GERMANY

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INTRODUCTION

Germany has a binary system of higher education, consisting of a university sector and a nonuniversity sector. The university sector is by far the larger, attracting 1.8 million students. The nonuniversity sector is only a quarter this size (Baldauf 1998, p. 162). The basis of the current higher education system lies in the 1960s, but the traditions of earlier times are still very much present in the German doctoral system. Paramount in this respect is the unity of teaching and research.

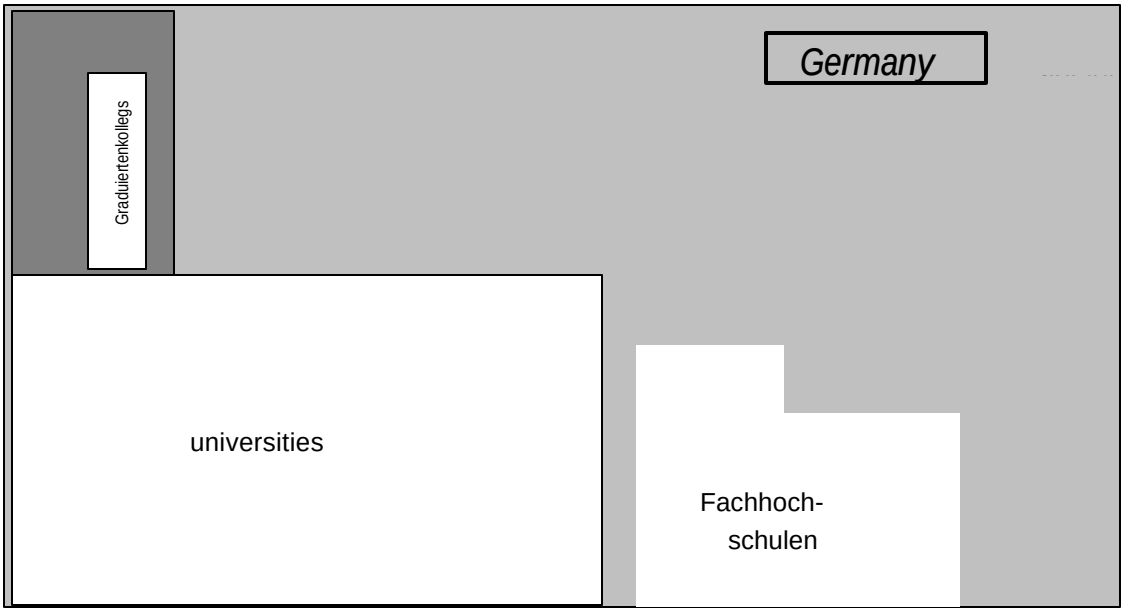
As opposed to the distinction commonly made between undergraduate and graduate studies, German university programs rather are divided into first degree programs and advanced, or postgraduate, degree programs. First degree programs have a formal duration of 4 to 4.5 years and lead to the *Staatsexamen*, *Diplom*, or *Magister*. After obtaining these degrees, graduates can continue their education in two ways: through specialized postgraduate courses leading to a variety of postgraduate certificates or by pursuing a doctorate degree. The doctorate is the highest academic degree in Germany. It can only be offered by universities. Another qualification beyond the doctorate can be obtained, although this is not considered an academic degree in its own right (Kouptsov 1994): the *Habilitation*. The *Habilitationschrift* gives proof of academic scholarship and should comprise a piece of original, independent scholarly work. The holder of a *Habilitation* qualifies for a professorship at a university.

In figure 1, a graphical overview of the German higher education system is presented. In this report, we address the doctoral stage.

