.784*
	Supervisor publication expectations	1.045
	Institute publication expectations	1.021
Non-academic Em-ployment		
	Previous research experience	1.100
	Ph.D. Status	1.863**
	Articles submitted	0.919
	Articles accepted	1.132
	Individual publication expectations	0.989
	Supervisor publication expectations	0.840
	Institute publication expectations	1.042

The only other significant predictors of permanent employment in academia are the number of articles accepted and individual publication expectations. The higher the individual publication expectation, the lower the probability of a permanent contract is. More research is needed to explain this puzzling result. Lastly, the higher the number of accepted articles is, the higher the probability of a permanent contract in academia.

6.3.2.3 Labour Market Preparation, Supervision and Educational Trajectory

When measuring the effect of supervision and career guidance on the probability of permanent or temporary employment both inside and outside academia, we found that most of the scales calculated to measure the effect of these items returned no significant results. In fact, when we control for the background characteristics, previous research experience and individual performance, only one scale remains significant while any significance from the other scales is no longer present.[10] The only significant effect can be found in regards to the quality of supervisory guidance in writing and finishing the Ph.D. thesis, which has a negative effect on the probability of having a permanent contract in academia. Although this result may seem strange at first, it can also be quite logical. Most Ph.D. graduates do not immediately enter into permanent employment in academia, and when they are working closely with their supervisor to finish their thesis in a timely manner, they may be more likely to choose an unsure career path in academia where temporary contracts are the norm rather than go into private sector employment. More research is needed to determine the validity of this argument, however. After controlling for background characteristics, previous research experience and individual performance, none of the scales have a significant effect on the probability of having a permanent contract outside of academia.

It is important to note, though, that the general absence of significant effects from the scales on the initial employment outcome does not mean that supervision or labour market preparation are not important to Ph.D. candidates and labour market outcomes. Rather in our sample, background characteristics, previous research experience and individual performance, such as age, children living in the household as well as publications submitted and accepted, are more important predictors of contract type inside and outside of academia than factors such as supervision and labour market preparation.

6.4 Conclusions Temporary versus Permanent Contract

In this section, we considered the most important predictors of permanent and temporary employment, both inside and outside academia. We have found a number of significant predictors of having a permanent contract. The data demonstrate that within academia:

- Age and the presence of children are important predictors of having a permanent contract.
- External Ph.D. candidates are more likely to be employed under a permanent contract than *aio*s in academia.

[10] We have not included these results for space reasons. The results of both the simplistic model (using the scales as independent variables) and the combined model can be obtained from the authors.

- The higher the number of articles accepted for publication, the higher the probability of a permanent contract.
- After controlling for background characteristics, previous research experience and individual performance, supervision and labour market preparation have little effect on the probability of a permanent contract in academia. The exception is the quality of supervisory guidance in writing and finishing the Ph.D. thesis, which has a decreases the probability of having a permanent contract in academia.

The data demonstrate that outside of academia:

- Gender and the presence of children are important predictors of having a permanent contract. Male doctoral recipients are more likely than female doctoral recipients to have a permanent contract outside of academia.
- External candidates are more likely to have a permanent contract than *aio*s.
- After controlling for background characteristics, previous research experience and individual performance, supervision and labour market preparation have no effect on the probability of a permanent contract outside academia.

6.5 General Conclusions

In this chapter we focused on investigating the initial employment outcomes of recent doctoral recipients in the Netherlands. We have analysed which factors influence the probability of being inside and outside academia, as well as the probability of having a permanent contract both inside and outside academia. We once again summarize the most important results. Without controlling for contract type, the data show that:

- Gender is important: male doctoral candidates are one and a half times more likely to be employed outside academia.
- External Ph.D. candidates and candidates who started their own business are more likely to be employed outside academia.
- Ph.D. candidates who followed a versatile educational trajectory and received labour market preparation from the university are more likely to work in academia.
- Ph.D. candidates who are positive about the role of their supervisor and the way their supervisor prepared them for the labour market are more likely to be employed outside academia.

