

Higher Education Dynamics 43

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The Changing Governance of Higher Education and Research

Multilevel Perspectives

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The Changing Governance of Higher

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Chapter 3 Bringing Efficiency In?

The Effect of Training Conditions on the Time to the Doctorate in Research Training Groups and Traditional Forms of Doctoral Training in Germany During the 1990s

Andrea Kottmann

3.1 Introduction

Since the mid of the 1980s the traditional German system of doctoral training has constantly been criticised. Mostly, its efficiency was under scrutiny, in particular time to the doctorate, age upon graduation and the employability of doctoral graduates were criticised (Wissenschaftsrat 1995). At the beginning of the 1990s the German Research Foundation (GRF) started to implement Research Training Groups (RTG) as a new form of doctoral training. One rationale beyond this programme was that new forms of doctoral training should increase its efficiency. By implementing more collaborative and more structured forms of research training the RTG should lead to a shorter time to the doctorate (preferably within 3 years), to a lower age upon graduation and to a better employability of graduates.

The design of RTG was mostly oriented to overcome the main critical points of the traditional forms of doctoral training. Though a multitude of different forms of doctoral training existed beginning of the 1990s, several characteristics of the traditional pattern ranging from funding/financing and the legal status of doctoral students at universities to the actual training were criticised as impeding efficiency in doctoral training.¹

As regards the actual research training a lack of means for training doctoral students as well as the organisation of supervision of the PhD-students as master-apprenticeship model was under critical review. Enders (1999: 31) summarises this critique mostly as targeting the “lack of structure and systematization”.

¹ An overview on the special characteristics of the traditional forms of doctoral training in Germany and the differences between traditional forms and more structural forms can be found in Berning and Falk 2006; Hüfner 2004; Enders and Bornmann 2001; Enders and Kottmann 2009.

The main ambition of the RTG was to overcome this lack of 'structure and systematization' by changing the legal status of doctoral students at universities, strengthening research training and by identifying doctoral training as an autonomous study phase. To achieve these goals the RTG were and still are designed along the following lines (cf. DFG n.d.; Wissenschaftsrat 2002: 23 ff):

- Organisational framework: RTG are constructed as temporary research units at universities and are funded by the DFG. Installing RTG as temporary research units at universities mainly aimed at improving the integration of doctoral students into collaborative research.
- Research programme: Within an RTG doctoral students and professors conjointly work on an overarching, often interdisciplinary research programme related to a shared topic. Within this programme each single dissertation is regarded as an element contributing to this overarching project. The framework also serves as an instrument to direct and bundle the exchange of professors, doctoral students and other scientists, i.e. to serve as a framework for collaboration that prevents doctoral students from working in an isolated setting.
- Study programme: Besides extensive research training RTG also offer a study programme providing training in different topics in line with the research programme. This study programme is designed to support the constant exchange between professors and doctoral students and other scientists visiting/participating in the RTG.
- Innovative supervision: Proposing (interdisciplinary) teams of supervisors aims at dismantling the master-apprentice-relationship and at establishing transparent conditions for supervision.
- Competitive access to doctoral education: RTG are obliged to advertise their fellowships publicly. Doctoral students have to be selected from these applicants and selection procedures should be transparent.

These innovations can mainly be considered to add an organisational framework of doctoral training: instead of working solitary on an independent research project the RTG intended to offer a setting for doctoral students that would allow them to integrate into a collaborative research project, in particular into teamwork and into a (interdisciplinary) network of scientists.

To date some structural characteristics of the RTG have been mimicked and further extended by other new forms of doctoral training (e.g. by different forms of Graduate Schools at universities). Serving as a role model the RTG could be considered to be a success story. Also, the self-evaluation reports of the GRF show that the majority of (former) doctoral students inside the RTG rated the conditions of training very positive; most of them indicated a high level of satisfaction with the RTG (DFG 2000, 2003).

Nonetheless, to date it has not been analysed whether the RTG actually were more efficient than other forms of doctoral training, in particular the performance of RTG has not yet been compared to other forms of doctoral training systematically. Also, it has not been studied yet to what extent the conditions of training differed

In the following efficiency and the conditions of training in the RTG will be compared to other forms of doctoral training. As regards efficiency we will have a closer look at the time to the doctorate. Regards the conditions of doctoral training the RTG will be compared to other forms of doctoral training for those aspects that the RTG tried to change. Finally, the paper will investigate in the question to what extent different conditions of training and other determinants have contributed to achieve more efficiency in terms of shortening the time to the doctorate.

3.2 Model and Theoretical Approaches

Studies on the time to the doctorate have quite some tradition in the US (e.g. Seagram et al. 1998; Stock and Siegfried 2006; Stricker 1994; Ehrenberg and Mavros 1995; see also overview in Ferrer de Valero 2001). In the vein of institutional research, the time to the doctorate serves as an important indicator to evaluate the effectiveness of doctoral programmes. Accordingly a range of theories and explanatory models using different factors affecting the time to the doctorate have been developed. From this research, two main categories of factors can be distinguished. On the one hand individual characteristics of the doctoral student, for example his/her sociodemographic/sociobiographic background and/or individual educational and academic abilities are identified as important determinants. On the other hand the conditions of doctoral training build a second main category of factors: the organisation and structure of supervision, the quality of supervision, as well as additional activities of the doctoral students during his/her doctoral studies and the integration of the doctoral student into collaborative research are identified as important variables.

In total, this research shows that there is no dominant factor influencing the time to the doctorate. Mostly a very complex combination of different factors from both categories determines the time to the doctorate. In addition, the impact of factors also varies along the lines of the field of study and gender of the doctoral student.

Studying the time to the doctorate therefore needs to take both kinds of factors into account: the individual characteristics as well as conditions of training.

For Germany, the time to the doctorate has not yet been analysed very intensively; despite a strong interest in the topic only a few studies exist (Hausz et al. 2010). Among these studies the work of Bornmann and Enders (2002) has analysed the time to the doctorate most intensively. The authors test five assumptions on the different factors influencing the time to the doctorate (Bornmann and Enders 2002: 62–63). Those also take both kinds of factors into account: the conditions of doctoral training as well as the individual achievements and abilities of doctoral students. Bornmann and Enders (2002; Enders and Bornmann 2001) found strong differences in the time to the doctorate between fields of study. Further, their multivariate analysis made clear that within the different fields of study each factor can have a different impact on the time to the doctorate (2002: 64 ff). Therefore, for

not be revealed. Bormann and Enders findings also make clear that for the German context the field of study and related to that the different field-specific cultures play an important role when looking at the time to the doctorate. Within the different fields of study they found different patterns of transitions to doctoral studies and also different patterns of completing the doctoral thesis.

