

Graduation delay of WIAS PhD students



WAGENINGEN UR

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1. Introduction

PhD students are supposed to submit their thesis at the end of their four-year PhD study so that they can graduate a few months later. In practice, however, many PhD students need more than five years due to experimental draw-backs, pregnancy, illness, a new job and other delaying factors. At WIAS, the average time to graduation is 5.2 years.

On the occasion of WIAS' re-accreditation in June 2000, the Royal Netherlands Academy of Sciences (KNAW) praised WIAS for the quality of its research and PhD programme, but recommended that WIAS should reduce the average time to graduation to 4.5 years.

That is quite a challenge! Unlike e.g. in the UK, Dutch law sets no time-limit to graduate, but there are, indeed, good reasons to reduce graduation delay:

- PhD students appointed as AIO (*Assistent in Opleiding*, 65% of WIAS PhD students including the NWO-funded OIOs) are entitled to maximum three years of unemployment benefit after their PhD study. The unemployment benefit comes out of the University's or NWO's budget.
- Since January 2001, the rules for unemployment benefit for AIOs who still are writing their thesis, have been tightened severely.
- There is, or at least should be, another interest from the PhD student's perspective: what if a challenging new job position becomes available and the PhD thesis is not yet finished? Writing a thesis in spare time makes life not easier.
- Finally, there is a general scientific interest: the longer it takes to publish the PhD thesis, the more its contents become outdated.

Since its start, WIAS has already given some attention to the problem:

- It is standard procedure to have PhD project proposals reviewed by two external referees, not only on scientific quality but also on *feasibility as a four-year PhD project*.
- During the PhD study, the student's progress is regularly evaluated by his/her supervisor.
- In its documentation for the two peer reviews of 1999, WIAS analysed the performance of its AIOs and compared it to AIOs at Wageningen University and at all Dutch universities. On average, WIAS AIOs performed better - but a further improvement is necessary.
- In June 1999, unemployment benefit of WIAS AIOs was analysed. Unexpectedly, there appeared to be no correlation with graduation delay.
- In December 2000, WIAS organised a workshop on PhD supervision, which was attended by forty PhD students and twenty staff. Discussion items were style of supervision, time management, and the difference in expectations between students and supervisors.

Now, WIAS has taken one step further. In order to be able to take effective measures, the causes of graduation delay have been analysed. Among WIAS supervisors, an inquiry was held on the causes of graduation delay of each of their graduates. The graduates themselves were given the opportunity to check and correct the data.

Part II of this report gives the results of that inquiry. First, however, in Part I some remarks on methodology and its pitfalls need to be made. They will be illustrated by comparing PhD students performance at WIAS, at Wageningen University (WU) as a whole, and at all Dutch universities (indicated as NL further in this report; data from the Association of Dutch Universities VSNU). Finally, Part III will present conclusions and recommendations.

Throughout this report, great care was taken to arrive at unbiased analyses and fair comparisons. Inevitably, for different analyses different sub-populations or cohorts of PhD students were used. This might, at first glance, confuse the novice reader. If that would happen, just focus on the results, not on the technical details.

Part I. Methodology and comparison of PhD students performance

2. How to quantify PhD students performance

PhD students performance can be quantified by two, basically different approaches:

- *Analysis of graduates*: only the PhD students who graduated are included. The following performance indicators can be determined:
 - average time to graduation,
 - percentage graduated within 4, 5, 6 or >7 years.
- *Cohort analysis*: all PhD students who started are included. Now, more performance indicators can be determined:
 - average time to graduation,
 - percentage graduated within 4, 5, 6 or >7 years,
 - percentage of students who finally graduate (final success rate),
 - percentage of drop-outs during appointment,
 - percentage of students who probably will never graduate.

The choice of analytical approach, of performance indicators, and of the time period analysed is very important, because a wrong choice will produce biased or misleading results:

- A cohort analysis yields a more complete picture, but is not always used. For example, when a graduate school would claim '50% graduates within 5 years' it makes a difference whether that is 50% of the graduated students (equal to the NL average) or 50% of all students (above NL average).
- One single performance indicator shows an incomplete picture. Average time to graduation is probably the poorest single indicator (figure 1, table 1) and is not suited for a trend analysis (figure 2). A better single performance indicator would be percentage of cohorts graduated within 5 years. Also, that indicator enables us to make unbiased trend analyses (figure 3).
- Preferably, full cohorts are analysed, otherwise results become biased. The first AIOs entered in 1986, but WIAS started in 1994. For an unbiased comparison, 'pre-WIAS' AIOs who worked at the Department of Animal Sciences and graduated before 1994, have been included in figures 1, 2 and 3, and in table 1. International PhD students, on the other hand, had to be excluded from the comparison because data on these students at WU and NL are lacking.

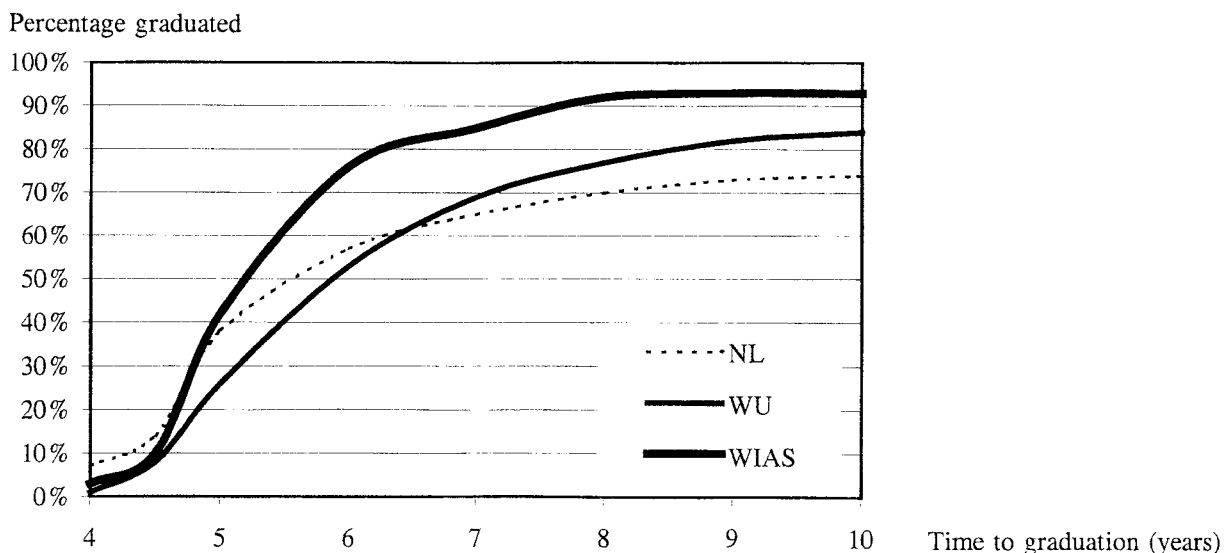


Fig. 1. Cohort analysis of AIOs started since 1986 and graduated until end of 2000 (WIAS and WU) or 1999 (all Dutch universities: NL). In the analysis the difference in time window was taken into account.

Performance indicator	WIAS	WU	NL
average time to graduation (years)	5.2	5.6	5.0
percentage of AIOs graduated within 5 years	42%	26%	38%
percentage of AIOs graduated within 6 years	76%	53%	57%
percentage of AIOs who finally graduate	93%	85%	75%
percentage of drop-outs during appointment	2%	6%	8%
percentage of AIOs who probably will never graduate	5%	9%	17%

Table 1. Performance indicators after cohort analysis of AIOs started since 1986 and graduated until end of 2000 (WIAS and WU) or 1999 (NL). In the analysis the difference in time window was taken into account.

3. Trend analysis of AIO performance

As was mentioned above, the first AIOs entered in 1986, but graduate schools in the Netherlands started after 1992 and WIAS in 1994. Did graduate schools, and WIAS in particular, improve AIO performance? Are there other trends in AIO performance?

Following the KNAW recommendation, i.e. to reduce the average time to graduation to 4.5 years, two trend analyses of this performance indicator were made: by cohort and by graduation year (figure 2).

Both, however, are excellent examples of analyses that produce *biased* results:

- The trend analysis by cohort suggests that the cohorts of 1994-1996, i.e. right after WIAS started, already are approaching the objective of 4.5 years to graduation. But, of course, the 'slower' students of those cohorts are not yet graduated and not represented in the data.
- The trend analysis by graduation year suggests that the earliest AIOs, who graduated in 1991-1992, were the fastest. Also here, the 'slower' students of those early cohorts did not contribute to the data. The curve wavers further in the 1990's due to small numbers, but also because this indicator is heavily influenced by differences in the relative amount of 'slower' graduates from earlier cohorts.

The only unbiased way to analyse trends in AIO performance is by cohort analysis, using percentage graduated within 5 and 6 years as indicators (figure 3). Unexpectedly, AIOs who started in the 1980's performed better than their successors in the early 1990's. Maybe those first few AIOs were more intensively supervised. Certainly, they spent less time on PhD education, but that goes also for the 1990-1992 cohorts.

At WIAS, AIO performance improved again in the cohorts started after 1993, which suggests a 'WIAS effect'. A slight improvement is also visible at WU after 1994. Data on NL are not conclusive yet. In all cases, better conclusions will be possible after a couple of years.