Once we take contract type into account, predicting who is more likely to have a permanent contract inside and outside academia, we find that:

- Age and the presence of children are important predictors of having a permanent contract in academia and external Ph.D. candidates are more likely to be employed under a permanent contract than *aios* in academia.
- Gender and the presence of children are important predictors of having a permanent contract outside of academia. Male doctoral recipients are more likely than female doctoral recipients to have a permanent contract outside of academia. External candidates are more likely to have a permanent contract than *aios* outside academia.
- The higher the number of articles accepted for publication, the higher the probability of a permanent contract in academia and the more positive the Ph.D. recipient is about the role of the supervisor in creating the Ph.D.'s network, the greater the chance of having a permanent contract.
- In our sample, factors such as age, children living in the household as well as publications submitted and accepted are more important determinants of the probability of a permanent contract both inside and outside academia than supervision and labour market preparation.

A number of the conclusions presented in this chapter are very intriguing but simultaneously confirm the need for more research. In particular, more long-term research on the relationship between the Ph.D. trajectory and employment is needed to put some of these conclusions in perspective.

6.6 Appendix General Methods and Operationalisation

The analyses presented in this chapter are based on logistic regression models carried out in Mplus v.5.21 (Muthen and Muthen 2007) using the FIML method to account for missing data.

For each model, we specify five demographic variables: marital status, the presence of children in the household, nationality/citizenship, gender and age. Marital status is measured with a dummy variable: the reference category is never married/divorced/widowed/separated; the category of married or cohabitating=1. We also estimate the effect of the presence of children in the household (no children present is the reference category). Given the complexity of nationality, we use three different variables here, including whether or not an individual came to the Netherlands to obtain their Ph.D. or for some other reason, whether an individual has Dutch citizenship or not and whether or not the individual is living in the Netherlands at the time of the defence. The first variable measures whether or not an individual came to the Netherlands to obtain their Ph.D. The citizenship variable measures whether or not an individual has a Dutch passport. Living in the Netherlands at the time of the defence is a binomial dummy variable (country other than the Netherlands is the reference category). Gender is measured with a dummy variable (female is the reference category). Lastly, we measure age in years.

In the next model, we measure the effect of previous research experience and a number of individual performance characteristics. Research experience is measured as whether or not an individual has previous research experience and years of research experience. The variable measuring years of research experience does not have a standard distribution and is therefore included in the model as a count variable with a Poisson distribution. In other words, nearly all respondents have a zero (no years of research experience) yet the answers provided by respondents who do not have a zero are distributed normally. We account for this zero-inflated Poisson distribution in the analyses in two steps: 1) we measure no experience versus experience (using the number of years) and 2) by calculating a regression coefficient for the non-zeros.

Individual performance characteristics are measured in terms of publications, expectations in regards to publications, and entrepreneurship. We also control for Ph.D. status. As discussed in Chapter 1, there are three different types of Ph.D. status: *aios*, scholarship recipients and external Ph.D. candidates. The number of scholarship students in our sample is too small to be included in the analyses here. Therefore, we distinguish between Ph.D. candidates employed by the university (the reference category) and external candidates. Publication variables include the number of submitted and accepted international, scientific journal articles. We also include: 1) whether or not respondents had an individual expectation of producing at least one article (no is the reference category); 2) whether their supervisor expected them to produce at least one article (no is the reference category); and 3) whether their research school or institute expected the to produce at least one article (no is the reference category). We also include a dummy variable measuring whether the respondent has started their own business (entrepreneurship; no is the reference category). Entrepreneurship is only measured in the first analyses as the number of respondents starting their own business is too small to be taken into consideration in the later analyses. Other measurements of individual performance, such as patent applications, only occur sporadically in the dataset and are therefore not included here.