Our analysis will build on these studies and use both categories of factors. As the field of study plays an important role for both conditions of training as well as time to the doctorate we will in the following compare the RTG to other forms of doctoral training by field of study mainly. In the following we will build an explanatory model that will distinguish between different sets of independent variables contributing to the length of doctoral studies.

3.2.1 Individual Characteristics

For the purposes of our study we define as individual characteristics those personal attributes of doctoral students which are related to their abilities, resources and social origin. In some respect these determinants can be regarded as the input to doctoral education as they mostly refer to the competencies and resources doctoral students bring with them.

In the recent literature on the time to the doctorate individual characteristics refer to a broad set of different attributes of an actor: variables reflecting on the sociodemographic as well as on the sociobiographic background of the doctoral student. Besides these two aspects, our model will consider the past educational performance of the doctoral students before they started their doctoral study.

(a) Sociodemographic Background

The sociodemographic background of a former doctoral student mainly refers to his or her family background. Boudon (1974) identifies class differentials as primary effects on the academic ability of individuals (Breen and Goldthorpe 1997). Parents having a higher education background are able to provide more educational resources to their children than parents without a higher education background. Consequently, it is assumed that children from families with a higher educational background would perform better than children from families with a low educational background. This effect holds in particular true for the school performance of children. For the academic performance of doctoral students this primary effect of social origin has proven to be less important as the group of doctoral students is already highly selective (Enders and Bormann 2001). Nonetheless we will consider the social origin of former doctoral students to estimate whether the social origin determines the time to the doctorate. In general we assume that doctoral students having parents with a higher educational background will have a shorter time to the doctorate as they can rely on more resources than doctoral students with parents having a low educational background.

(b) Sociobiographic Background

The sociobiographic background reflects those individual characteristics of the former doctoral student which are independent of his or her social origin. With the sociobiographic background we refer to their gender and family status during doctoral studies. Recent research on gender differentials in time to the doctorate has shown that women mostly take longer to complete their doctoral studies than men (cf. Seagram et al. 1998). Two explanations are generally used to explain this gender difference. Firstly, gender differentials in the time to the doctorate are explained by using the 'chilly climate construct' which points to the different experiences of men and women of the university environment and of the supervision relationship. In these studies gender is used to relate to the gendered experiences of the conditions of the doctoral studies assuming that conditions will be experienced differently by women and therefore leads to a longer time to the doctorate. Secondly, gender is often used in conjunction with the family status of the doctoral students during doctoral studies. Different studies reveal that the family status and in particular the number of dependents of the doctoral student have a significant influence on the time to the doctorate (Abedis and Benkin 1987). The higher the number of dependents was the longer also was time to the doctorate. Bormann and Enders (2002) also found for the German case that starting a family during doctoral studies lengthens the time to the doctorate in particular for women.

For our analysis we assume that gender and family status will have an impact on the time to the doctorate; in general we assume that women will take longer to complete their doctoral studies than men. Further, we assume that having dependents during the time of doctoral studies lengthens the time to the doctorate. For this relationship we also expect gender differentials. We also expect that the sociobiographic background will be less important for doctoral students inside the RTG as the different conditions of training could lead to a better integration of women. We further assume that starting a family during doctoral studies might be easier for students inside the RTG as the training conditions might lead to more opportunities to integrate work and family.

(c) Educational Background

This last set of independent variables representing the individual characteristics refers to the academic performance and ability of the doctoral student. Within the model educational achievements as well as the length of the first study will be considered. Bormann and Enders (2002) found that the individual abilities of doctoral students have some but no significant influence on the time to the doctorate. In their study students from mathematics who were already high performers in their first study completed their doctoral degree faster.

We assume that former doctoral students who have been high performers in their first study will also perform well in their doctoral studies and therefore have a shorter time to the doctorate. We also assume that the educational performance of doctoral students plays a more important role for the time to the doctorate when comparing students inside and outside the RTG. As doctoral students for

the fellowships in the RTG are selected in a competitive procedure we assume that there are more high performers among them than among doctoral students outside the RTG (Bonaccorsi 2015 in this volume). We assume that these higher competencies of doctoral students inside will lead to a shorter time to the doctorate. In addition the conditions of training inside the RTG will support their abilities better and therefore help them to complete their doctoral studies faster.

3.2.2 Conditions of Doctoral Training

With the term conditions of doctoral training we refer to several aspects of doctoral training including for example the organisation of supervision as well as the integration into teaching and research.

Ferrer de Valero's (2001) study on the influence of departmental factors on the study success of doctoral students shows that departments with successful doctoral programmes (=high completion rates and short time to the doctorate) were able to offer some or a combination of the following training conditions to their doctoral students: good financial support, a strong relationship between course work and research skills, a good student-advisor relationship, and peer support. In departments with less successful doctoral programmes (=low completion rate and long time to the doctorate) training conditions were mostly characterised by the following factors: conflict and a lack of collaboration between faculty and graduate students and a negative attitude towards students (cf. Ferrer de Valero 2001: 354 ff). In our analysis some of these aspects will also be considered: The organisation and structure of the supervision of the doctoral candidate, the integration of doctoral students into collaborative research, their integration into academia and finally the doctoral student's research and teaching activities besides working on his or her dissertation.

(a) Organisation and Structure of Supervision

Ferrer de Valero's (2001) study highlighted that an important success factor for doctoral programmes is a good student-advisor relationship (2001: 356). Also other studies support this finding: student's success is mostly dependent on the kind of the supervising relationship (Marsh et al. 2002; Pearson and Brew 2002). While these studies mostly study the quality of the relationship the organisational structure of the supervision is not considered. As one of the main innovations implemented by RTG was to overcome strong dependencies between the doctor father or doctor mother and the doctoral student our model will pay special attention to this aspect. We will distinguish between different organisational forms of supervision and assume that 'new' forms of supervision, i.e. also consider supervision models beyond the traditional master-apprenticeship-relation. We expect that the new forms of supervision will prevail among students inside the RTG and that these will contribute to a shorter time to degree.²

²To date there has not been much research to what extent the organisational structure of supervision

(b) Integration into Collaborative Research

Besides restructuring the supervision the integration of doctoral students into collaborative research and into an overarching research project was at the heart of the RTG programme. With this instrument the RTG mainly intended to overcome isolated work settings that some doctoral students experienced in traditional training. Some recent studies on the time to the doctorate considered the integration of doctoral students into collaboration and further research. Seagram et al. (1998) found that fast completers among doctoral students are more likely to collaborate with their supervisors. Data on whether the integration of doctoral students in a wider circle of collaboration with other scientist also shortens the time to the doctorate does not exist. In the following we will assume that a stronger integration of doctoral students into collaborative research will have a significant impact and shorten the time to the doctorate. For the integration into collaborative research we will consider research liaisons with the supervisor(s) as well as with other scientists and doctoral students. Again, we expect that doctoral students inside the RTG were more often integrated into collaborative research and therefore completing their doctoral studies faster.