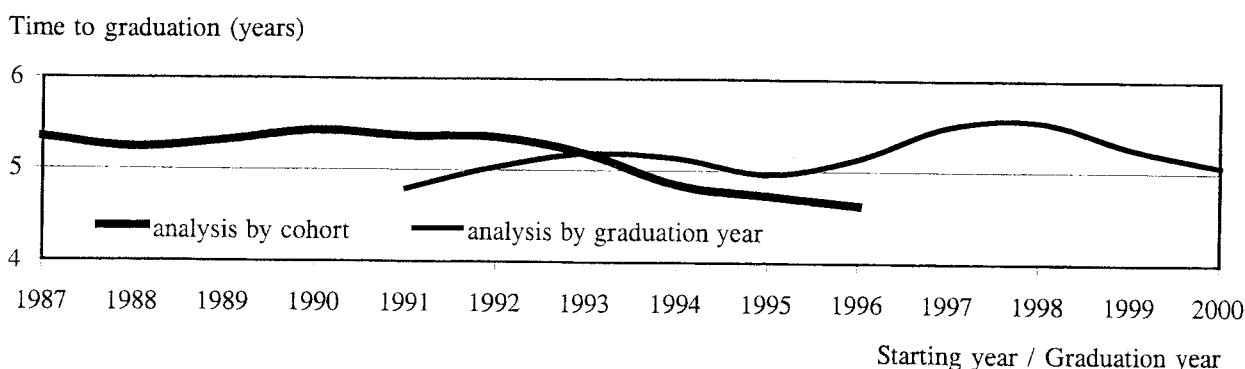


Fig. 2. Trend analyses of average time to graduation of WIAS AIOs by cohort (1987-1996) and by graduation year (1991-2000). Both produce biased results (see text). Curves have been smoothed by averaging each cohort with its two neighbouring cohorts.

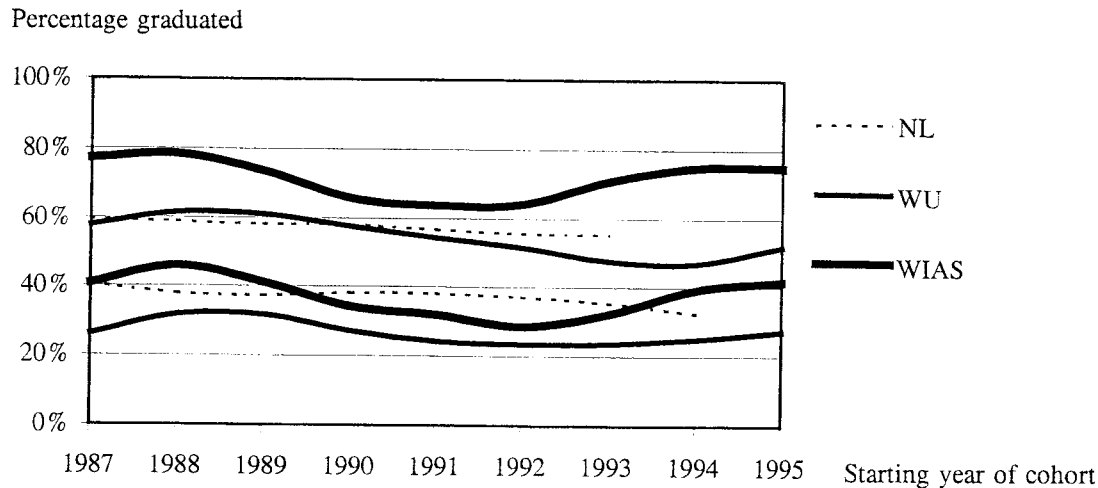


Fig. 3. Trend analysis of percentage of AIO cohorts graduated within 5 years (lower series) and within 6 years (upper series) at WIAS, WU and NL. Curves have been smoothed by averaging each cohort with its two neighbouring cohorts. The first, very small (and in WIAS even absent) cohort of 1986 is not represented in the graph. Percentage graduated within 6 years of cohort 1995 at WIAS and WU was estimated by conservative extrapolation of graduations in 2000. Graduation data on NL are only available until end of 1999, which makes the cohorts of 1993-1994 the last ones usable.

4. Productivity in PhD theses

The major part of research at graduate schools is carried out by PhD students, and research time of tenured staff is largely devoted to supervising these students, besides writing new PhD proposals and seeking funds for them. An interesting performance indicator is, therefore, productivity in PhD theses, i.e. the number of PhD theses per FTE total research input.

Productivity at WIAS is significantly higher than at WU and NL (figure 4). This can be explained by two factors: the high final success rate of WIAS PhD students, and the relatively high proportion of PhD students in WIAS research. The high student/staff ratio was reason for WIAS to recommend, already in December 1999, that the number of PhD students present should not increase further. In the year 2000, inflow and outflow of PhD students was balanced and their number stayed at 105.

PhD theses per FTE total research input

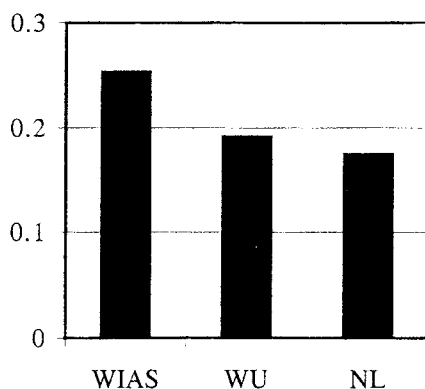


Fig. 4. Productivity in PhD theses (of all types of PhD students) per FTE total research input (of staff, postdocs and PhD students) at WIAS (average over 1994-2000), WU and NL (average over 1994-1999).

Part II. The WIAS inquiry on the causes of graduation delay

5. Material and methods

WIAS supervisors were asked to identify and quantify the causes of graduation delay of each of their graduates in the period 1994-2000, and to indicate the status of the PhD thesis at the end of the PhD student's appointment. The inquiry included AIOs and those international PhD students who carried out (most of) their research in Wageningen. Also included were ungraduated AIOs whose appointment had ended before 1 January 2001 (table 2). Sandwich PhD students were excluded, among others because the exact start and end of their project is less well defined.

The graduates themselves were given the opportunity to check and correct the data, and to provide additional information on the starting date of their new job. Response was 60%. One third of the respondents indicated (mostly minor) corrections in the data.

In Part I of this report it was stressed that full cohorts should be analysed. This inquiry excluded 'pre-WIAS' AIOs, but included 6 international PhD students (figure 5). Thus, performance indicators differ somewhat from the 'WIAS' data presented earlier.

AIOs have an appointment (salaried job) at the University, international PhD students have a scholarship. To keep the text concise, both will be referred to as 'appointment'.

Type of PhD student	G	U	Supervising WIAS group	G	U
AIOs WU-funded	23	3	Genetics	1	-
OIOs NWO-funded	10	3	Animal Breeding and Genetics	15	-
AIOs contract research	19	3	Cell Biology and Immunology	3	-
AIOs DLO-funded	7	1	Human and Animal Physiology	10	2
International PhD students	6	-	Experimental Zoology	3	1
			Animal Husbandry	5	-
Sex	G	U	Animal Husbandry - Ethology	2	-
Male	42	8	Animal Nutrition	14	3
Female	23	2	Fish Culture and Fisheries	7	3
			Animal Production Systems	2	1
Total	65	10	Farm Management	3	-

Table 2. Some characteristics of the 75 PhD students in the inquiry. G = number of graduated PhD students. U = number of ungraduated PhD students. Supervising WIAS group denotes the group of the (first) supervisor, but the student may have worked (partly) somewhere else, e.g. at a DLO institute or in the tropics.

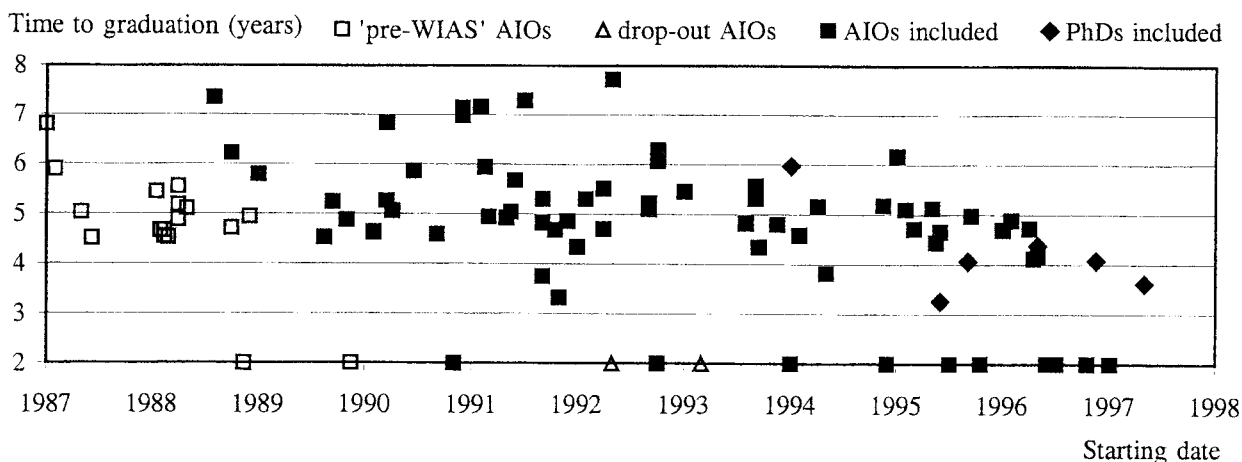


Fig. 5. The WIAS PhD students included in the inquiry and the 'pre-WIAS' AIOs, represented by starting date and time to graduation. Ungraduated and drop-out AIOs have been positioned at the bottom line of the graph.

The *reasoning in the analysis* goes as follows: a standard PhD study takes 4 years, at the end of which the thesis is submitted to the reading committee. Supposing a standard 'reading committee period' of 3 months until the official graduation, time to graduation is 4.25 years and graduation delay is zero. In the analysis, therefore, three groups of PhD students will be distinguished:

- Students who graduated within 4.25 years: 'negative' delay occurred. In the analysis, these 'fast' graduates are treated separately to prevent bias in the analysis of the slower graduates.
- Students who graduated after 4.25 years: the causes are identified and quantified. Delay can happen during the PhD study and can lead to extension of the appointment, or not, and can happen also after the appointment.
- Ungraduated PhD students: time to graduation, and therefore total graduation delay, cannot be quantified yet.