TRENDS IN GRADUATE EDUCATION

It was in Prussia in the early 19th century that the idea of research training was grafted onto the context of a university. This began within a broader reform of ideas on teaching, learning, and research. A few high-ranked administrators, influenced by political events in France and by the German idealist philosophers, conceived the idea that a balanced development of state and society was only feasible with educated citizens (Gellert 1993, pp. 5-9). To achieve this aim, the university had to train students for civil jobs, in a neutral atmosphere of truth-seeking. Von Humboldt expressed the ideals of his time into plans for the foundation of a new university. In 1809, the University of Berlin was founded on the basis of Von Humboldt's principles; in the following years, other German universities reformed accordingly.

Figure 1. The higher education system



The ideal of the German university as it emerged at the beginning of the 19th century is summarized by Paulsen (1906, p. 520):

> Its principle was to be, not unity and subordination, but freedom and independence. The professors were not to be teaching and examining State officials, but independent scholars. Instruction was to be carried on not according to a prescribed order, but with a view to liberty of teaching and learning. The aim was not encyclopedic information, but genuine scientific culture. The students were not to be regarded as merely preparing for future service as state officials, but as young men to be trained in independence of thought and in intellectual and moral freedom by means of an untrammeled study of science.

In practice, these principles lent themselves to multiple interpretations (see Clark 1995, pp. 21-24). The orientation toward research led to increasing specialization and gradual departmentalization of universities into centers of specialized research. In the course of the century, the original Humboldtian doctrine with its broad humanistic orientation evolved at some places into a narrow intellectualism: an over-commitment to the advancement of knowledge (see Gellert 1993, pp. 9-11).

The institutional forms that were created for the advancement of science and breeding of scientists were the teaching-research laboratory and the research-oriented seminar (Clark 1995, pp. 24-30). The classic case of the first form is the laboratory of the chemist Justus Liebig, founded in 1826 in Giessen. Here, Liebig combined research and teaching in a way that attracted many advanced students with whom he was able to create a research environment in which innovative research was conducted. Its success motivated other German research universities to review their own training methods. Morrell (1990, pp. 51-64) points out that "the university laboratory provided for science an equivalent of the Renaissance artist's studio, in that it offered to apprentices induction into the scientific guild through pupilage in practical skills under a master-practitioner."

Another form in which research activity was combined with teaching was the research-oriented seminar. The classic and exemplifying model here is the Neumann seminar in physics established in Königsberg in 1834. Unlike other seminars of those times, Franz Neumann included "practical exercises in techniques of quantification, group review of problems, and innovative design of instruments" (Clark 1995, p. 27). The laboratories (later named "research institutes") and seminars were autonomous, relatively small, organizations headed by the chair-holding professor. These influential figures ran the institutes and seminars and were sovereign in their scientific pursuit. The institutes and seminars gave the German higher education system its esteemed reputation in the late 19th century.

The origins of German research training as described in the foregoing section have of course undergone substantial changes in the first half of the 20th century. Rapid industrialization, two world wars, and the transformation of an elite into a mass system of higher education are only a few examples of circumstances with a high impact on the higher education system. However, some of the original beliefs and institutions are still vital and reflected in doctoral training and research.

Freedom of learning has remained the paramount feature of German education and research, anchored in the Basic Law of 1949, which reads: "Art and science, research and teaching, are free."[1] Still surviving is the unity of teaching and research, which is expressed profoundly in the apprenticeship model of doctoral research: the *Doctorvater* who, in a one-to-one relationship, guides his student by way of learning by doing. The institutes form a distinct organizational characteristic of the German higher education system. Influential chair-holders function at the top of these hierarchically ordered organizations, where many doctoral candidates conduct their research. Furthermore, the seminars still exist, although they have been watered down to large-scale instructional seminars at the first degree level rather than at the doctoral level.

After World War II and up until the 1990s, individuals aspiring to a doctoral degree usually sought a junior research post. In 1989, 70 percent of doctoral candidates were employed in this way. Doctoral candidates in these positions combine their research work with teaching and other activities: this, on the one hand, provides them with professional experiences and skills; on the other hand, it lengthens completion times (Baldauf 1998). Research training at the doctoral level is not formally organized. German universities in the 1980s did "not offer doctoral programmes incorporating a minimum systematic institutional effort to qualify candidates further. It is entirely a matter of the individual master/apprentice relation between the candidate and 'his' supervisor whether he gets training and advice in his work and, if so, how much" (Huber

[1] Article 5, par. 3, as reported by Clark (1995), p. 52.