(c) Integration into Academia

Integration into academia points to the participation of doctoral students into the wider academic community while publishing and actively participating in scientific conferences. Research on the time to the doctorate has not yet considered this aspect. We assume that one can expect both a shortening as well as a lengthening effect on the time to the doctorate. A strong integration into academia can shorten the time to the doctorate as participation in the wider academic community via publications or active conference participation forces the doctoral students to publish research results faster. On the other hand integration into academia can also be considered as a retarding factor when doctoral students spent too much time on preparation for conferences or do not focus their participation in the wider academic community. Comparing training conditions inside the RTG to conditions outside the RTG we expect that the RTG will on the one hand offer more opportunities to doctoral students to publish and participate in conferences. We also assume that these activities will be strongly related to the PhD research of the doctoral students inside the RTG and therefore help him or her to complete their doctoral studies faster.

(d) Research and Teaching Activities besides Working on Dissertation

Finally, we will consider research and teaching activities of the doctoral students during his or her doctoral studies. Within the traditional model of doctoral

assumed that (interdisciplinary) teams of supervisors would help to overcome the traditional dependence relationship between doctoral student and his/her doctor father or mother. Pferdenges, Pull and Backes-Gellner's study on the composition and performance of the research training groups (2015, in this volume) made clear that in RTG group heterogeneity does not *per se* lead to a better performance of the group, only under certain conditions heterogeneity also leads to a

training participating in teaching and further research were the key instruments in training doctoral students. Bornmann and Enders (2002) assume that these activities besides working on the dissertation would lengthen the time to the doctorate because these would distract doctoral students from their own PhD research. Bornmann and Enders' results did not fully support this assumption: on the one hand they find that additional activities impede the completion of the doctoral degree. On the other hand they also show that the integration of the doctoral students into collaborative research which comes along with these additional activities has a shortening effect on the time to the doctorate. In the following we will assume that teaching and research activities besides working on the dissertation will lengthen the time to the doctorate as these activities will force doctoral students to discontinue their PhD research more often. As the RTG aimed to reduce the involvement of doctoral student into activities which are not directly related to their PhD we expect that students inside the RTG were less often involved in these further activities and that they therefore complete their doctoral studies faster.

3.3 The Study: New Forms of Training: Different Careers

Our analysis is based on a large scale survey among doctoral degree holders graduating in Germany during the 1990s. The survey was undertaken in 2005 and included former doctoral students working on their dissertation between 1990 and 2000.³ The sample included former members of the RTG as well as PhD-holders graduating in a 'traditional' setting of doctoral training.

For the RTG-group all former doctoral students participating in one of the RTG of the German Research Foundation in the period between 1990 and 2000, in total 8,450 persons, have been included in the sample. To build the subsample of former doctoral students who have been trained in a traditional setting we applied a structured random sampling based on the year of graduation, sex and the academic discipline of the doctorate. These former doctoral students were drawn from the catalogue of the National Library in Frankfurt/M. In total about 4,320 PhD-holders who graduated in 1994 or 1995 or who graduated in 1999 or 2000 have been included in this sample. Both groups of former doctoral students have been surveyed with the same questionnaire asking for the processes and outcomes of doctoral training and later careers. About 4,676 persons responded to the survey; 2,618 former RTG-members and about 2,058 traditional doctoral students.

For the following analysis two new subsamples had to be drawn from the gross sample. As the gross sample included doctoral students form a multitude of different

Table 3.1 Subsamples

	Inside RTG		Outside RTG	
	n	%	n	%
Arts and humanities/social sciences	166	32	154	30
Life sciences	61	12	63	12
Sciences	194	37	231	45
Engineering	100	19	70	14
Total	521	100	518	100

Data source: PhD-Survey 2005, own calculations

forms of doctoral training we had to identify two subgroups in the sample to achieve a high degree of comparability.⁴

From the former RTG-members persons who successfully finished their dissertation between 1996 and 2000, who have been a fully funded member of a RTG with for at least 24 months have been included in the subsample which will be in following referred to as students 'inside RTG'.

From the traditional doctoral students those respondents graduating in 1999 or 2000 and whose main funding source during doctoral studies has been a job at university have been assigned to the subsample 'outside RTG'. Table 3.1 shows the composition of these two comparison groups as regards disciplinary fields.

3.4 Results I: Time to the Doctorate

Within our study, time to the doctorate is measured as the time difference between the date when the doctoral student started to work on his or her PhD and the date when he or she defended her thesis successfully in the final oral examination.⁵

The median time to the doctorate for all doctoral students from the subsample inside RTG was about 44 months. For all former doctoral students outside RTG the median time was about 49 months. Although this difference is small it is significant. Comparing categorised data on the time to the doctorate confirms that in general former doctoral students inside RTG completed their PhD earlier than doctoral students outside RTG: after 48 months about 63 % of them had already graduated while only 49 % of the doctoral students outside the RTG had.

As Bornmann and Enders (2002) already showed for the PhD-holders graduating in the 1980s time to the doctorate varies significantly among the different disciplinary fields (cf. Table 3.2).

⁴ More details on the sample can be found in Enders and Kottmann (2009).

⁵ Bornmann and Enders (2002: 55) distinguish between the time to the doctorate, which is the time difference between the end of the first study and the successful graduation from doctoral study and the time span of actually completing and successfully defending the PhD.

Table 3.2 (Median) time to the doctorate, in %, by disciplinary field

	Arts and humanities/ social sciences	Life sciences	Natural sciences	Engineering	Total
Inside RTG					
Median time to the doctorate in months	47	45	41	45	44
Time to the doctorate – categorised					
Up to 24 months	0	0	1	0	0
Up to 36 months	16	20	28	10	20
Up to 48 months	36	39	49	49	44
Up to 60 months	25	22	14	19	20
More than 60 months	23	19	8	21	17
Outside RTG					
Median time to the doctorate in months	54	49	42	60	49
Time to the doctorate – categorised					
Up to 24 months	2	2	1	1	1
Up to 36 months	11	10	22	9	15
Up to 48 months	21	37	44	21	33
Up to 60 months	32	31	22	23	26
More than 60 months	34	21	11	46	24

Data source: CHEPS-PhD-Survey 2005, own calculations

Similar to Bornmann and Enders (2002) we find that PhD-holders from the natural sciences in both subsamples completed their doctoral degree fastest. Former doctoral students inside RTG needed about 41 months to complete their doctoral degree and four out of five students had already graduated after 48 months. Students outside RTG needed about 42 months to complete their doctoral degree, from them only two thirds had graduated after 48 months.