In the third model, we consider the effect of Ph.D. supervision and career guidance. In the survey, we asked Ph.D. candidates to respond to a series of statements regarding Ph.D. supervision and career guidance. These statements have been combined to form nine scales (see also Chapter 3), measuring: 1) the role of the supervisor in creating the Ph.D. candidate's network; 2) the role of the supervisor in supporting and preparing the Ph.D. candidate for the labour market; 3) the Ph.D. candidate's insight into steps to be taken during research trajectory; 4) the quality of supervisory guidance in writing and finishing the Ph.D. thesis; 5) the versatility of the educational trajectory (in terms of subjects studied and extra study and research possibilities) and labour market preparation; 6) the intensity of contact with other Ph.D. candidates (preventing isolation during Ph.D. trajectory); 7) the quality of preparatory labour market information provided for by the supervisor/graduate school/university; 8) individual responsibility of the Ph.D. candidate in finding a job following graduation; 9) research experience abroad and support in obtaining international research funding post-Ph.D.

Notes

[27] Chi-square =33.093 (1 DF); p<.001; n=386.

7 SPOTLIGHT ON THE JOB SEEKERS

In this chapter we take a closer look at doctoral recipients in the Netherlands who are not employed by the time of graduation. Specifically, we will look at graduates who are not employed but are seeking employment: the so-called job seekers. In doing so, it must be noted that the overwhelming majority of doctoral recipients (86 per cent) are employed. Two per cent of respondents answered 'don't know' meaning 12 per cent of respondents are unemployed. Three per cent of these unemployed are not actively seeking employment leaving nine per cent of respondents (44) as unemployed job seekers. Put differently, we have information on the job seeking activities of 44 respondents. In this chapter, we look to see if these 44 respondents share any specific characteristics that might help us better understand the labour market position of this group.

The main research question being addressed in this chapter is:

- Is there a relationship between individual characteristics of doctoral recipients or their Ph.D. trajectories and their labour market status (as job seekers)?

In the first section, we look at the relationship between unemployment and a number of demographic characteristics. Following, we consider a possible relationship between having previous research experience and being unemployed at the time of the defence. Lastly, we investigate any possible differences in academic performance between the job seekers and employed doctoral candidates.

7.1 Demographic Characteristics

We start our investigation of the job seekers by looking at three demographic characteristics known to generate variation in employment and unemployment statistics in the general population: gender, age and country of birth. 42 of the 44 job seekers provided responses to these demographic questions. From this information we learn that 22 of the job seekers are female and 20 are male, a near fifty-fifty distribution and similar to the general gender distribution in the sample of respondents in our survey. The mean age of job-seeking doctoral recipients is 33 years old, just one year younger, on average, than the overall mean age of doctoral candidates surveyed.

There is also a fifty-fifty representation of job seeking doctoral recipients born outside the Netherlands and those born in the Netherlands or having a Dutch passport (21 versus 21). In the total population of our survey, the percentage of doctoral recipients born outside the Netherlands is 33 per cent; 67 per cent were born in the Netherlands or have a Dutch passport. In

other words, there is a slight overrepresentation of doctoral recipients born outside the Netherlands or without a Dutch passport in the job seekers category.

7.2 Previous Research Experience

Alongside demographic characteristics, we examined the possibility of a relationship between previous work experience and unemployment. We find no association between whether someone previously worked as a researcher before starting the Ph.D. and being a job seeker. Of the 24 job-seeking respondents who answered the question, 13 of them report having worked as a researcher earlier in their career while 11 did not.

7.3 Relationship with the Ph.D. Trajectory

In this section, we investigate a number of possible relationships between the Ph.D. trajectory and being a job seeker. We looked at the following: Ph.D. status, field of study, performance during the Ph.D. (publications, conference presentations, patents, etc.), expectations during the Ph.D. trajectory and the quality of Ph.D. supervision. An examination of the latter shows there are no differences found in the mean scores of the sub-scales measuring labour market preparation, quality of supervision and quality of the educational trajectory (see sub-scale description in Chapter 3) between the unemployed and the employed. Furthermore, we find no difference between the unemployed and the employed in regards to perceived expectations during the Ph.D. trajectory, including individual expectations, perceived supervisor expectations and perceived university expectations. However, we do find a number of interesting relationships between Ph.D. status and unemployment, field of study and unemployment as well as Ph.D. performance and unemployment, which we explore in the following sub-sections.