1986, p. 302). Enders (1996, p. 165) concludes that, in the 1990s, courses are increasingly being offered (for up to 50 percent of the junior staff working on a doctoral thesis), but that candidates usually perceive doctoral study as an informal learning process. In this respect, there are considerable differences across disciplines.

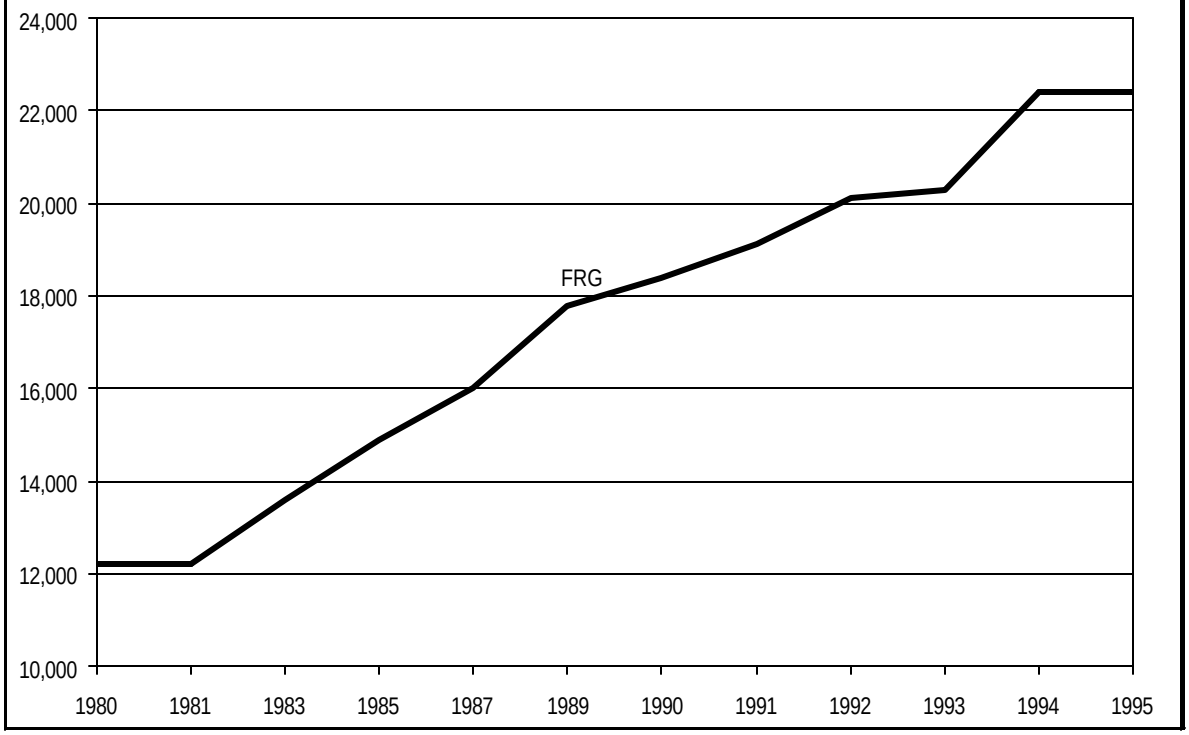
In the natural sciences, junior research posts are relatively numerous as (external) funds are more affluent. Those pursuing advanced research training usually participate in a research group at a university laboratory or an institute. These groups provide a more structured research environment. In addition to the one-to-one apprenticeship relationship, a larger group of researchers provide the doctoral candidates with the opportunity to interact more frequently and to find collegial support in their work. In this context, doctoral colloquia are commonly organized to give doctoral candidates the opportunity to present their work. Those working on a Ph.D. thesis in the social sciences and particularly the humanities miss such a research environment. Moreover, their supervision is often scant. These doctoral candidates "have little contact with universities or their supervisors; they mostly work at home" (Gellert 1993, p. 20).