For doctoral students from engineering a very diverse picture can be revealed. While students from engineering took longest to complete their PhD among the students outside the RTG, students inside the RTG were completing in average time. Students outside the RTG took about 15 months longer than students inside the RTG to complete their PhD.

Doctoral degree holders from arts and humanities/social sciences took in both groups longest to finish their doctoral studies. Further, the difference between the median times to the doctorate is here rather small.

The results show that former doctoral students inside RTG completed their doctoral degree faster than students outside the RTG. But it becomes also clear that the RTG did not really achieve the big gain in efficiency as regards the time to the doctorate. The majority of students inside the RTG needed more than 3 years to graduate.

Looking on the time to the doctorate in more detail shows that there is a difference between students inside and outside the RTG regards discontinuations during their doctoral studies (cf. Table 3.3). From the former doctoral students outside RTG every fifth had to discontinue his or her doctoral studies for a period of 17 months

Table 3.3 Discontinuations of doctoral studies

	Arts and humanities/ social sciences		Total
	Inside RTG	Outside RTG	
Experience of at least one discontinuation while working on PhD (in %)	23	37	20
Average duration of discontinuation (in months)	11	20	17
Life sciences			
	Inside RTG	Outside RTG	
Experience of at least one discontinuation while working on PhD (in %)	13	7	11
Average duration of discontinuation (in months)	14	11	11
Natural sciences			
	Inside RTG	Outside RTG	
Experience of at least one discontinuation while working on PhD (in %)	11	11	11
Average duration of discontinuation (in months)	11	21	20
Engineering			
	Inside RTG	Outside RTG	
Experience of at least one discontinuation while working on PhD (in %)	14	20	17
Average duration of discontinuation (in months)	11	21	20

Data source: PhD-Survey 2005, own calculations

on average. From the former students inside the RTG a lower number has discontinued their doctoral studies (14 %) for a shorter period of 11 months on average. Again, this aspect differs strongly among the different disciplinary fields. Students from arts and humanities/social sciences were most likely to discontinue their doctoral studies for a longer period in both groups. But we find that a much higher number of former students outside RTG had to interrupt their studies for a longer period compared to students inside the RTG. While being on a much lower level this finding also applies to students from engineering. For the natural sciences the data shows only slight differences between the two groups.

Comparing the two groups as regards discontinuations of their PhD work further differences can be revealed. Former doctoral students outside RTG mostly discontinued their doctoral studies because of additional workloads besides their PhD research or because they experienced problems with their supervisor(s). Students inside RTG mostly experienced discontinuations when they were starting a new job (mostly after the end of the fellowship) or starting a family. Problems with conditions of training or with the supervisor were no important reasons to discontinue studies for this latter group. Thus, against our first assumptions these results show that the conditions inside the RTG did not provide better conditions to easily integrate family and PhD-research.

The results on the discontinuations in PhD research can be interpreted from two angles: on the one hand results show that the RTG provided a more stable framework to doctoral students inside the RTG. They experienced less discontinuation and have not been distracted from their PhD research as often as the former doctoral students outside the RTG. The RTG provided opportunities that allowed doctoral students to fully concentrate on their PhD research. On the other hand, given the opportunity to be able to fully concentrate on the PhD research, it is quite disappointing that students inside the RTG did not really need less time to complete their PhD. Excluding periods of discontinuations from the calculation of the time to the doctorate reveals that there is hardly any difference between the former students inside and outside the RTG (cf. Table 3.4).

Given these little differences in the net time to the doctorate one could assume that the main effect of the RTG was to release doctoral students from additional work in research and teaching while not changing the conditions of doctoral training itself. In the following we will analyse in more detail how training conditions contributed to a lengthening of doctoral studies.

3.5 Result II: Individual Characteristics of Doctoral Students

Looking at the sociodemographic, sociobiographic and educational background reveals that former doctoral students inside and outside the RTG did not differ very much. Both groups were as regards their sociodemographic background already highly selective. In total, 53 % of the students inside the RTG and 49 % of the

Table 3.4 Time to the doctorate with/without periods of discontinuation

Disciplinary field	RTG	Time to the doctorate in months including periods of discontinuation		Time to the doctorate in months excluding periods of discontinuations		n
		Inside RTG	Outside RTG	Inside RTG	Outside RTG	
Arts and humanities/ social sciences	Inside RTG	47	44	46	46	159
	Outside RTG	54	45	48	44	149
Life sciences	Inside RTG	45	49	44	49	59
	Outside RTG	49	41	40	42	62
Natural sciences	Inside RTG	41	42	40	42	189
	Outside RTG	42	45	44	42	224
Engineering	Inside RTG	45	60	44	57	98
	Outside RTG	60	44	57	43	70
Total	Inside RTG	44	49	43	46	505
	Outside RTG	44	49	43	46	505

Data source: CHEPS PhD-Survey 2005, own calculations

students outside the RTG have a father with a higher education degree. 12 % of the students inside the RTG had a father who with a PhD, this also applied to 10 % of the students outside the RTG.

Also, differences in the sociobiographic background of doctoral students inside and outside the RTG were low. In both groups every third student was female; so the RTG did not provide more chances to women to pursue a doctoral degree than other forms of training. In both groups about 80 % were having a partner during his or her doctoral studies. Finally, nearly 20 % in both groups had one or more children/dependents during their doctoral studies.

Comparing the educational background demonstrates that students from both groups shows that students in both groups were already high performers in their first study. Former doctoral students inside the RTG did not have better final grades for their first study; also they have not completed their first study faster than students outside the RTG (cf. Table 3.5). Thus, it seems that both forms of doctoral training have attracted high performers, and that the competitive model of the RTG did not lead to a "better input" in terms of more high performing doctoral students.

3.6 Results III: Differences in the Conditions of Doctoral Training

The main rationale underlying the programme of the RTG is to implement an organisational/structural framework to doctoral training. This framework is designed to integrate doctoral students better into collaborative research, also into wider academia and finally to improve the quality of supervision.

In the following we will analyse to what extent the conditions were different in both forms of doctoral training. For this question we are particular interested in how the differences between the both groups for the disciplinary fields looked like and if the different disciplinary cultures of doctoral training have been affected by the implementation of the RTG.