7.3.1 Job Seekers and Main Ph.D. Status

When we look at the distribution of job seekers across the three Ph.D. statuses, we find that 38 of the 44 job seekers are *aios*. Ph.D. candidates who were employed on a university contract are more likely to be unemployed than scholarship Ph.D. candidates or external candidates. Two of the job seekers in our sample are scholarship recipients and four of the job seekers are external candidates.

7.3.2 Job Seekers across Different Disciplines

Looking at the relationship between unemployment and field of study, we find a greater proportion of unemployed in the Natural Sciences (see Table 7.1). 20 of the 44 respondents who report being unemployed but seeking a job come from the Natural Sciences. However, we need to correct for the fact that there are, in general, more respondents in the Natural Sciences. Thirty per cent of all respondents received their doctorate in the Natural Sciences, a

higher proportion than in the other five fields. Despite this, we still see an overrepresentation of doctoral candidates from the Natural Sciences in the job-seeking category of the unemployed. 14 per cent of all doctoral candidates from the Natural Sciences are seeking a job; this is five per cent higher than the average for all fields of study.

The smallest difference in unemployment is between the Natural Sciences and Engineering and Technology (where 10 per cent of all doctoral recipients are unemployed but seeking a job). The largest difference can be found between the Natural Sciences and the Medical and Health Sciences, where only three per cent of doctoral recipients are unemployed and seeking employment.

The higher proportion of unemployed, job-seeking graduates in the Natural Sciences is concentrated in one area of the Natural Sciences, namely the Biological Sciences. 11 of the 20 unemployed job seekers from the Natural Sciences are biologists. In no other field of study do we find such a significant proportion of unemployed job seekers. Again, this is not related to an overrepresentation of biologists in the Natural Sciences. Biologists represent 27 per cent of all candidates in the Natural Sciences (47 respondents) and 23 per cent of these Biologists (11 respondents) are unemployed at the time of the defence and seeking a job.

Table 7.1 The Distribution of Job Seekers across Field of Study

Field of Study	Number (percentage) of job seekers
Natural Sciences	20 (45.5)
Engineering and Technology	8 (18.2)
Medical and Health Sciences	3 (6.8)
Agricultural Sciences	3 (6.8)
Social Sciences	8 (18.2)
Humanities	2 (4.5)
Total	44 (100.0)

7.3.3 Job Seekers and Academic Performance

Alongside Ph.D. status and field of study, we now examine whether academic performance is related to being unemployed and seeking employment. In the survey, we measure ten characteristics of academic performance. These include the number of: papers (co)authored and presented at regional, national or international conferences; posters presented at national and international conferences; articles (co)authored and submitted to an international, scientific journal; articles (co)authored and accepted in an international, scientific journal; as well as books or monographs (co)authored that have been published or accepted for publication; book chapters or other publications (co)authored that have been published or accepted for publication; external reports (co)authored that have been published or accepted for publication; patents applied for; patents granted; and patents granted, resulting in a commercial product or process. Of these 10 characteristics, only three are significantly and substantially

related to being unemployed and seeking a job at the time of the defence.[28] These include the number of papers (co)authored for presentation at regional, national or international conferences, the number of articles (co)authored and submitted to an international, scientific journal and the number of articles (co)authored and accepted by an international, scientific journal.

When testing for differences between the group of employed doctoral candidates and job-seeking doctoral candidates, in all three cases, job seekers score, on average, significantly lower than doctoral candidates currently employed at the time of the defence. Starting with the number of conference papers (co)authored by doctoral candidates, candidates who are employed by the time of the defence have (co)authored an average of six papers, whereas job seeking candidates have (co)authored an average of 3.2 papers.[29] Next, looking at the number of submitted articles, employed doctoral candidates submitted an average of 4.9 articles for publication versus 3.4 articles by job seekers.[30] Lastly, candidates employed at the time of the defence had (co)authored, on average, 4.4 articles accepted for publication in an international, scientific journal versus 2.7 articles accepted for publication by the job-seeking group.[31]