The following figures show quantitative trends in German doctoral education. Note that only earned degrees are recorded in German statistics on doctoral training. Figure 2 shows the number of doctoral degrees awarded in the former Federal Republic of Germany (FRG). In figure 3, the number of awarded Ph.D. degrees are shown for the FRG, the former German Democratic Republic (GDR), and these two areas together (after 1994, these two areas are not presented separately in German statistics). Figure 4 presents the proportion of Ph.D. graduates in the various disciplines. Figure 5 shows the proportion of female Ph.D. graduates.

Doctoral Reforms

Basically, three broad developments have given an impetus to change to the German system of doctoral education (see Enders 1995,[2] pp. 247-51). First, degree programs were considered overloaded in terms of student numbers and years of study. In particular, the desire to educate students capable of doing scientific research was shifted from first degree programs to a more structured doctoral stage. Second, doctoral education itself was con-

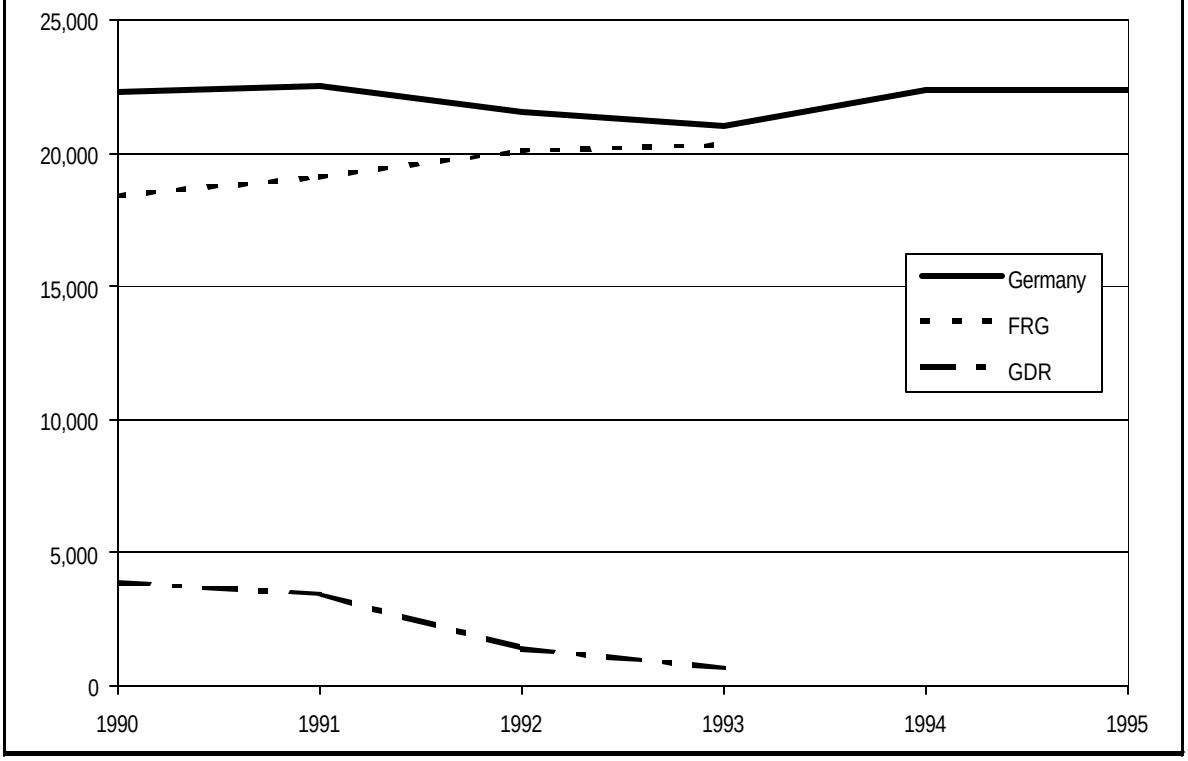
Figure 2. Ph.D. degrees awarded in the former FRG



SOURCES: Bundesministerium für Bildung, 1991-92 to 1996-97; and Statistische Bundesamt (1998).