6. Overall results

In figures 6 and 7 the overall results are presented. The next sections will zoom in on certain groups of PhD students or on certain causes of delay.

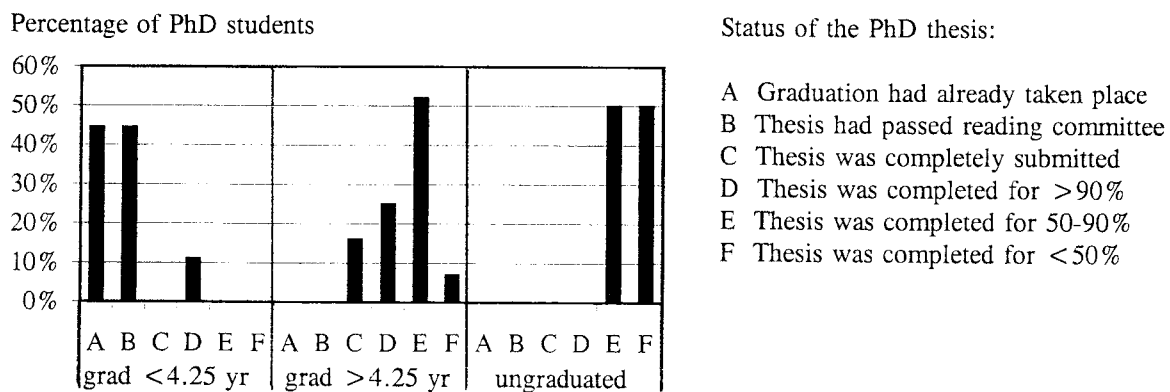


Fig. 6. Status of the PhD thesis at the end of the (extended) appointment of students graduated <4.25 years (N = 9), graduated >4.25 years (N = 56) and ungraduated students (N = 10). Percentages are taken per group.

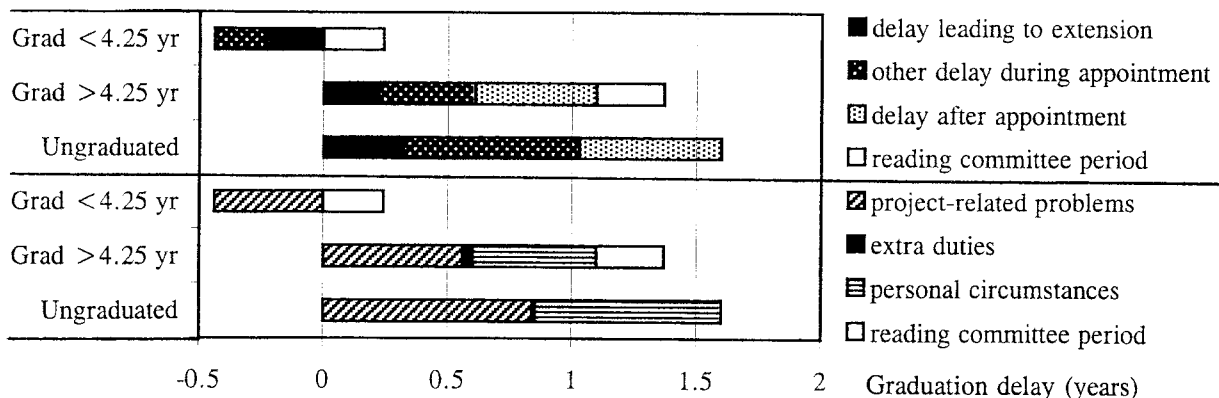


Fig. 7. Average graduation delay represented by the moment of occurrence (upper panel) and by three groups of causes (lower panel; see figure 8 for a break-down in single causes). Students graduated <4.25 years had a 'negative' delay of -0.44 year (mainly due to good time management). Adding a reading committee period of 0.24 year, their average time to graduation is $4 - 0.44 + 0.24 = 3.8$ years. Students graduated >4.25 years had, on average, 1.1 year delay and a reading committee period of 0.27 year. Their average time to graduation is $4 + 1.1 + 0.27 = 5.37$ years. Data on delay of ungraduated students are not yet final.

7. PhD students graduated after 4.25 years

At *population level* (figure 8), graduation delay clearly is a multi-factorial problem:

- There is no single factor, except 'extra courses/training', that did not contribute.
- There is also no single factor, except 'new job or study', that contributed more than 0.2 years to overall delay. The next three important causes are problems with experiment or experimental animals, extra experiment/analysis (desired by either supervisor/ sponsor or the PhD student), and pregnancy/parenthood.
- Delay due to project-related problems caused nearly 0.6 year delay and happened mainly during appointment, with the exception of 'problems with writing' which probably existed earlier but came to light after the appointment.
- Delay due to extra duties plaid, at population level, a minor role.
- Delay due to personal circumstances caused 0.5 year delay and happened mainly after the appointment, with 'new job or study' as the most important factor.

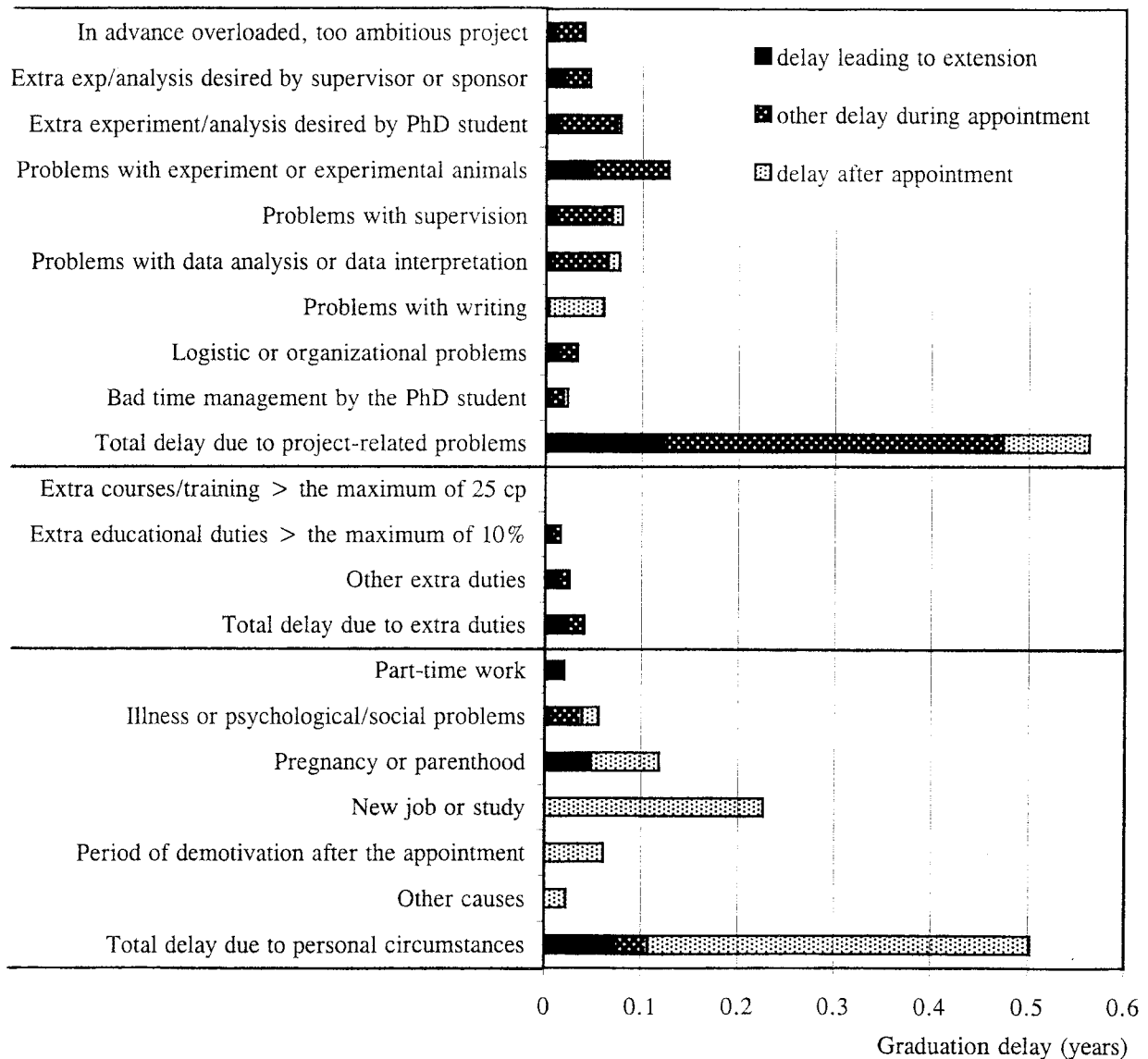


Fig. 8. Overall impact at population level (i.e. contribution to graduation delay of the whole population) of causes of graduation delay of the 56 graduates graduated >4.25 years. Total delay of each group of causes is given at the bottom of each panel.

At *individual level* (figure 9) students encountered, on average, only 2.5 causes of delay. Thus, the average single cause of delay affects only 14% of the students, but causes about 0.4 year delay for these students. There is no PhD student who shares the same set of causes of delay with another, but some general observations can be made:

- Nearly 80% of the PhD students encountered one or more project-related problems, which caused, on average, 0.7 year graduation delay.
- Problems with experiment or experimental animals, and extra experiment/analysis (desired by either supervisor/sponsor or the PhD student) were - again - paramount. They had the highest incidence and the highest individual impact.
- Delay due to 'in advance overloaded, too ambitious project' occurred only a few times and just once after 1994, when WIAS took over the external review process of PhD project proposals. It occurred also in one NWO-funded (and NWO-reviewed) project. But when a PhD project turns out to be over-ambitious, the impact is quite large.