(a) Organisation and Structure of Supervision

Comparing doctoral students inside and outside RTG we find that in both forms of doctoral training most students were still supervised by one professor only. In total, we do not find a broad institutionalisation of supervision teams inside the RTG. This aspect appears differently for the arts and humanities/social sciences and the doctoral students from engineering. In these disciplinary fields students inside the RTG were supervised by teams more often than students outside the RTG. In particular, students from arts and humanities/social sciences were supervised by teams much more often than students outside the RTG.

For those students who have been supervised by teams we find that inside the RTG mostly students from arts and humanities/social sciences and from engineering had more often an interdisciplinary supervision team. Students

Table 3.5 Educational background

Final grade first study ^a	Arts and humanities/social sciences		Life sciences		Natural sciences		Engineering		Total
	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	
Mean	1.3	1.0	1.1	1.3	1.2	1.3	1.2	1.4	1.3
Median	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
n	140	123	48	53	165	201	83	57	434
Length of first study in months									
Mean	67.6	67.9	68.8	68.6	67.2	65.7	65.3	65.3	67.1
Median	68.5	68.0	68.0	70.0	66.0	66.0	66.0	60.0	68.0
n	136	129	51	49	180	210	88	62	455

Data source: CHEPS PhD-Survey 2005, own calculations
^aFinal grades on a scale from 1 = excellent to 5 = not sufficient

from life sciences and natural sciences inside as well as outside the RTG both experienced interdisciplinary teams of supervisor to the same extent.

The cooperation among supervisors also seems to be determined by disciplinary fields. In the life sciences and the natural sciences as well as in engineering cooperation among the supervisors was very common while in arts and humanities/social sciences only half of the supervisors have cooperated. Comparing students inside and outside the RTG shows that when supervising teams were in place cooperation among the supervisors was not determined by the form of doctoral training but mostly by the disciplinary field (cf. Table 3.6).

The frequency as well as the quality of supervision was evaluated very positively by both groups of doctoral students. Again, results do not show any difference between students inside and outside the RTG (cf. Table 3.11 in Annex). Students from natural sciences showed the highest level of satisfaction with the frequency and quality of supervision.

Looking at the evaluations of the support of supervisors reveals bigger differences between the disciplinary fields and also among students inside and outside the RTG (cf. Table 3.11 in Annex). Students from natural sciences evaluated the support of supervisors mostly positive; here also differences between the different forms of training were only small. Students from arts and humanities/social sciences and from engineering evaluated the support of their supervisors less positive. Comparing students inside and outside the RTG for this disciplinary field shows that students inside the RTG evaluated the support of their supervisors better than students outside the RTG. For students from engineering a reverse picture can be depicted. Here students outside the RTG were more satisfied with their supervisor's support than students inside the RTG.

To conclude, within the RTG the organisational structure of supervision has only been innovated to a slight degree. This can only be found for some disciplinary fields; nonetheless the traditional organisation of supervision specific to the different disciplines prevailed also inside the RTG, particular in the life sciences and the natural sciences.

(b) Integration into Collaborative Research

One of the major targets of the RTG is to better integrate the doctoral students into collaborative research. This approach mainly aimed at avoiding dependencies of the doctoral student from his or her supervisor. Also, a strong integration of the doctoral student into a collaborative research should help to provide a better research training.

The survey results show that in total former doctoral students inside and outside the RTG did not experience integration into collaborative research to a very high extent. In total, both groups of doctoral students did not evaluate their integration into different aspects of doctoral research very differently.

Within the disciplinary fields we only found slight differences between students inside and outside the RTG, expect for the arts and humanities/social sciences. On the one hand doctoral students from this disciplinary field reported the lowest extent of integration into collaborative research. On the other hand

Table 3.6 Organisation of supervision

	Arts and humanities/social sciences		Life sciences		Natural sciences		Engineering		Total	
	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG
Number of supervisors	36	67	57	57	61	66	60	73	53	66
One supervisor	46	27	37	36	32	30	31	23	37	29
Two supervisors	18	6	7	7	6	4	9	4	10	5
More than two supervisors	157	150	60	61	189	228	100	70	506	509
n = 100 %	157	150	60	61	189	228	100	70	506	509
Interdisciplinary team	Yes	50	42	35	33	22	60	21	45	29
No	50	58	65	65	67	78	40	79	55	71
n = 100 %	98	48	26	26	70	78	40	19	234	171
Did the supervisors cooperate	Yes	54	51	88	71	82	77	63	70	71
No	46	49	13	29	18	15	23	37	30	29
n = 100 %	95	49	24	24	72	78	39	19	230	170

Data Source: CHEPS-PhD Survey 2005, own calculations

comparing students inside and outside the RTG reveals that the students inside the RTG experienced integration into collaborative research to a higher extent than students outside the RTG (Table 3.7).

(c) Integration into Academia

The participation in academe by exchanging research results via talks and publications can be regarded as a factor that contributes to the integration of the doctoral student into wider academic community. One could expect that the special organisation of the RTG would allow doctoral students to achieve a higher degree of integration into the wider academic community as the RTG provide more opportunities to publish and to visit scientific conferences.

Across the board survey results show that former doctoral students inside the RTG were to a slight degree more likely to visit conferences than doctoral students outside the RTG. On the other hand they published less often in addition to their doctoral thesis than students outside the RTG. Further results on the active participation in conferences and additional publications show that students outside the RTG have also been more productive than students inside the RTG (cf. Table 3.8).

This finding applies in particular to the students from arts and humanities/social sciences outside the RTG as well as to students from natural sciences outside the RTG. Both were much more active in publishing book chapters and journal articles than students inside the RTG.

(d) Research and Teaching Activities besides PhD Research

The results on the time to the doctorate and discontinuations experienced during doctoral studies have already shown that doctoral students outside RTG spend more time on activities besides their PhD research than students inside RTG. Looking at these activities in more detail we find that also quite a number of the doctoral students inside the RTG performed additional activities. Nearly half of them participated in further research projects or were actively teaching and counseling students. More than 60 % were also working for the different organisational tasks related to the RTG (cf. Table 3.9).

Nonetheless, performing additional tasks beside the PhD research discerns former doctoral students inside the RTG from students outside the RTG. This becomes evident when comparing the two groups within the different disciplinary fields. While the majority of doctoral students in arts and humanities/social sciences outside the RTG were teaching and participating in research projects only a low number of the students inside did. This difference can also be found for the doctoral students from the natural sciences. Among students from the life sciences the difference between the two groups was only low.