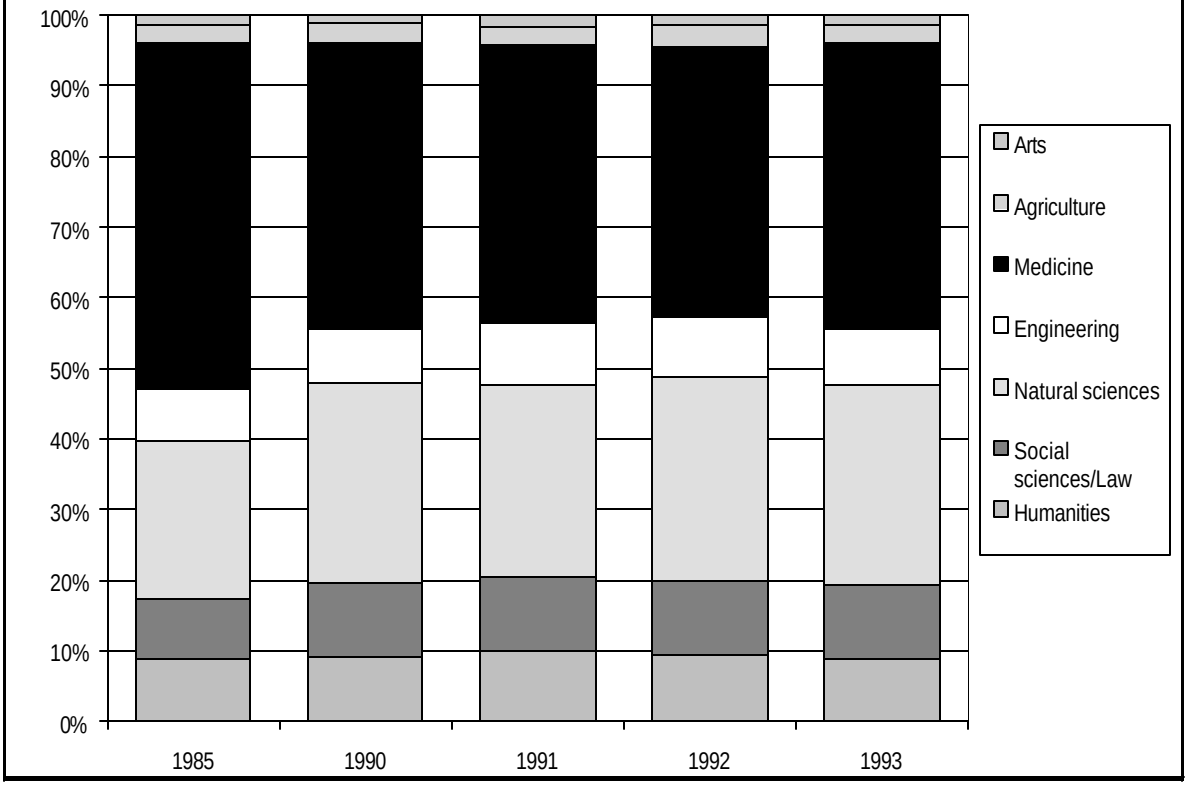
[2]This publication is a draft version of Enders (1996); the draft contains an analysis of the development of *Graduiertenkollegs* which was omitted in Enders (1996).