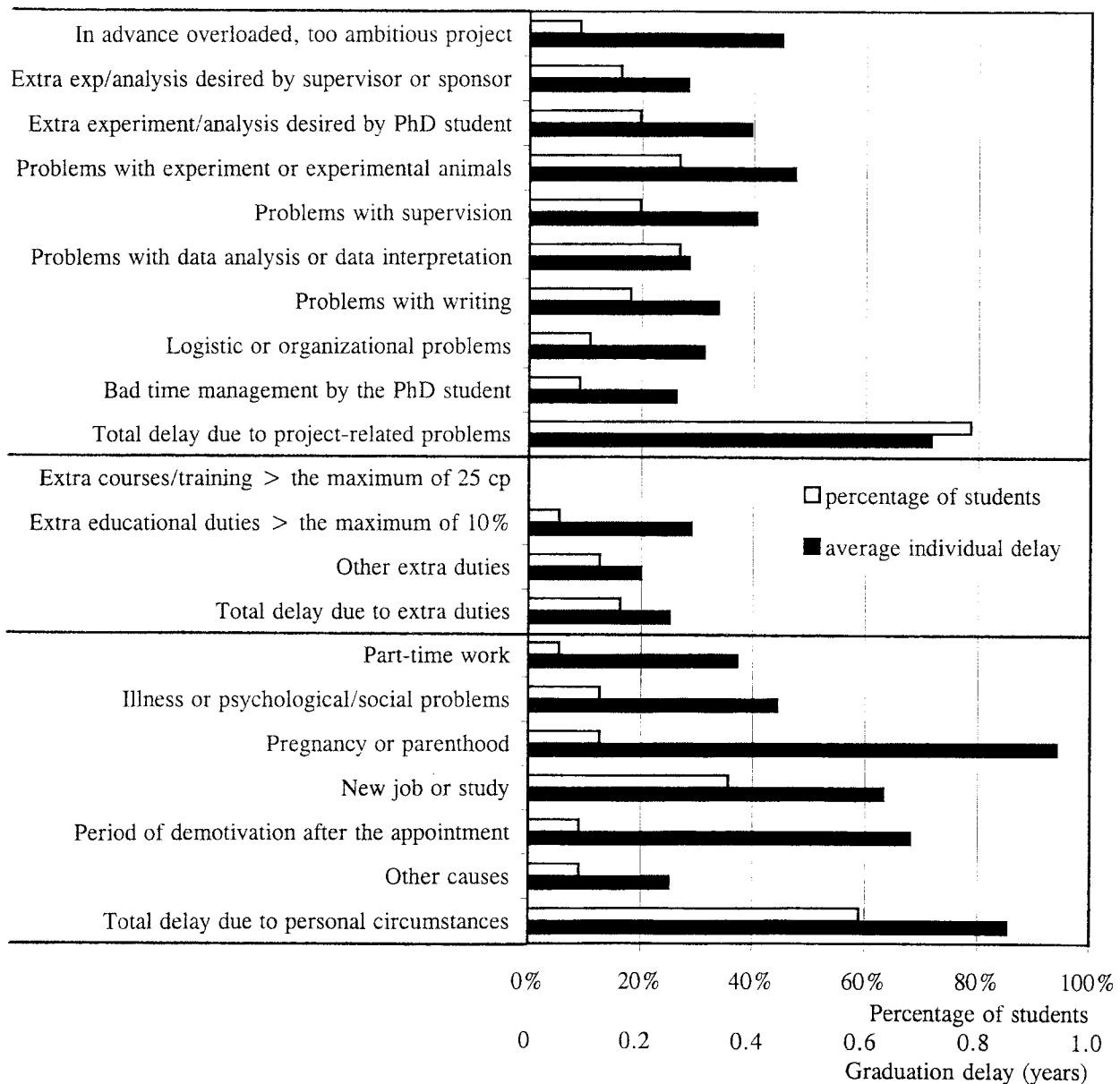


Fig. 9. Individual impact of causes of graduation delay of the 56 graduates graduated >4.25 years represented by percentage of students who encountered a certain cause of delay and the average contribution of that cause to graduation delay of those particular students. Total delay of each group of causes is given at the bottom of each panel. Note that percentages of students add up to >100% due to multiple causes of delay.

- Extra duties didn't play an important role in graduation delay at population level (figure 8), first because they were carried out by a minority of students, and secondly because the average individual delay was only 0.2 - 0.3 years (figure 9). Moreover, most of these students had low total graduation delay.
- Nearly 60% of the students encountered delay due to personal circumstances, which caused, on average for these students, more than 0.8 year graduation delay. Delay due to new job or study had the highest incidence and caused more than 0.6 years delay, but figure 9 shows that its individual impact is surpassed by two other, more rarely occurring causes of delay: pregnancy/parenthood and period of demotivation after the appointment.

8. Correlations between causes of delay

Several correlations between causes of delay, and factors correlated with increasing total delay were analysed for the group of PhD students graduated >4.25 years. The main results are:

- As could be expected, the status of the PhD thesis at the end of the appointment is strongly related to delay due to project-related problems encountered during the (extended) appointment (figure 10). On average, a roughly equal amount of delay occurred after the appointment, mainly due to personal circumstances.
- Project-related problems were the major cause of delay for students graduated within 5.5 years, i.e. for the majority (70%) of students (figure 11). Beyond that point, personal circumstances became the major cause of delay, e.g. a new job or pregnancy/parenthood.
- With increasing graduation delay, the delay per cause *and* the number of causes of delay increased, both at the same rate (figure 12). Apparently, with increasing delay, the situation becomes also more complex, one cause of delay leading to other delay.

It should be stressed that the trends and correlations described here are averages. For several students the situation differed substantially from the average.

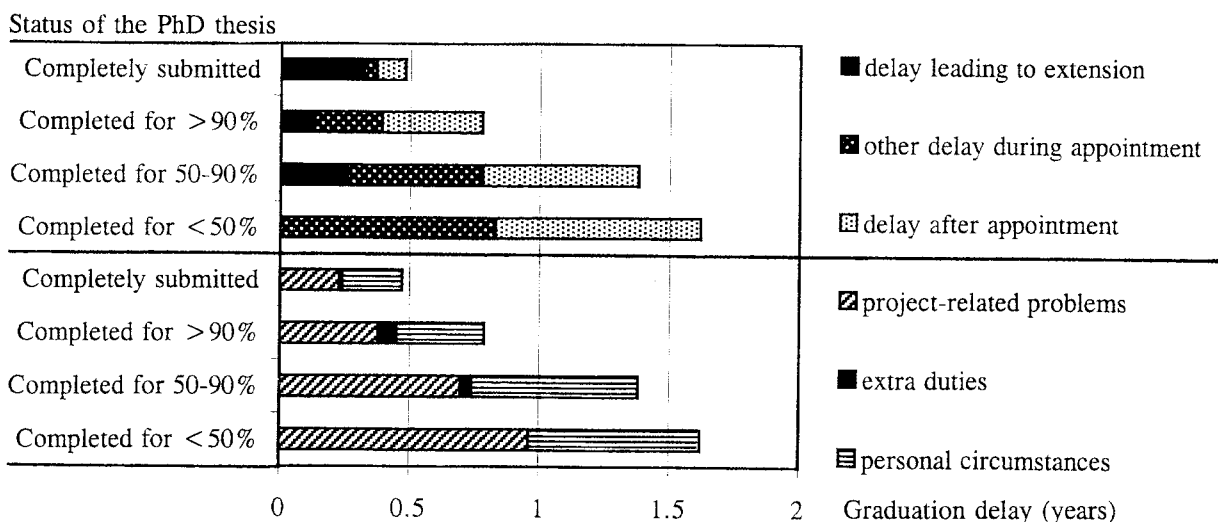


Fig. 10. Graduation delay related to the status of the PhD thesis at the end of the appointment, represented by the moment of occurrence (upper panel) and by three groups of causes (lower panel). Note that the status of the PhD thesis is determined at the end of the appointment including a possible extension: students whose thesis was completely submitted, for example, had a relatively high extension of their appointment.