Summarising the findings on the conditions of doctoral training we can state that the RTG did not change these. Only in some disciplinary fields and only for a few aspects the RTG have implemented different training conditions. Mostly doctoral students from arts and humanities/social sciences inside the RTG experienced different training conditions, in particular a stronger integration into collaborative research.

Table 3.7 Integration into collaborative research, mean and median*

Integration into collaborative research	Arts and humanities/ social sciences		Life sciences		Natural sciences		Engineering		Total		
	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	
Mean	3.7	4.3	2.8	3.2	2.7	2.8	3.0	2.9	3.1	3.3	
Median	3.0	5.0	2.0	3.0	2.0	2.0	3.0	2.0	3.0	3.0	
...into longstanding research interests of supervisor											
Mean	3.2	3.5	1.9	2.1	2.0	1.9	2.6	2.6	2.5	2.5	
Median	3.0	3.0	1.0	2.0	2.0	1.0	2.0	2.0	2.0	2.0	
...into collaboration with other PhD students											
Mean	3.8	4.6	3.2	3.4	3.0	2.8	2.9	3.1	3.2	3.4	
Median	4.0	6.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0	
...exchanging with other experienced scientists											
Mean	2.1	2.9	1.9	2.4	2.1	2.2	2.3	2.5	2.1	2.5	
Median	2.0	2.0	1.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0	
n	166	154	61	63	194	231	100	70	521	518	

Data source: CHEPS PhD-survey 2005
On a scale from 1 = to a very high extent to 5 = not at all

Data Source: CHEPS PhD-Survey 2005, own calculations

Category	Arts and humanities/ social sciences		Life sciences		Natural sciences		Engineering		Total
	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	
Participating in research projects	31	60	59	63	43	59	47	79	63
Teaching	37	81	62	62	48	70	49	84	74
Counseling/supervision of students	24	80	57	68	56	65	58	86	73
Scientific services (library, etc.)	9	36	20	24	23	30	20	43	33
Organisation of events	42	60	36	27	33	37	41	60	46
Cooperation with other PhD students	31	19	23	8	13	10	20	11	12
Responsibilities in the RTG	64	8	67	3	58	5	71	3	5
Other	17	26	10	10	7	10	8	20	16
<i>n = 100 %</i>	162	154	61	63	190	231	98	70	518

Table 3.9 Research and teaching activities besides PhD research

Category	Arts and humanities/ social sciences		Life sciences		Natural sciences		Engineering		Total
	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	
Participation in conferences, in %	93	83	100	100	98	94	96	99	92
Number of conferences	5.7	6.9	4.7	4.4	5.2	5.7	5.9	8.2	6.2
Median	5.0	5.0	3.0	4.0	5.0	5.0	5.0	6.0	5.0
<i>n</i>	140	119	60	63	183	215	90	62	459
Actively participated in ... conferences	3.8	4.7	3.7	3.4	5.8	4.5	4.8	6.6	4.7
Mean	3.0	3.0	3.0	3.0	3.0	3.0	4.0	5.0	4.0
Median	113	94	45	52	154	189	81	58	393
<i>n</i>	71	81	87	87	80	87	93	93	86
Additional publications during doctoral studies, in %	3.5	3.2	1.9	2.0	2.3	1.7	1.6	1.7	2.7
Mean	2.0	2.0	1.0	1.0	2.0	1.0	1.0	1.5	2.0
Median	65	86	7	7	15	29	17	14	104
<i>n</i>	2.3	4.0	3.5	3.1	3.2	5.1	2.9	4.0	2.9
Mean	2.0	2.5	3.0	2.0	3.0	3.0	2.0	3.0	2.0
Median	77	94	46	53	133	188	59	47	315
<i>n</i>	2.0	2.0	2.0	2.0	2.0	2.0	2.0	3.0	2.0
Number of research reports	2.0	2.8	2.3	2.2	2.5	2.9	2.7	3.7	3.0
Mean	2.0	2.0	3.0	3.0	2.0	2.0	2.0	3.0	2.0
Median	30	30	3	14	34	48	27	30	84
<i>n</i>	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0	3.0

Table 3.8 Conference participations and further publications during doctoral studies

Despite these little differences, two main differences in the training conditions between students inside and outside the RTG may be highlighted:

- Inside the RTG doctoral students were less often performing additional activities in teaching and research besides working on their PhD. This condition gave them more chance to continuously concentrate on their dissertation.
- Further, in particular doctoral students from arts and humanities/social sciences inside the RTG faced a new framework for doctoral training. They had more often a team of supervisors and were more often integrated into collaborative research than students outside the RTG. For students inside the RTG from the other disciplinary fields the doctoral training was not really different. In particular differences among the students from natural sciences were only small as the organisational form of the RTG mostly mimicked training conditions from this disciplinary field.

Nonetheless, given the only slight differences in the outcomes we will in the following investigate to what extent the different factors determined the time to the doctorate in both forms of doctoral training.

3.7 Determinants of the Time to the Doctorate

In this section we will investigate to what extent the different factors will influence the time to the doctorate. The foregoing results already made clear that the differences between students inside and outside the RTG were only small. Only for students from arts and humanities/social sciences inside the RTG different training conditions have been established. In the following we will analyse if – even though differences between both forms of training were only low – conditions of training mattered in a different way for the time to the doctorate inside or outside the RTG and within the different disciplinary fields. To receive more insight into the impact of the training conditions we will in the model also contrast training conditions to the individual characteristics (Table 3.10).

Results of the GLM⁶ show that some individual characteristics and conditions of doctoral training have significant influences on the time to the doctorate. From the individual characteristics the educational background of the doctoral students are very important factors in all disciplinary fields. From the conditions and forms of doctoral training we cannot derive a similar picture; for each factor a very different impact within the different disciplinary fields can be distinguished.

⁶The results in the table show the impact of the factors on the time to the doctorate. Positive values indicate that the factor is lengthening the time to the doctorate; negative values indicate the reverse effect. The final grade of the first study reflects the German school grading system; the scale is from 1 = very good to 4 = sufficient. The items for integration into collaborative research were measured on a Likert scale ranging from 1 = to a very low extent to 5 = to a very high extent. Both factors, final grade and integration into collaborative research, were integrated as continuous data into the GLM.