Figure 3. Ph. D. degrees awarded in Germany by region



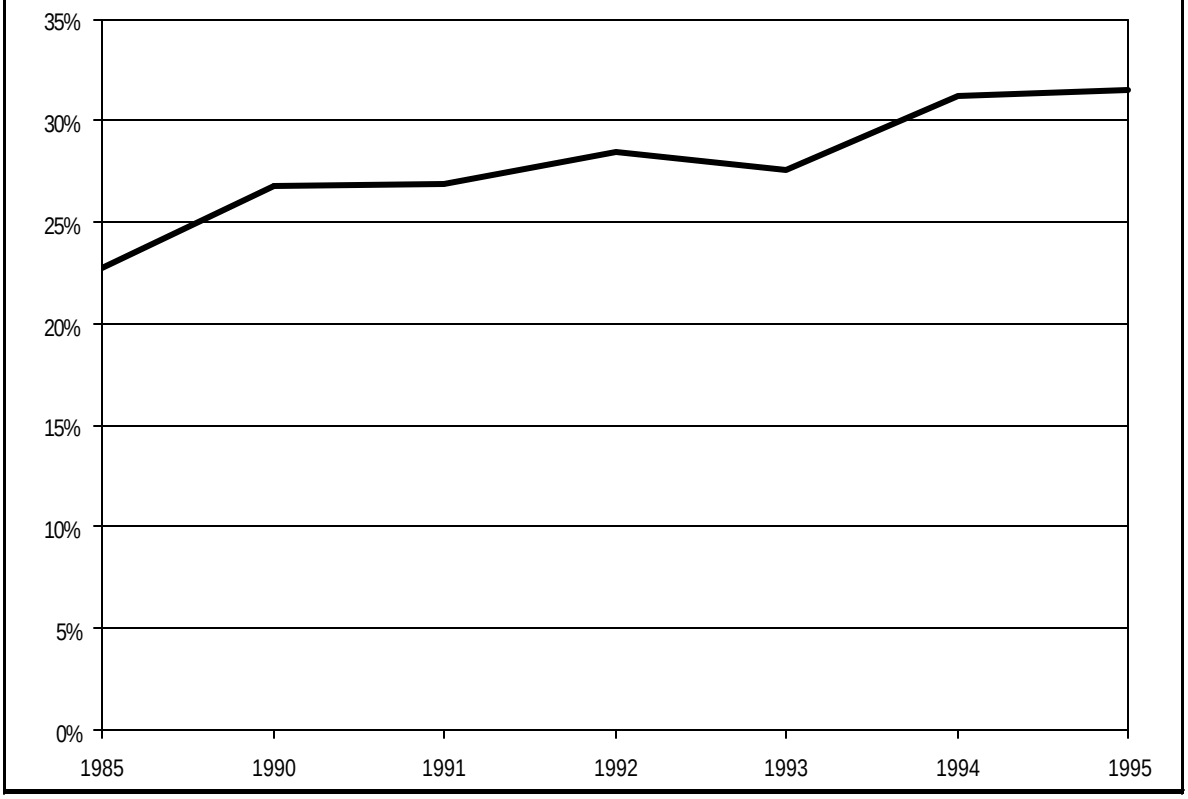
SOURCES: Bundesministerium für Bildung, 1991-92 to 1996-97; and Statistische Bundesamt (1998).

Figure 4. Breakdown of Ph. D. graduates by discipline



SOURCES: Bundesministerium für Bildung, 1991-92 to 1996-97; and Statistische Bundesamt (1998).

Figure 5. Proportion of female Ph. D. graduates



SOURCES: Bundesministerium für Bildung, 1991-92 to 1996-97; and Statistische Bundesamt (1998).

sidered to be in need of reform. Long times to degree and low completion rates, as well as the fear of not keeping pace with European developments in higher learning, stimulated the German government to initiate experiments with new structures of doctoral education in 1986 (see Nerad 1994a and De Wied 1991). Illustrative is the following statement by the Wissenschaftsrat (1988): "the present state of Ph.D. training is too long, too specialized and too isolated…" Third, research policy objectives—such as the creation of more interdisciplinary work, the stimulation of joint and transparent research planning, and the advancement of applied research—were also cited as reasons to reform graduate schools.