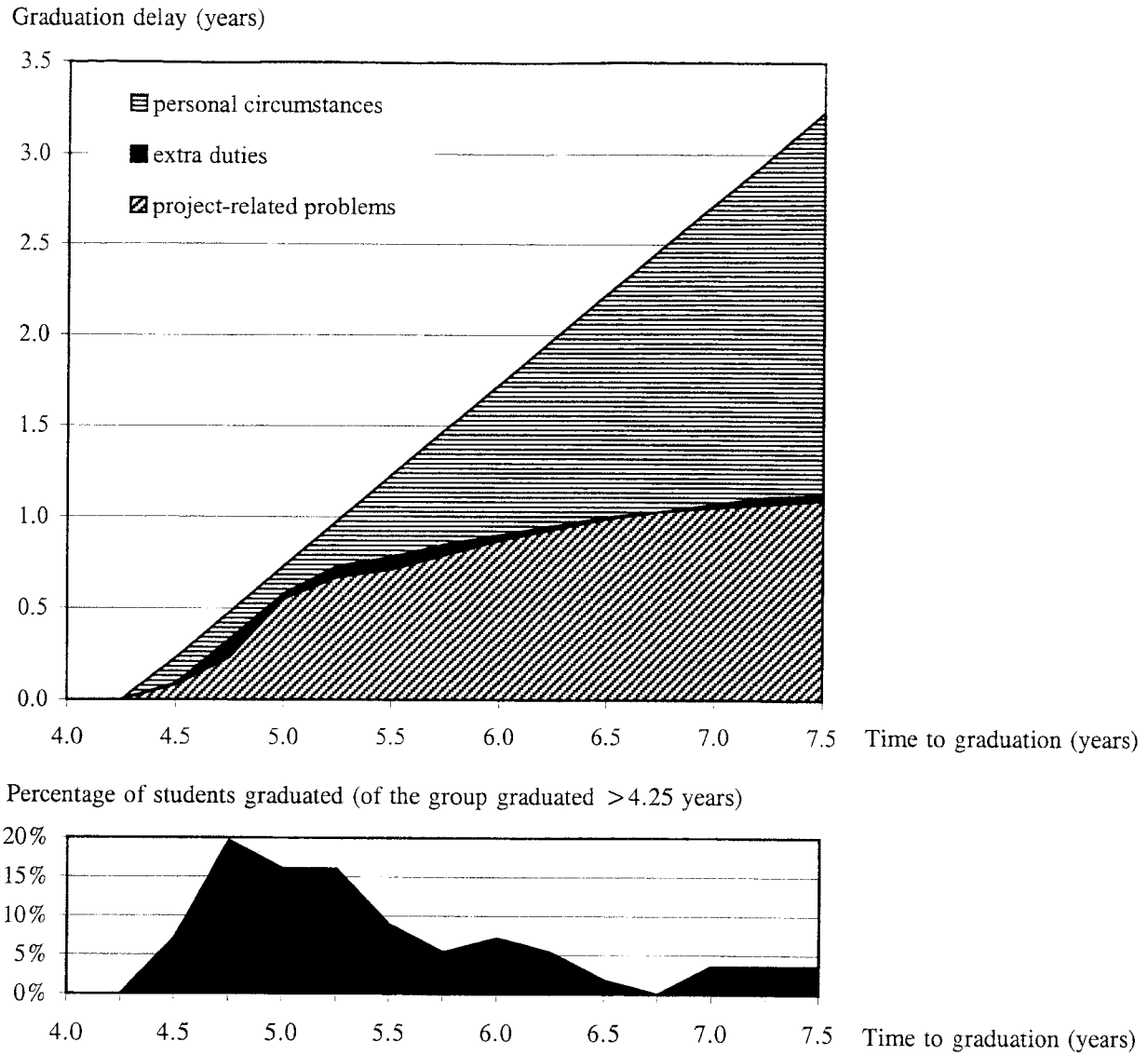


Fig. 11. Contribution of three groups of causes of delay to increasing graduation delay (upper graph). The frequency distribution of time to graduation (lower graph) is shown for a better appreciation of the upper graph: the majority of students graduated <5.5 years and their main causes of delay were project-related problems.

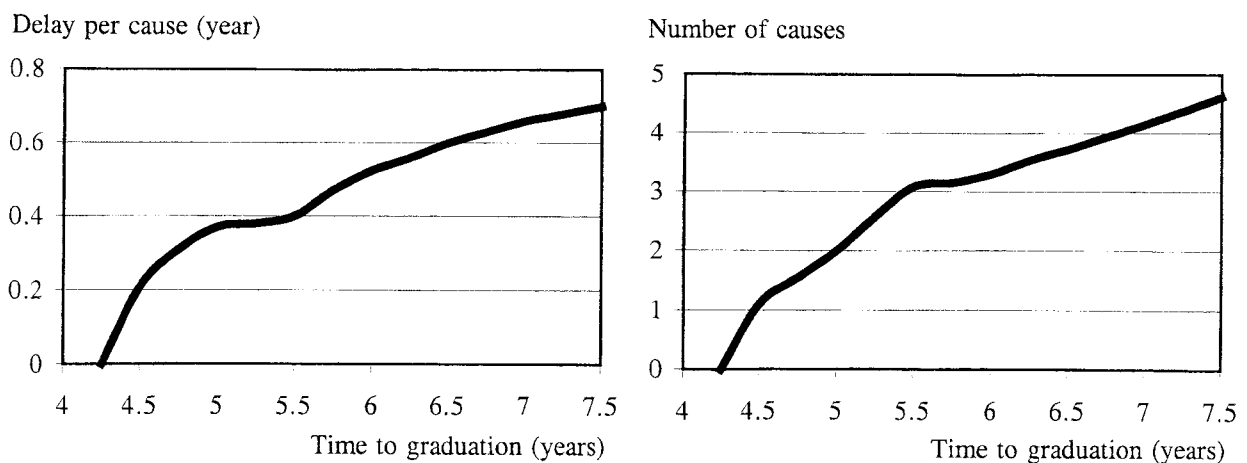


Fig. 12. Average delay per cause (left graph) and average number of causes (right graph) at increasing graduation delay.

9. PhD students graduated within 4.25 years

The group of nine 'fast' graduates in the WIAS inquiry consists for over 50% of non-Dutch PhD students:

- Four international PhD students (out of the 6), two of whom had a scholarship of less than four years.
- One PhD student from Poland, appointed as AIO for three years because he had done already experiments at his home institute and in Wageningen.
- Four Dutch AIOs (out of the 68), who all had a four-year appointment and no previous research results to start with. One AIO did pure desk research, the others carried out animal experiments.

The common success factors seem to be: a strong determination to finish in time, the readiness to solve problems as they occur or otherwise seek help to solve them, excellent time management, and the awareness to stop experimenting and start writing well before the end of the appointment. A specific factor for international PhD students is that they mostly cannot get an extension of their scholarship and are not entitled to unemployment benefit. Also, international PhD students often start with their PhD study at an older age and have more research and management experience. In other words: international PhD students *must* finish their thesis in time, but are probably also more able to accomplish that.

10. Ungraduated PhD students

The group of ten ungraduated AIOs in the inquiry is very heterogeneous:

- Four students started in the period 1990-1994. Two of them will certainly not graduate, graduation of the other two is doubtful. For three students personal circumstances were the major factor; one student encountered serious problems with his supervisor and co-supervisor after they both moved to another university.
- Six students started in 1995-1996. Five of them will very probably graduate in the autumn of 2001, which would put their time to graduation, on average, at 5.2 years, i.e. equal to the WIAS average. Also the causes of their delay are comparable to those of other WIAS PhD students.

Except for extension of the appointment (see next section), the data on delay are not final until graduation has taken place and, therefore, a detailed analysis of causes of delay was not possible. Besides that, the heterogeneity of the group would lead to inconclusive results.

11. Extension of the appointment

When an AIO encounters serious delay during the appointment for which he/she is not to blame, the supervisor can submit a request to the personnel officer for extension of the appointment. In practise, such a request is always granted, provided that it is properly documented (which was always the case). As mentioned before, it is far more difficult for international PhD students to get an extension of their scholarship:

- Only one international PhD student (out of the total 6) had a considerable extension of his scholarship (1.8 years) because of several project-related problems. One other got six weeks extension, paid by the supervising WIAS group, and the others didn't have (but also didn't need) an extension or even had a scholarship < 4 years.
- Of the 69 AIOs (graduated and ungraduated AIOs taken together), 42% had an extension of their appointment of about 0.4 year on average. Extension of appointment of ungraduated

students was, on average, somewhat higher than of the graduated students, but this difference is not statistically significant. The further analysis, therefore, will focus on the whole group of AIOs in the WIAS inquiry.

The extent to which delay was compensated, can be expressed in two ways:

- The percentage of delay compensated by extension relative to the total delay of the whole population (see figure 8).
- The percentages of students who were fully, partly or not compensated by extension of their appointment (figure 13).

There appear to be large differences in compensation of delay:

- Project-related problems were compensated for only a few of the students who encountered these problems. Problems with supervision, for example, were very poorly compensated. Problems with experiment or with experimental animals were relatively best compensated: half of the students got a full or partial compensation. Bad time management by the PhD student was, not surprisingly, never compensated.
- Extra duties were for most students concerned fully, sometimes partly, compensated.
- Delay due to part-time work and pregnancy/parenthood during employment was almost fully compensated, but delay due to illness was compensated for less than half of the students. It seems that physical illness was much better compensated than psychological/social problems.