7.3.4 Ruling Out Other Characteristics of the Ph.D. Trajectory

In the previous paragraphs, we discussed a number of significant relationships between certain Ph.D. characteristics and being a job seeker. Characteristics of the individual Ph.D. trajectory were not the only subject of interest, however. We investigated the relationship between the quality of supervision and the quality of the Ph.D. programme and being a job seeker and found no significant relationship between any of these aspects. Naturally, the absence of a significant effect does not mean no relationship exists between the quality of supervision and/or the quality of the Ph.D. programme and employment outcomes, as shown in Chapter 5. It does, however, mean no relationship can be found between the scales measuring various aspects of the quality of supervision and the quality of the programme and being a job seeker. Lastly, we examined the possibility of a relationship between job seekers and the phenomenon of brain drain/brain gain. Coming to the Netherlands to obtain a Ph.D. is not significantly associated with being a job seeker. Moreover, we find no relationship between being a job seeker and planning on leaving the Netherlands following graduation.

7.4 Conclusion

In this chapter, we have taken a closer look at a small, but important group among doctoral recipients in the Netherlands: the job seekers. Despite being a relatively small group (44 respondents), we are able to discern a number of important characteristics that define this group. It is perhaps easiest to sum up what does not matter:

- Gender, age and nationality/citizenship;

- Expectations of the Ph.D. candidate, perceived expectations of the graduate school or perceived expectations in regards to the supervisor;
- Quality of supervision or quality of the Ph.D. programme;
- Brain drain/brain gain.

What does matter is:

- The Ph.D. status of the candidate;
- The field of study and performance during the Ph.D. trajectory; in particular,
- The number of papers and articles produced: Doctoral candidates who are unemployed and seeking a job at the time of the defence have a lower number of (co)authored conference papers, articles submitted for publication and articles accepted for publication.

Notes

[28] We find significant multivariate effects. Wilks' lambda: F (11, 443)=2.29; p=.01; n=455.
[29] F (1, 453)=13.432; p<.001; n=455.
[30] F (1, 453)=4.336; p<.05; n=455. While it is possible that these results differ across the various Ph.D. statuses, given the small sample size of job seekers, it is not possible to control for these differences.
[31] F (1, 453)=5.863; p<0.05; n=455.

8 Recommendations

In this chapter, we make a number of recommendations based on our research findings. We focus on three different groups of stakeholders: Ph.D. candidates, Ph.D. supervisors and graduate and research schools. We do this on the basis of our research results, which we summarize below. We will start with the Ph.D. candidates, since they are the primary concern of this report. Supervisors are the main players in the professional lives of Ph.D. candidates. Their role in preparing Ph.D. candidates for the labour market may be considerable, although in many cases it proves negligible. They are the second party we are addressing. Finally, we examine the organisations within which supervisors and Ph.D. candidates operate: graduate schools, research schools and the universities encompassing them. We conclude this chapter with some suggestions for follow-up research.

8.1 Recommendations for Ph.D. Candidates

8.1.1 Take Initiatives with Your Supervisor

Here we summarize the most important conclusions from Chapter 3. Very few Ph.D. candidates have reason to hope that their supervisors will offer them a job following graduation. As perceived by Ph.D. candidates, supervisors heavily emphasize that Ph.D. candidates are responsible for finding their own way in the labour market. Few Ph.D. candidates believed that supervisors will assist them in preparing follow-up research possibilities for after completion of their Ph.D., such as assisting them with grant applications for further research. The general perception was that supervisors provide little useful information about career options, especially outside academia, although they are very active in aspects of academic labour market preparation, emphasizing the importance of publishing in international, scientific journals and providing good opportunities for establishing international contacts.

Ph.D. candidates just starting out may infer several recommendations from our results. Should they notice that their supervisor takes no interest in publishing in international, scientific journals, they will need to take action. Ph.D. candidates who are similarly oblivious to publishing in international, scientific journals will otherwise belong to the very small group of Ph.D. recipients that loses out to the overwhelming majority of their peers on the labour market. The same holds true for establishing international and domestic contacts. Inactivity on the part of Ph.D. candidates and supervisors in this respect places Ph.D. candidates in an outsider position. However, an inactive disposition on the part of the supervisor need not be the end of the matter. Ph.D. candidates can take the initiative to reach agreements with their supervisors about the above points—see for example ‘How to manage your supervisor’ (Phillips and Pugh, 2007). Annual review meetings can be held between supervisors and Ph.D. candidates to dis-

cuss results and the continued development of the Ph.D. thesis and career aspirations and are an optimal moment for taking such initiatives.