The most striking reform in German doctoral education regards the introduction of the system of graduate schools in 1989, the so-called *Graduiertenkollegs*. The introduction of the *Graduiertenkollegs* has not replaced the previous situation, but it certainly marks the beginning of a shift in German doctoral education.

The establishment of a system of *Graduiertenkollegs* can be considered one of the few top-down operations in the area of doctoral education. The German federal government does not have extensive power over higher education: it influences higher education primarily through budgetary policies (Frackmann and De Weert 1994, p. 141). More responsibilities over education exist at the level of the 11 *Länder* that must comply with the Framework Act on Higher Education (HRG). But doctoral education in the German higher education system has remained a rather autonomous area, only lightly touched on in the margin of research policies and reforms of first degree education. The HRG authorizes universities and faculties to establish their own regulations in accordance with the law of the *Land*. The government of the *Land* should formally approve such regulations (Baldauf 1998, p. 171). Although the idea of the graduate school developed in close cooperation with representatives of the academic world, the program for the stimulation of graduate schools is strongly backed and shaped by (semi-) governmental organizations.

In 1986, the Wissenschaftsrat, which is the leading advisory board in scientific affairs, recommended the creation of graduate schools. The German federal government and the *Länder* governments accepted the recommendations of the Wissenschaftsrat. In December 1989, the federal government and the governments of the *Länder* signed an agreement on joint support for *Graduiertenkollegs*.

The implementation of the entire program was assigned to the Deutsche Forschungs Gemeinschaft (DFG). The DFG describes the *Graduiertenkollegs* as: "university institutions devoted to the promotion of young graduates. They are designed to enable Ph.D. students to work on their theses within the framework of a systematic and mostly interdisciplinary program of study and in cooperation with various research groups working on allied topics" (DFG 1993, pp. 1-2). The DFG has formulated the following objectives for the system of *Graduiertenkollegs*, which are supported by the Wissenschaftsrat (DFG 1996b, p. 1; and Wissenschaftsrat 1994, p. 15):[3]

1. To engage doctoral candidates in joint research activities of the participating institutions and thus move beyond the supervision of a single professor.

2. To strengthen supervision both qualitatively and organizationally through guest professors, research seminars, and the like.

3. To prevent overspecialization through a research-oriented study program.

4. To stimulate mobility and other forms of support for Ph.D. candidates that might foster educative opportunities.

5. To provide participating professors with the opportunity to cooperate with qualified young academics.

6. To open up possibilities for institutions to choose priority areas for research and research training.

7. To contribute to the restructuring of higher education in general.

The first reactions to the idea of the *Graduiertenkolleg* were ambiguous. Some institutions feared they would lose their traditional monopolies. The faculties of philosophy, for example, were reluctant to alter the *Doktorvater* system; and the West German Rektorenkonferenz expressed its concerns regarding the financial consequences of the *Graduiertenkollegs* for universities. Other organizations feared that the schools would create a new elite education at the expense of high-quality first degree studies (Müller 1993, p. 31). Nevertheless, in several fields, a strong interest was expressed in establishing *Graduiertenkollegs*; by 1988, 15 experimental *Graduiertenkollegs* were established, funded by the Thyssen and Volkswagen Foundations. In 1990, the Programm zur förderung von Graduiertenkollegs officially started.

A proposal to establish a *Graduiertenkolleg* is drawn up by the engaged scientists and submitted to the respective departments of education in the *Land* where the university is established. After approval, the application is forwarded to the DFG. At the DFG, several academic committees assess the proposals on a number of criteria. If the proposal is approved and selected, then the *Graduiertenkolleg* receives funds for a 3-year period. After 3 years, the school is evaluated and may receive funds for another 3 years. The idea is that no further grants are provided after 9 years—the perceived full life-cycle of a *Graduiertenkolleg*.