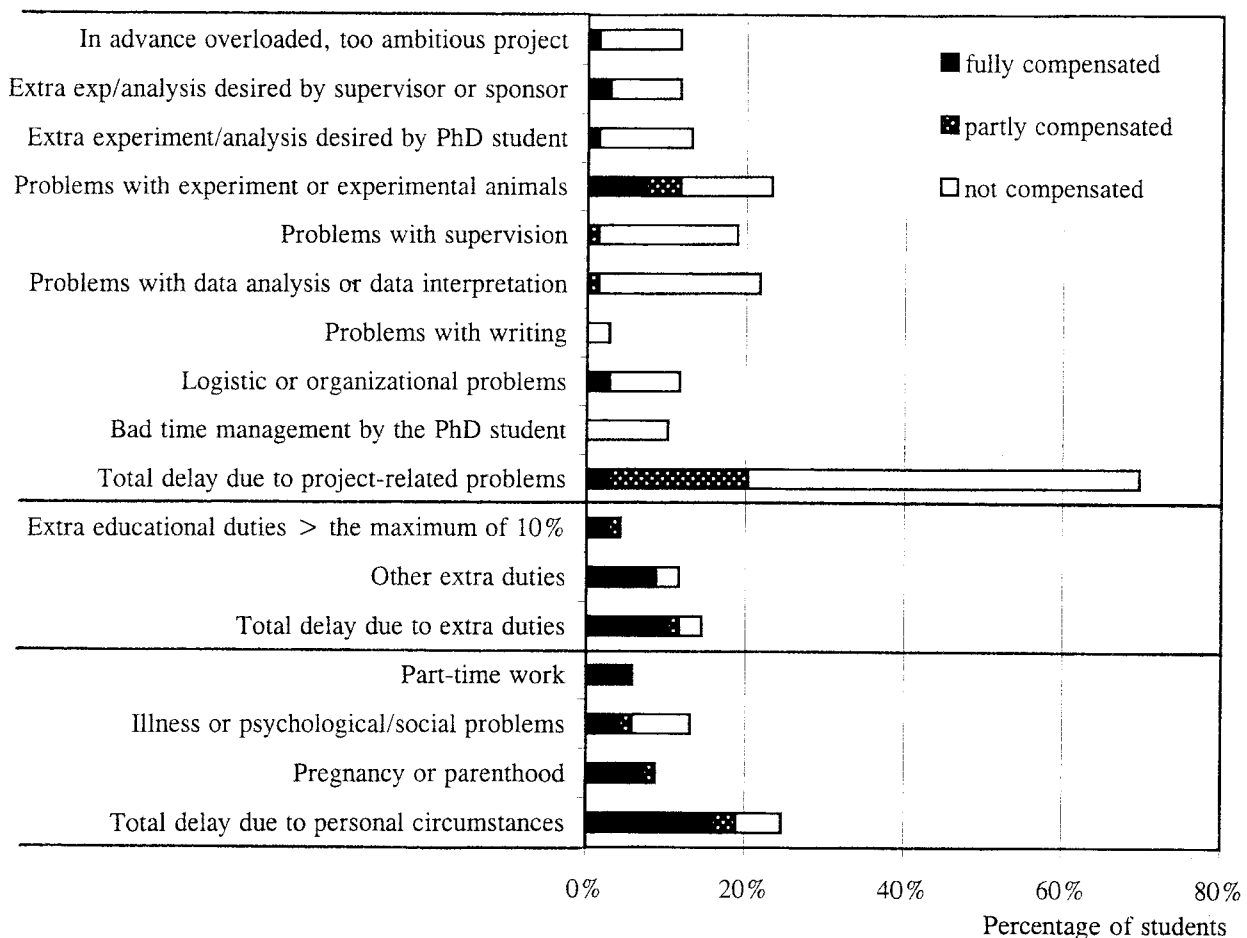


Fig. 13. Compensation of delay by extension of the appointment, expressed in percentage of students who were fully, partly or not compensated by extension of their appointment. Note that only (causes of) delay *during* appointment were taken into account. Total population is 69 graduated and ungraduated AIOs.

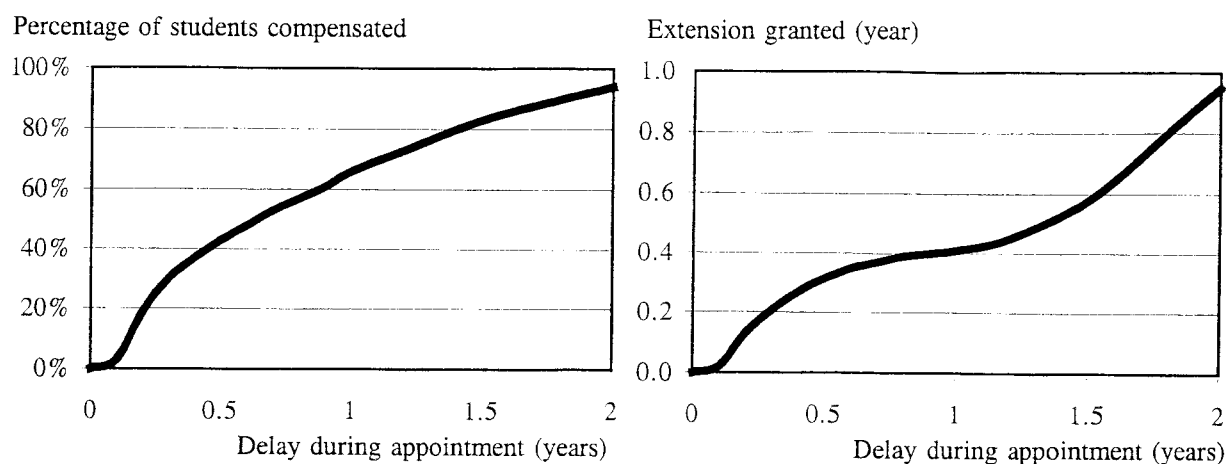


Fig. 14. Average percentage of students who were compensated by extension of their appointment (left graph) and average amount of extension granted (right graph) at increasing delay during appointment. Total population is 69 graduated and ungraduated AIOs. For a better appreciation of the graphs note that 80% of the students had <1 year delay during appointment.

Overall, 84% of the PhD students encountered delay during appointment, but only half of them were compensated - some fully, most partly. Apparently, supervisors (and students) were reluctant to request extension of the appointment, especially when project-related problems were encountered. Probably they hoped that the delay could be overcome during the remainder of the PhD study, or they accepted that the thesis would be finished during the period of unemployment benefit.

The dataset of the WIAS inquiry shows no clear clues or trends with respect to the policy whether or not to request extension, besides the already mentioned differences between causes of delay. One other trend, though, is visible: at increasing delay during appointment, the percentage of students who got extension increased, as well as the amount of extension granted (figure 14).

12. Unemployment benefit and new job

Unlike international PhD students, AIOs are entitled to maximum three years of unemployment benefit when they don't have a new job after their appointment. Many AIOs (and supervisors) regarded that as a 'safety net' to keep on experimenting till the end of the appointment and finish the thesis afterwards. Since January 2001, the rules for unemployment benefit for AIOs have been tightened severely. However, for the AIOs in the WIAS inquiry the old rulings applied.

Already in 1999, unemployment benefit of (then 40) WIAS AIOs was analysed. Now, we have data of 60 out of the 69 graduated and ungraduated AIOs in the WIAS inquiry, including the starting date of their new job. The results of the analysis are:

- Overall, 73% of the students had unemployment benefit of, on average, 1.1 year. The other 27% had a new job immediately after their appointment.
- Like in the analysis of 1999, there appears to be no correlation between graduation delay and duration of unemployment benefit (figure 15). Most students (67%) found a new job before graduation. Nearly all of them had <1 year of unemployment benefit, but the new job often increased their graduation delay. On the other hand, the 33% of the students who were unemployed until graduation, often stayed so after graduation for up to one year or more.
- A trend analysis (figure 16) shows that the duration of unemployment benefit decreased in recent years, partly because graduation delay of WIAS AIOs decreased (see figures 3 and 5), but probably more so because of the booming job market.

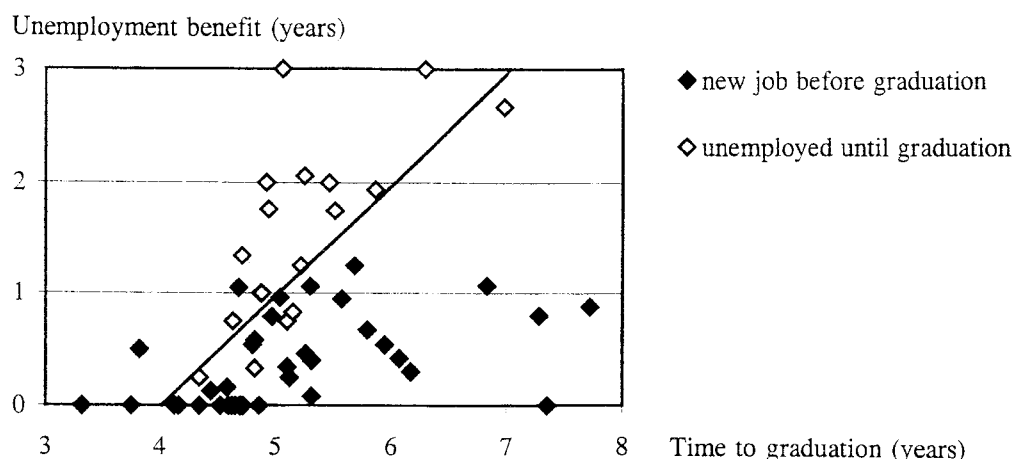


Fig. 15. Duration of unemployment benefit and time to graduation of 55 graduated WIAS AIOs. Each dot represents one AIO. If there were a correlation, most dots would be positioned around the 1:1 line. For students with a part-time job, 'effective' duration of unemployment benefit was set at 50% of the nominal duration.

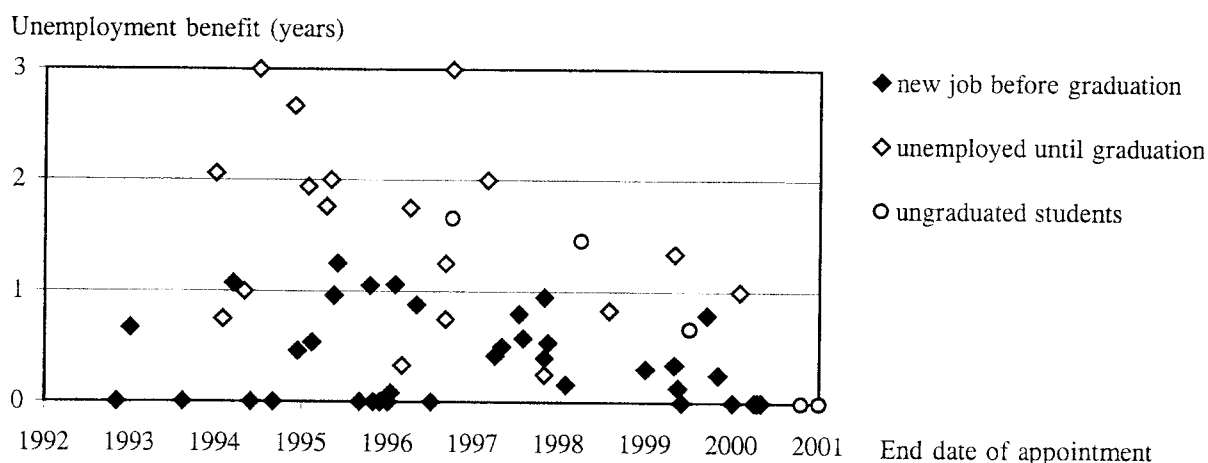


Fig. 16. Trend analysis of unemployment benefit of 60 graduated and ungraduated WIAS AIOs.