8.1.2 Ensure Personal Adaptability on the Labour Market

Many Ph.D. recipients will in many cases, or at least initially, have to settle for temporary appointments. They will need to be adaptable in their Ph.D. trajectory and should not expect to stick exclusively to that one subject. They will have to be highly resourceful. This study reveals that the doctoral programme will not necessarily be broad enough to provide training for jobs in the private sector and academia alike. Many Ph.D. candidates believe that the highly specific topic of their Ph.D. research compromised their job prospects. Ph.D. candidates will therefore need to take initiatives to ensure that the preliminary trajectory is broad enough and to increase their adaptability. Taking courses on subjects with a disciplinary foundation that extends beyond the Ph.D. research as well as acquiring teaching and research experience (also outside the research institute) are areas where Ph.D. candidates cannot afford to wait passively if they want to prepare themselves for a variety of labour market opportunities.

In this context, Ph.D. candidates did not believe that they or their supervisors have high expectations about acquiring extra research experience during the Ph.D. trajectory. Their actual duties after completing the Ph.D. programme prove that neglecting this aspect of professional preparation is unwise.

In addition to discipline-related courses and courses in teaching skills, universities and the NWO are more active in offering courses to build ‘transferable skills’, such as talent days and talent classes, which are applicable in multiple work situations. Given our survey results, it seems only a very small share of the Ph.D. candidates attends such sessions. Universities need to investigate why Ph.D. recipients make so little use of these training opportunities. Were such opportunities non-existent? Unknown? Unappealing?

One important lesson learned from this study is that Ph.D. candidates can increase their labour market flexibility in a timely manner by (1) taking courses, (2) registering with Academic Transfer (the international job site of Dutch universities), (3) seeking career guidance and (4) contacting senior researchers within and outside university settings. It is advisable to put Ph.D. candidates just starting out in touch with third and fourth-year Ph.D. candidates as well.

Ph.D. candidates need not sort out all these matters individually. Organisations that represent Ph.D. candidates (at the level of graduate schools or universities) can help by arranging mentor programmes between Ph.D. recipients and third and fourth-year Ph.D. candidates. Alumni associations of Ph.D. recipients may be crucial in this regard.

8.2 Supervisors

In chapters 2 and 3 we learned the following about the role of supervisors in relation to Ph.D. candidates and labour market preparation: According to the perceptions of the respondents, supervisors have moderate to low expectations with respect to acquiring teaching and research experience outside the research institute. The score for expectations of submitting grant proposals during the current Ph.D. trajectory for new research is remarkably low. We indicated above that supervisors make a far better impression in other areas (international publications, facilitating international contacts).

We are not arguing here that supervisors have a duty to secure a new job for their Ph.D. candidates. Moreover, the relationship between supervisors and Ph.D. candidates is selective. Supervisors will try hard to arrange good employment opportunities for their best Ph.D. candidates. They will wish a large contingent of their Ph.D. candidates a safe journey without the sense that they would have liked to keep them at the university or research institute where they are working. Even if supervisors prefer to remain passive, however, they can do several things to make these Ph.D. candidates more adaptable, such as helping them explore ways to gain professional experience outside the institute and – especially – encouraging Ph.D. candidates to consider follow-up research and assisting them in preparing grant proposals during the Ph.D. trajectory. Supervisors can also impress the importance of gaining teaching experience upon Ph.D. candidates and can help prepare them professionally for this role.

With respect to teaching, the maximum amount of time to be devoted to teaching duties merits consideration, and the timing should be optimized (avoiding or minimizing any teaching during the final year of the Ph.D. trajectory).

Finally, supervisors may provide assistance by helping their Ph.D. candidates think about planning activities not directly related to their Ph.D. thesis, such as gaining extra research experience either in the Netherlands or abroad, without automatically labelling these activities as a threat to timely Ph.D. completion.