Table 3.10 Determinants of the time to the doctorate; generalised linear model, main effects

Individual characteristics	Arts and humanities/ social sciences		Life sciences		Natural sciences		Engineering		
	Inside RTG (n=96)	Outside RTG (n=94)	Inside RTG (n=39)	Outside RTG (n=41)	Inside RTG (n=132)	Outside RTG (n=171)	Inside RTG (n=68)	Outside RTG (n=48)	
Gender	4.616*	-2.890	7.754*	5.075	1.572	-1.329	4.940*	-1.752	
Female									
Farther has higher education degree	-0.742	-0.630	-0.253	9.203*	-2.231	1.902	2.746	-7.295*	
Yes									
Having a partner during doctoral studies	-2.564	-7.310*	-10.301*	-4.172	-5.585**	1.469	-6.269*	-1.784	
Yes									
Dependents during doctoral studies	6.791**	0.671	16.499**	5.754*	3.958*	-0.517	-2.471	0.978	
First study	0.313**	0.201**	0.235*	0.248*	0.119*	-0.103*	0.229*	0.686**	
Length									
Final grade	-1.250	-7.920*	-6.681	0.636	-1.306	6.147**	7.342*	10.143**	
Conditions of doctoral training									
Organisation of supervision	2.912	4.271	14.481*	-10.164*	3.271	1.683	-6.501*	-8.337	
Single supervisor									
Intra-disciplinary team of supervisors	-0.219	2.457	17.421*	-9.804*	-2.432	5.970*	-15.528**	-13.748*	
Inter-disciplinary team of supervisors	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.000	

(continue)

(a) *Results for the arts and humanities/social sciences*

Comparing students inside and outside RTG in the arts and humanities/social sciences shows that factors have a very different influence within these groups. Most surprisingly results depict that gender and a higher number of dependents have lengthened the time to the doctorate significantly for the former doctoral students inside the RTG. Both determinants did not play a role for the students outside the RTG. From these students females took less time to complete their doctoral degree. On the other hand students outside the RTG benefitted from having a partner during their doctoral studies. The educational background mattered as well: While a higher length of the first study only was increasing the time to doctorate only to a slight extent the final grade of the first study can be considered as a strong and significant factor shortening the time to the doctorate for the students outside the RTG. The conditions of doctoral training had a different impact inside and outside the RTG. While actively participating in conferences was shortening the time to the doctorate for students inside the RTG significantly, it was lengthening the time to the doctorate for the students outside the RTG. Teaching and participating in further research projects was an impeding completion in both groups. Conditions of doctoral training specific to the RTG in particular the organisation of supervision did not matter for the time to the doctorate in a significant way, but results show that having only one supervisor has lengthened the time to the doctorate for the students outside the RTG. Students inside the RTG benefitted from having an intradisciplinary team of supervisors. The results for the integration into collaborative research show that the longstanding interest of the supervisor had a significant impact on the time to the doctorate in both groups: being less integrated in his or her interests was lengthening the time to the doctorate in both groups. Also, for students outside the RTG being less integrated in exchange/cooperation with other experienced scientist was lengthening the time to the doctorate.

(b) *Results for the life sciences*

Results for the students inside and outside the RTG in the life sciences reveal that the individual characteristics have a similar influence on the time to the doctorate like in the arts and humanities/social sciences. Again, it becomes clear that being female and the number of dependents have a significant and very strong effect on lengthening the time to the doctorate for students inside the RTG. Additional activities besides working on the dissertation did not much influence the time to the doctorate; only for students outside the RTG who were also involved in participating in further research projects we find that this activity was lengthening their time to the doctorate significantly. For both groups also the organisation of supervision mattered: Inside the RTG single supervisors or intradisciplinary teams were impeding the completion of the doctorate compared to interdisciplinary teams. Outside the RTG we find a contrary effect: here students with single supervisors or intradisciplinary teams were completing faster. Being integrated into collaborative research did not play a role for both groups of students, only for former doctoral students inside the RTG it

Additional publications during doctoral studies		Actively participating in conferences during doctoral studies		Participating in further research projects during doctoral studies		Teaching during doctoral studies		Integration into collaborative research		Cooperative research project		Interest of supervisor		Work with other PhD students		With other experienced scientists	
Yes	-1.459	3.560	-0.772	7.622*	-4.634*	1.126	10.263	-21.638*	Yes	4.218*	6.780*	-3.569	-4.058	0.108	0.338	-2.265	12.878*
Yes	-11.218**	2.856	0.000	0.000	-19.642*	0.597	-5.915	52.571**	Yes	5.099*	1.137	0.926	8.540*	3.645*	3.635*	5.443*	12.212*
Yes	-0.364	3.011**	2.767*	1.193	0.829	-1.436*	0.482	0.479	Yes	0.617	-0.892	1.517	1.339	-0.409	-0.547	0.574	-0.864
Work with other PhD students	0.105	0.742	-1.924	-1.201	-1.867*	1.300*	-1.285	-1.001	Interest of supervisor	1.737**	1.323*	-0.406	0.954	1.084*	0.581	1.783*	1.860
With other experienced scientists	-0.364	3.011**	2.767*	1.193	0.829	-1.436*	0.482	0.479	Cooperative research project	0.617	-0.892	1.517	1.339	-0.409	-0.547	0.574	-0.864

*p ≤ 0.05; **p = 0.000
Data Source: CHEPS PhD-Survey 2005, own calculations

Table 3.10 (continued)

becomes clear that being less integrated into exchange with other experienced scientists was lengthening the time to the doctorate.

(c) *Results for the natural sciences*

For the students from the natural sciences it becomes clear that individual characteristics were less important for the time to the doctorate than for students from the other disciplinary fields. In particular we find that being female did not have a significant impact. For students inside the RTG the number of dependents was affecting the length of doctoral studies significantly but also less dramatically than for students from the other disciplinary fields. While the descriptive results on the conditions of doctoral training discerns that these were mostly similar for students inside and outside the RTG the GLM shows that these conditions are influencing the time to the doctorate in a different way. Students inside the RTG benefitted from the additional publications, active participation in conferences and being less involved in the collaboration with other PhD students. These factors shortened their time to the doctorate in a significant way. Participation in further research projects as well as being less integrated into the research interests of their supervisors were factors that were lengthening the time to the doctorate. For students outside the RTG only participation in further research projects was shortening the time to the doctorate. Here having an interdisciplinary team of supervisors, participating in further research projects or being less integrated into an exchange with other PhD Students were impeding the completion of the doctorate.

(d) *Results for engineering*

Comparing former doctoral students inside and outside the RTG from engineering shows that regards the individual factors that being female had a lengthening effect on the time to the doctorate. The educational background of the doctoral students was also important; in particular a good final grade of the first study was shortening the time to the doctorate to a high extent. The organisational structure of supervision had a significant impact for doctoral students inside the RTG. Students who had one supervisor only or an intradisciplinary team of supervisors completed the doctorate faster than students having an interdisciplinary team of supervisors. Some other conditions of doctoral training had different effects in both groups. While teaching and active participation in conferences were shortening the time to the doctorate for the students inside the RTG, they were impeding completion for students outside the RTG. These students on the other hand were completing faster when they also had additional publications during their doctoral studies.