13. Male/female differences

Nationally, male PhD students graduate faster than females, and the final success rate of male students is 10% higher (figure 17). Undoubtedly, pregnancy/parenthood plays a role here (though data are lacking), but another factor is that females are under-represented in 'fast' areas like beta sciences and economy.

At WIAS the difference is smaller (figure 17). Female PhD students even have a slightly higher final success rate. The WIAS inquiry offers the explanation for the male/female difference:

- Average time to graduation of male PhD students is 5.0 years, and of females 5.4 years. However, the 70% of female students who did not get children also graduated in 5.0 years.
- The 30% of female students who had children (during or after their appointment) graduated in 6.3 years. On average, pregnancy and parenthood caused them 0.9 year delay. The remaining difference in delay (0.4 year) is rather diverse and statistically not significant.
- Delay due to parenthood for graduated male students is zero. It seems likely that some of them got children (though data are lacking), but apparently they didn't ask for paternity leave.

In other words: at WIAS, the male/female difference in time to graduation is to be explained by the difference in reproductive biology and role pattern.

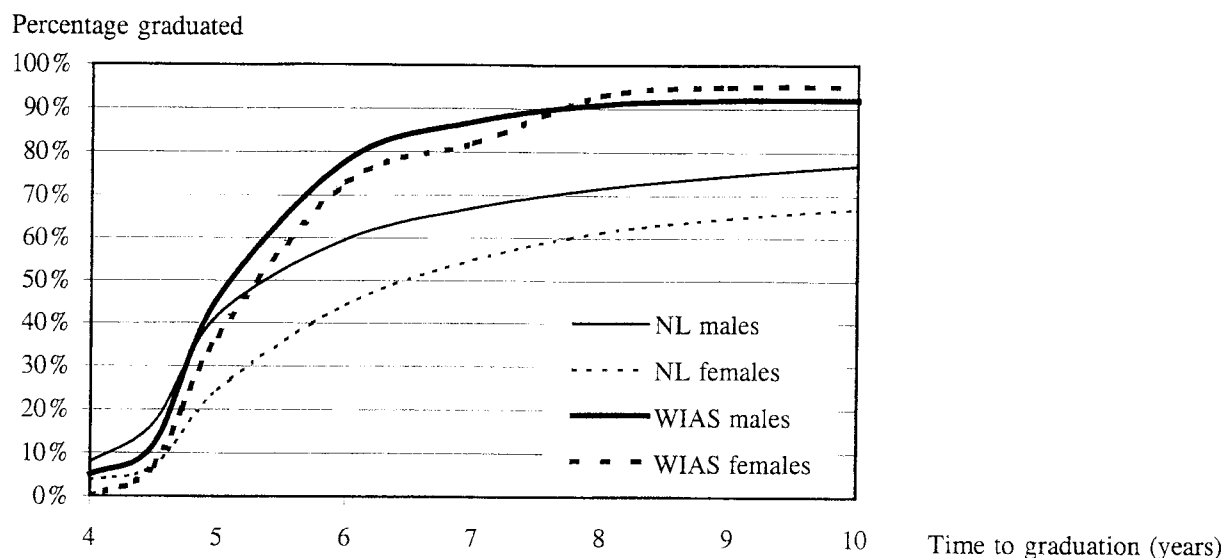


Fig. 17. Cohort analysis of male and female AIOs started since 1986 and graduated until end of 2000 (WIAS) or 1999 (all Dutch universities: NL). In the analysis the difference in time window was taken into account. The 'pre-WIAS' AIOs were included, and international PhD students excluded, to enable an unbiased comparison. Nationally, 31% of the AIOs is female, at WIAS 36%.

14. Differences in source of funding and between WIAS groups

Two approaches were followed:

- *Cohort analysis of time to graduation*

Full cohorts were used, including 'pre-WIAS' AIOs, to arrive at large enough numbers. International PhD students were excluded because they have specific reasons to graduate in time (see also section 9).

An option would be to correct for delay due to pregnancy because of its large effect on graduation delay (see section 13). This would allow a better comparison, but the disadvantage is that results divert from reality. The effect of such a correction was analysed and will be reported below.

- *Status of the PhD thesis at the end of the (extended) appointment*

This analysis includes the 69 AIOs from the WIAS inquiry. International PhD students were excluded for the same reason as mentioned above.

This approach shows specifically the result at the end of the appointment, including a possible extension, and is not influenced by e.g. a new job or pregnancy after the appointment.

The results are:

- Differences in source of funding are small (figure 18). When corrected for delay due to pregnancy/parenthood (during and after appointment) the results of NWO-funded OIOs become equal to those of WU-funded AIOs.

The second analysis, on the status of the PhD thesis at the end of the (extended) appointment (figure 19) shows even less difference between source of funding.

- Differences between WIAS groups are large, but the results of many groups are based on (much) less than 10 AIOs. Therefore, these results are not presented. No differences are visible between e.g. groups with or without animal experiments, zootechnical and zoological groups, etc. Several WIAS groups were confronted with the departure of a chairholder in the late 1990's, but also that effect is, in general, not visible.

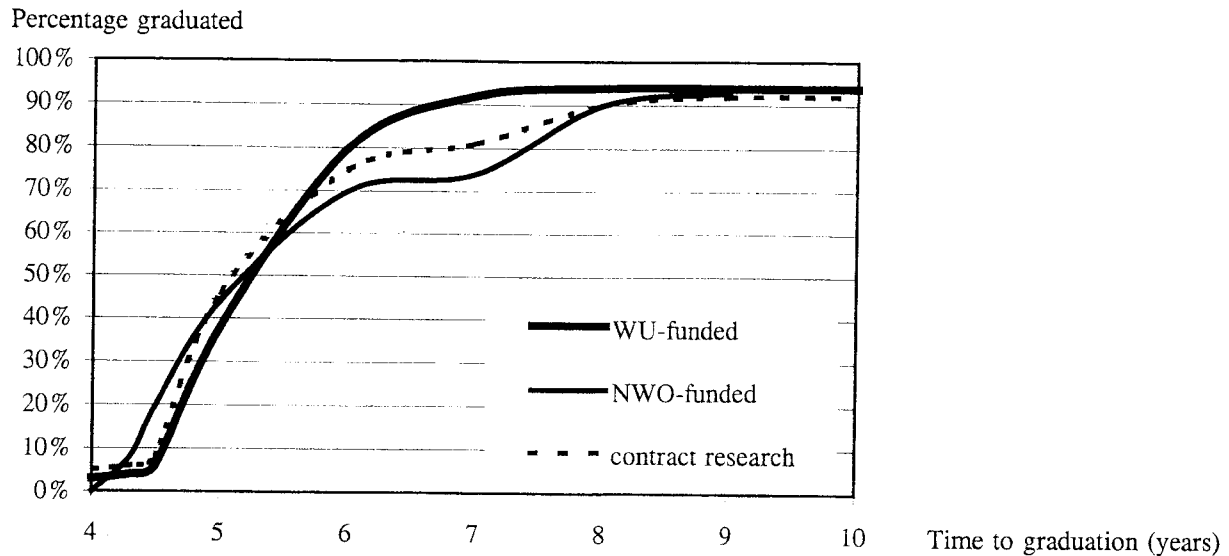


Fig. 18. Cohort analysis of WIAS AIOs started since 1986 and graduated till end of 2000, by source of funding. DLO-funded AIOs are included in contract research AIOs.

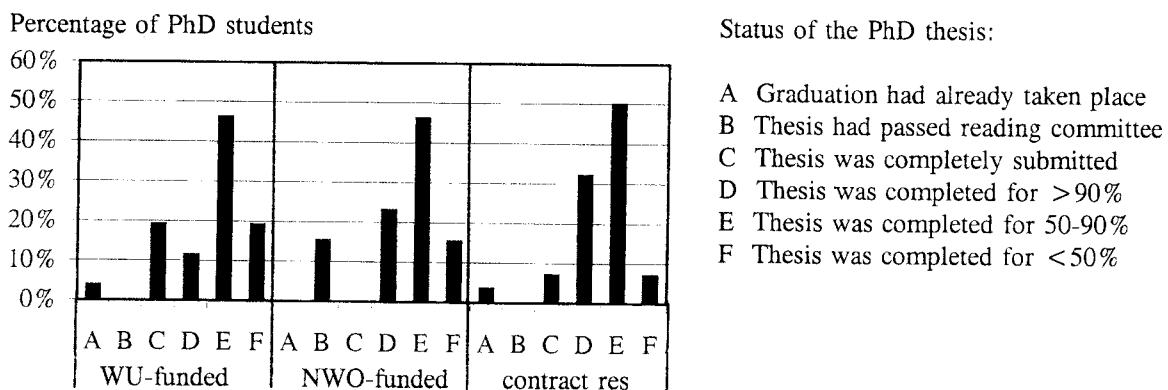


Fig. 19. Frequency distribution of the status of the PhD thesis at the end of the (extended) appointment, by source of funding. Population consists of the AIOs in the WIAS inquiry. DLO-funded AIOs are included in contract research AIOs.

15. Effect of PhD education

Finally, an interesting question is whether the PhD education programme had any effect on graduation delay. After all, in order to get the WIAS Education Certificate, PhD students must spend about 15% of their time on courses, seminars, international symposia etc. None of the PhD students reported delay due to extra courses/training above the maximum of 25 credit points (see figure 8), although a few students actually took more than that.