8.3 Universities and graduate and research schools

8.3.1 Step 1: Reach all Ph.D. candidates, not just the aios

The first point we will address concerns the possibilities universities have to help their Ph.D. candidates prepare for the labour market. One of the problems is that most universities and graduate and research schools lack a central registrar's office, listing all current, active Ph.D. candidates. Virtually all universities will experience difficulty reaching Ph.D. candidates who have *aio* status. Individual departments where these *aios* are working can easily trace this group. However, the university's central administration is likely to have greater difficulty trac-

ing them because there is no central registration of *aios* at the majority of Dutch universities. Whether the university as such manages to contact *aios* about labour market preparation depends on the local administrative organisation. Moreover, while a small number of Dutch universities has made an attempt to collect relevant information about *aios* actively working on their Ph.D., these attempts are generally unsystematic and irregular. We strongly advise Dutch universities to collect information about their Ph.D. candidates on an annual basis, providing long-term, systematic information about doctoral candidates at Dutch universities

Ph.D. candidates receiving a scholarship or grant are far trickier to reach. Because they are not employees, reaching them in labour market initiatives depends entirely on how alert their immediate Ph.D. setting is (institute or graduate or research school). Moreover, many Ph.D. candidates in this category come from abroad and have adjustment problems, such as learning about how the Ph.D. system works in the Netherlands, hierarchical relationships between supervisors and Ph.D. candidates, not being aware of their entitlements etc.

Dual or external Ph.D. candidates are even more difficult to reach. Their supervisors and closest colleagues often know them, but they usually become visible to the university organisation only once they register to defend their Ph.D. thesis, which marks the end of what is frequently a very time-consuming Ph.D. trajectory.

Taken together, this means that any initiative universities take to support the career preparations of their Ph.D. candidates will fail to benefit a considerable share of the Ph.D. candidates. In the Netherlands, which boasts one of the most professionalised Ph.D. programmes, the number of currently active Ph.D. candidates is generally impossible to determine.

For these two reasons, we recommend setting up a register of Ph.D. candidates at each university. The simplest way of achieving this is by launching a procedure for registering Ph.D. candidates annually, as do American universities, which are more successful in this regard.

8.3.2 Dual and External Ph.D. Candidates

A ‘by-product’ of this study is that we now have a clearer understanding of dual and external Ph.D. candidates. These Ph.D. candidates tend to take far longer to complete their Ph.D.s, exceeding their original planning. In addition to being granted more time to finish their Ph.D., they are more likely to exceed the period allotted. Presumably, dual and external Ph.D. candidates have always remained a substantial group, even since *aios* were introduced. At many graduate and research schools, however, they tend to be overlooked. Faculties are intermittently starting to scrutinize the conditions under which dual and external candidates are working on their doctorate. In some cases, they receive group support in designing a Ph.D. plan. The extended Ph.D. duration for dual and external Ph.D. candidates in our study raises ques-

tions regarding facilities that universities can offer this group to reduce the time this group spends pursuing their Ph.D.

8.3.3 Gather Labour Market Information about Your Ph.D. Recipients

As we have observed above, less than 20 per cent of the Ph.D. recipients felt that the institute where they were conducting their Ph.D. research provided clear information about the labour market position of its Ph.D. recipients. The supervisors did not compensate for this shortcoming, as their score is similar.

The least that universities and graduate and research schools can do for their Ph.D. candidates to prepare them for the labour market is to gather and disseminate up-to-date labour market information. Three options come to mind. Graduate and research schools will do their Ph.D. candidates a great service by requesting annual updates about the activities of their Ph.D. graduates. Second, they can put their current Ph.D. candidates in touch with previous Ph.D. graduates, possibly at annual gatherings or in a mentor programme. Third, in such cases, Ph.D. candidates might be able to acquire work or research experience with Ph.D. alumni to enhance their labour market qualifications.

8.3.4 Research Content and Use of Current University Services

At present, universities take virtually no part in preparing Ph.D. candidates for the labour market. In Chapter 3 we saw that only 12.3 per cent of respondents used the university career service. In our view, the first worthwhile course of action would be to investigate why Ph.D. recipients make so little use of university facilities. Did such facilities not exist? Were they unknown? Were they unappealing? Clearly, a service that is passive (it is there, but it is not brought to the attention of Ph.D. candidates) will be ineffective. This is yet another area where Ph.D. associations might pioneer change, for example by designing and maintaining relevant websites.