Finally, comparing the disciplinary fields for the effects of the specific characteristics of the RTG we find that these had a very different impact on the time to the doctorate within these different fields. In particular innovative forms of supervision did not shorten the time to the doctorate. Moreover, having an interdisciplinary team of supervisors was even lengthening the time to the doctorate inside the RTG. Also, the effects of integrating the doctoral students into collaborative research were less strong than expected and for some disciplinary fields even counterproductive. Most

striking is the strong effect of gender on the time to the doctorate which was found for students inside the RTG from three out of the four disciplinary fields. Being female and/or having a higher number of dependents during doctoral studies were factors that lengthened the time to the doctorate to a very high extent. Both factors did not have a significant impact on the time to the doctorate for students outside the RTG.

3.8 Conclusions

Returning to the main question of this paper we can state that the training conditions in the RTG did not contribute to a shortening of the time to the doctorate compared to the traditional doctoral training. The descriptive data shows that the conditions of training differed only slightly in some disciplinary fields while in other disciplinary fields, in particular in the natural sciences, training conditions were nearly similar. Also, the data on the time to the doctorate shows that students inside the RTG did not complete their doctoral studies faster than students outside the RTG. The comparison of the net time to the doctorate even shows that there is hardly any difference between the two groups. But the results also depict that students outside the RTG had to discontinue their doctoral studies more often and for a longer period than students inside the RTG.

Despite these only slight differences between both groups our GLM analysis revealed that the factors investigated above have a very different impact on the time to the doctorate in the two groups. Like in recent research on the time to the doctorate we can state that no dominant factor can be distinguished as lengthening or shortening the time to the doctorate. Rather, we find very different sets of factors for each of the disciplinary fields and also for the both groups.

Surprisingly, the special characteristics of the RTG, which have been introduced as innovation and sometimes even as an improvement of doctoral training when implementing the RTG were not very important compared to other factors. In some respects these factors were even lengthening the time to the doctorate. Also, the competitive selection of PhD students did not lead to 'better' results in terms of a shorter time to the doctorate.

Given these only slight differences in the conditions of doctoral training we therefore conclude that the RTG in the 1990s did not establish a complete new form of doctoral training. In practice RTG mostly took up central characteristics of traditional training and added new RTG elements to it. Mostly these newly added training elements were impeding the completion of the doctorate as they can be understood as add-ons for the majority of doctoral students inside the RTG. This explains why students inside the RTG actually needed the same time to complete their doctoral degree while being less burdened with additional tasks and discontinuations than students outside the RTG. Therefore we cannot conclude that as regards the time to the doctorate the doctoral training inside the RTG was more effective than doctoral training outside the RTG.

Table 3.11 Evaluation of supervision

	Arts and humani- ties/social sciences		Life sciences		Natural sciences		Engineering		Total
	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	Inside RTG	Outside RTG	
While choosing the dissertation topic	78	77	73	82	83	63	60	76	77
While working on the dissertation	70	66	65	62	70	74	65	56	67
While finalising the dissertation	71	74	73	65	78	75	68	74	73
While preparing the oral examination	71	80	75	62	74	69	70	80	73
n = 100 %	150	148	59	60	183	225	97	64	497
Quality of supervision^b									
... while choosing the dissertation topic									
Mean	2.4	2.5	2.6	2.4	2.4	2.3	2.7	2.8	2.4
Median	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.5	2.0
... while working on the dissertation									
Mean	2.4	2.6	2.5	2.7	2.1	2.2	2.9	2.6	2.4
Median	2.0	2.0	2.0	3.0	2.0	2.0	3.0	2.0	2.0
... while finalising the dissertation									
Mean	2.5	2.7	3.0	2.2	2.2	2.4	2.8	2.5	2.5
Median	2.0	2.0	2.0	2.0	2.0	2.0	2.0	2.5	2.0

... while preparing the oral examination

Mean	2.9	2.8	3.0	3.1	2.7	2.8	2.9	2.9	2.8
Median	3.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0	3.0
n	166	154	61	63	194	231	100	70	518

Support of supervisors^c

Mean	3.5	3.4	2.4	2.8	2.4	2.2	3.0	2.7	2.7
Median	3.0	3.0	2.0	2.0	2.0	2.0	3.0	2.0	2.0

... publication of intermediary results

Mean	3.3	3.4	2.1	2.6	2.0	2.2	2.6	2.2	2.6
Median	3.0	3.0	2.0	2.0	2.0	2.0	2.0	2.0	2.0

... contacting scientists in Germany

Mean	3.4	4.0	3.0	3.2	2.8	2.8	3.6	3.0	3.2
Median	3.0	4.0	3.0	3.0	3.0	2.0	3.0	3.0	3.0

... contacting scientists abroad

Mean	3.8	4.2	3.4	3.4	2.9	3.0	3.8	3.2	3.4
Median	3.0	5.0	3.0	3.0	2.0	3.0	4.0	3.0	3.0
n	166	154	61	63	194	231	100	70	518

Data source: CHEPS PhD-Survey 2005, own calculations

^a% of PhD students indicating an adequate number of supervisors

^bOn a scale from 1 = mainly productive to 5 = mainly unproductive

^cOn a scale from 1 = to a high extent to 5 = not at all

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Chapter 4 The Interplay of New Public Governance Dimensions and Their Effects on Academic Outcomes

The Example of PhD Education in Economics Departments in Continental Europe, England and the US

Peter Schneider and Dieter Sadowski

4.1 Introduction

The idea of a structured education of future researchers was established in the US long before any European countries initiated similar attempts in the early 1990s. The apparent success of US research universities in placing their PhD graduates in top research institutions worldwide highlights the success of their educational system (cf. Bonaccorsi in this volume). But there are some European universities who also achieve remarkable placement success. The question then is what the organisational and institutional conditions for success at producing recognised researchers are. The question is all the more important for economics, the subject we focus on, as at least here not only future, but also current knowledge production heavily depends on doctoral research (Fabel et al. 2002). In our study of governance regimes we look at the interplay of intensity of competition driven by external incentives – and of the degree of a centralised, non-collegial decision-making in departments and universities. Both mechanisms are closely connected. For example, ample financial resources are only conducive to a successful PhD education as long as they meet favourable organisational preconditions (Schneider and Sadowski 2010). Given the sometimes narrow perspective of New Public Management (NPM) promises and bench-marks (Clark and Ma 2005; Frackmann 2005; Gumpert 2005;

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