The analysis shows (figure 20):

- An increasing proportion of the PhD students who started after 1991, graduated with a WIAS Certificate. Students who started earlier also took PhD education, but not sufficiently to meet the requirements of the WIAS Certificate.
- Students with a WIAS Certificate graduated, on average, faster than their predecessors without certificate. Note, however, that a decrease in time to graduation appears to be a general trend at WIAS (see also figure 3).

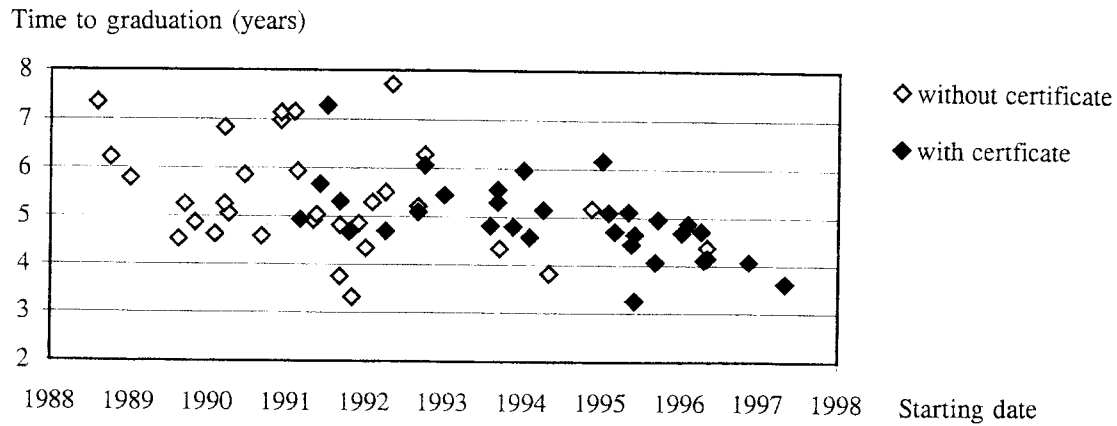


Fig. 20. WIAS PhD students graduated with and without WIAS Education Certificate, represented by starting date and time to graduation. Note that the upper right corner of the graph is empty because the 'slower' students of the most recent cohorts didn't graduate yet.

Part III. Conclusions and recommendations

16. Conclusions on methodology and comparison of PhD students performance

- a) Whenever data on PhD students performance are presented (or requested), it should be made clear which analytical approach was (or is to be) used, and which population of students and time window were (or are to be) taken (section 2).
- b) Only a cohort analysis, using a long series of full cohorts, yields a complete and unbiased picture. Several performance indicators can be derived from a cohort analysis, and the choice of indicators should preferably not be limited to just one (section 2).
- c) Average time to graduation is probably the poorest single performance indicator and is not suited for a trend analysis. Thus, the recommendation of the Royal Netherlands Academy of Sciences (KNAW), on the occasion of WIAS' re-accreditation, to reduce the average time to graduation to 4.5 years, was well-meant but ill-chosen. It would be easy, for example, to 'prove' that the WIAS PhD students who started since 1994, are already approaching that objective (section 3).
- d) Instead, it is advocated to use percentage of cohorts graduated within 5 and 6 years (or e.g. 4.5 years) as performance indicators, because only these indicators are suited for an unbiased trend analysis. Such a trend analysis suggests that PhD students who started after 1993, when WIAS was established, are graduating somewhat faster. At Wageningen University as a whole a 'graduate school effect' is less visible, and at national level the available data are not conclusive yet (section 3).
- e) It is advocated not to focus only on the 'fastest' PhD students, but also to look at e.g. final success rate (the percentage of students who finally graduate). The latter represents in fact 'return on investment' (section 1). Also, productivity in PhD theses is a valuable performance indicator (section 4). On all these indicators WIAS scores, already now, much above the Wageningen and national average.

17. Conclusions on the WIAS inquiry on the causes of graduation delay

- a) At population level, graduation delay is a multi-factorial problem. Eighteen possible causes of delay were identified. All of these causes, except extra courses/training, contributed to the delay of students who graduated >4.25 years. The most important causes of delay are new job, problems with experiment or experimental animals, extra experiment (desired by either supervisor/sponsor or PhD student), and pregnancy/parenthood (section 7).
- b) Individual differences are large. On average, students who graduated >4.25 years, encountered 2.5 causes of delay (section 7). However, at increasing graduation delay, the delay per cause and the number of causes of delay generally increased, both at the same rate. So, when the delay is becoming more severe, it also becomes more complex, like in the Dutch proverb: 'An accident seldom comes alone' (section 8).
- c) Project-related problems were encountered by nearly 80% of the PhD students who graduated >4.25 years. Together, project-related problems caused them, on average, 0.7 year delay. Problems with experiment or experimental animals had the highest incidence and the largest individual effect. Other causes had a lower incidence, but could have a large individual effect as well.

- d) Delay due to 'in advance overloaded, too ambitious project' was encountered by only a few students. Apparently, review of the project proposal by external referees had a preventive effect. But when it occurred, it had a large individual effect (section 7).
- e) Project-related problems were the major cause of delay for students graduated in 4.25 - 5.5 years. Also, the status of the PhD thesis at the end of the (extended) appointment is strongly related to project-related problems. When time to graduation exceeds 5.5 years, personal circumstances, such as a new job or pregnancy, become the major cause of delay (section 8).
- f) Most project-related problems were poorly compensated by extension of the appointment. Apparently, supervisors (and students) were reluctant to request extension of the appointment. Probably they hoped that the delay could be overcome during the remainder of the PhD study, or they accepted that the thesis would be finished during the period of unemployment benefit.
- g) Extra duties didn't play an important role in graduation delay, neither at population level, nor at individual level (section 7). When extra duties occurred, they were mostly fully compensated by extension of the appointment (section 11).
- h) Personal circumstances caused delay for 60% of the PhD students who graduated > 4.25 years (section 8). When such delay occurred during the appointment, it was, in general, partly or fully compensated (section 11). Delay due to a new job had the highest incidence and caused, at individual level, more than 0.6 year delay.
- i) Pregnancy/parenthood, although more rarely occurring, caused almost one year of extra delay (section 7). Female PhD students who did not get children had, on average, the same time to graduation as male students (section 13). It is remarkable that male students, who have also the right to paternity leave, did not seem to suffer graduation delay due to parenthood.
- j) There appears to be no correlation between graduation delay and unemployment benefit. Most students found a new job before graduation and had < 1 year, or none at all, unemployment benefit. On the other hand, the minority of students who were unemployed until graduation, often stayed so after graduation for up to one year or more. The duration of unemployment benefit decreased in recent years, mainly because of the booming job market (section 12).
- k) Differences in source of funding are small, and become even smaller when corrected for delay due to pregnancy. Differences between WIAS groups are large, but the results of many groups are based on less than 10 students, too few to draw conclusions (section 14).
- l) Only 12% of the PhD students in the WIAS inquiry graduated < 4.25 years, and more than half of them are non-Dutch PhD students. International PhD students *must* finish their thesis in time because they mostly cannot get an extension of their scholarship and are not entitled to unemployment benefit. But they also might be more able to accomplish that because they often have more research and 'life' experience (section 9).
- m) The WIAS education programme, although it requires 15% of the student's time, didn't have any negative, and maybe even a positive, effect on the PhD students' progress (section 15).

18. Recommendations to the WIAS Board and management

- a) The WIAS inquiry with supervisors, checked by the PhD graduates, has proved to be useful as a tool to identify and quantify the causes of graduation delay. It should be continued in the coming years and should then also include sandwich PhD students.
- b) The KNAW recommendation, mentioned in conclusion 16c), could be rephrased to: 'The *median* time to graduation of PhD student cohorts should be reduced to 4.5 years'. This means that 50% of all PhD students started since 1997 should graduate within 4.5 years. That would make it an objective that could be tested unambiguously in 2004 when WIAS is due for re-accreditation again. But then WIAS faces a great challenge: only 12% of the WIAS AIO cohorts 1989-1996 graduated within 4.5 years, nearly the same as nationally.
- c) WIAS should invest in the supervising capacities of its staff, e.g. through workshops like the one organised in December 2000. The policy not to increase the student/staff ratio but to maintain it at its present level needs to be continued.
- d) The review (external as well as internal) of PhD project proposals should check, more thoroughly than before, the feasibility as a four-year project including the writing of the thesis and including the maximum 25% time for PhD education and on-the-job training.
- e) A PhD thesis is supposed to contain at least four published or publishable chapters (apart from the general introduction and general discussion), but there still is a strong tendency to exceed that minimum. WIAS, together with other Wageningen graduate schools, should start a discussion on the required size of a PhD thesis. Quality, and not quantity, should be the guiding principle.

19. Recommendations to PhD students and supervisors

- a) At the start of a PhD project, a 'supervision plan' should be made by PhD students and their supervisors, in which the style and intensity of supervision is laid out. Especially for the first year, the work plan should be clear and supervision should be frequent.
- b) During the project, the progress of the PhD student *and* the supervision should be evaluated at least annually. Planning, evaluation *and revising of plans* should be standard procedure.
- c) As mentioned in conclusion 17b), one cause of serious delay may trigger further delay. Thus, PhD students and their supervisors should recognise and try to solve delay as it happens.
- d) Since 1 January 2001, the rules for unemployment benefit for AIOs have been tightened severely. AIOs who are half-way their research, may have encountered already (project-related) delay. Students and their supervisors should try, by all possible means, to prevent and reduce graduation delay.
- e) More and more PhD students accept a new job before graduation, and thus hardly present a financial burden to the University in terms of unemployment benefit. However, such a career step may increase time to graduation severely. It might be better - both for the student and for WIAS - to accept a few months extension of the appointment in order to finish the PhD thesis.