Second, initiatives will gain considerable visibility in this field if they are embedded in a robust organisational structure. American universities have Career Information Centers; the British Ph.D. students can rely on their national organisation called Vitae (a national organisation championing the personal, professional and career development of doctoral researchers and research staff in higher education institutions and research institutes). These initiatives deserve to be taken into consideration as soon as possible. Three missions are obvious for such a service: gathering periodic information about the labour market position of Ph.D. recipients, organising encounters between Ph.D. candidates and Ph.D. recipients and offering labour market preparation that is not tied to specific disciplines.

Given the results of this study, the following topics merit consideration in training sessions to prepare Ph.D. candidates for the labour market:

- Teaching skills
- Skills in offering professional services
- Management training for managing both people and projects (especially in relation to research)
- Enhancing of applied research skills, particularly in research projects of limited duration

8.3.5 Is It Possible to Improve the Supervision of the Structure of Doctoral Training?

This survey primarily concerns labour market issues. To investigate whether aspects of the Ph.D. programme, as perceived by Ph.D. candidates, relate to a certain position on the labour market, we included some questions about the Ph.D. programme. Although the results did not reveal any relationships between the Ph.D. programme and the labour market position, some findings provide, nonetheless, food for thought. They may be cause for supervisors and graduate schools to have an internal exchange of ideas about the subject. We will mention a few points that we consider to be remarkable, and which, in our view, should be discussed within graduate and research schools. All of these remarks are based on observations by former Ph.D. candidates.

- Among the respondents, 74.5 per cent agrees or strongly agrees with the statement that supervisors provided good advice regarding the Ph.D. topic and its elaboration. Only 9.7 per cent is dissatisfied.
- Only 52.1 per cent had a clear impression of the data that would be needed to answer the research questions at the start of the second year of their Ph.D. programme.
- Approximately the same share (51.0%) received proper guidance in searching for relevant literature.
- Only 44.2 per cent of the respondents believed that their supervisor thought that completing the Ph.D. thesis on time was important.
- With respect to timely completion of the Ph.D. trajectory, it is also remarkable that only 39.2 per cent of the respondents agreed with the statement that by the end of first year they knew exactly which research questions they hoped to answer.

The literature (Phillips and Pugh 2007, Golde 2000 and 2005), as well as experiences in practice, reveals that accepting a new job after ending the Ph.D. trajectory, without finishing the Ph.D. thesis, increases the likelihood of serious delays in completion, if not failure to do so altogether. In some cases, labour market conditions are so favourable that they are highly attractive to Ph.D. candidates still in their fourth year (i.e. in the legal field). To streamline the connection between Ph.D. completion and the labour market, so that the first job after the Ph.D. trajectory does not jeopardize the completion of the Ph.D. thesis, the Ph.D. trajectory should be regarded as a process planned as rigidly as possible (in terms of time management, not in terms of content!). By the end of the first year, Ph.D. candidates should know exactly what the core questions of their study are, and which research data they will need to answer them.

8.4 Suggestions for Follow-up Research

We have a number of suggestions for further research. First, this study should be repeated among those respondents who have stated that they would be willing to participate in a repeat study about their labour market position in a few years. In particular, the former *aios* in this study are very likely to be making various labour market transitions. Most will spend ample time hopping from one temporary job to another. One important question is whether Ph.D. recipients will be able to continue conducting academic research or whether they will need to move elsewhere.

Second, we will need up-to-date information about the labour market position of future Ph.D. recipients at all 13 Dutch universities. This might include an annual survey among Ph.D. candidates leaving the university or graduate or research school, followed by periodic surveys among the same group, to gain a clear view of trends and relationships between the Ph.D. trajectory and labour market outcomes. One option might be an information requirement for graduate and research schools. They should provide their Ph.D. candidates with up-to-date information about labour market developments in their field.

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