Between 1990 and 1993, 512 applications for the establishment of a *Graduiertenkolleg* were submitted to the DFG; of these, 199 were granted. Three years later, in May 1996, the number of approved and established *Graduiertenkollegs* increased to 214, and in 1997 reached 280 (see table 1). Eventually, the number of *Graduiertenkollegs* is expected to stabilize at around 300, a number that is not only determined by financial reasons but also based in the idea that excellence in research and research training can only be achieved through selectivity. The DFG has therefore declined proposals to expand the number of *Graduiertenkollegs* to 600 or 1,000. In these *Graduiertenkollegs*, 4,936 *Nachwuchswissenschaftler*[4] and 2,401 professors were engaged. The number of doctoral candidates residing in *Graduiertenkollegs* is 4,385; of these, 2,500 candidates were funded by the DFG. In 1996, the average number of doctoral candidates participating in a *Graduiertenkolleg* was 21.

Table 1. Number of *Graduiertenkollegs* by discipline

Discipline	1993	1994	1995	1996	1997
Total	175	199	203	214	280
Social sciences and humanities	57	64	63	64	81
Biology and medicine	37	44	45	51	72
Natural sciences	61	69	72	71	90
Technical sciences	20	22	23	28	37

SOURCE: Deutsche Forschungsgemeinschaft. *Entwicklung und Stand des Programms "Graduiertenkollegs" (Graduate schools).* Bonn: DFG (1997), p. 3.

[3]Translation by authors.

[4]*Nachwuchswissenschaftlern* are doctoral candidates as well as postdoctorates.

PATTERNS OF SUPPORT

Funding for doctoral work is generally acquired in four ways: (1) in junior positions at universities, (2) in junior positions at research organizations outside universities, (3) through grants from various institutions, and (4) through self-support (Wissenschaftsrat 1995, pp. 23-36). These categories are detailed below.

- **Junior positions at universities.** Universities employ roughly 7 out of 10 doctoral candidates in junior positions (usually called *wissenschaftliche Mitarbeiter*). Often, the contracts are on a temporary basis, and doctoral candidates may complete several of these contracts during their doctoral work. Mainly because of the growth in contract research, the number of *wissenschaftliche Mitarbeiter* grew between 10 and 15 percent in the 1990s (Baldauf 1998, p. 169). Salaries vary from DM1800 to DM2000 for part-time contracts and from DM3000 to DM3200 for full-time contracts (after taxes and health insurance payments).

- **Junior positions at research organizations outside universities.** Research institutions outside the universities employ another 4,500 doctoral candidates, usually on 3-year contracts.

- **Various grants.** Doctoral work is also funded by grants. Around 8,500 stipends are provided by a number of organizations. The most important of these are mentioned here. The *Länder* grant around 2,500 stipends yearly (*Graduiertenförderung der Länder*). The DFG funds around 2,300 through its graduate school program (discussed earlier). A number of other institutions, such as political parties, churches, and trade unions (*Begabtenförderungswerke*), provide around 2,700 doctoral grants under strict conditions. The level of the scholarships varies, but the stipends provided by the DFG are DM1400 (DM1700 for technical subjects).

- **Self-support.** About 1 out of 10 doctoral candidates is believed to prepare a dissertation without any of the above-mentioned types of funding (Wissenschaftsrat 1995, p. 36).

Table 2 and figure 6 present the proportions and absolute numbers of doctoral candidates using the various sources of support.

Table 2. Sources of support in 1995 (estimated)

Source of support	Percent	Number
Total	100	63,000
Junior staff at universities	70	44,000
Junior staff at research institutes	7	4,500
Grants *lander*	4	2,500
Grants DFG	4	2,300
Grants *begabten*	4	2,700
Grants other	2	1,000
Self-financed	10	6,000

SOURCES: Wissenschaftsrat (1995), pp. 23-36 and Baldauf (1998), p.169.

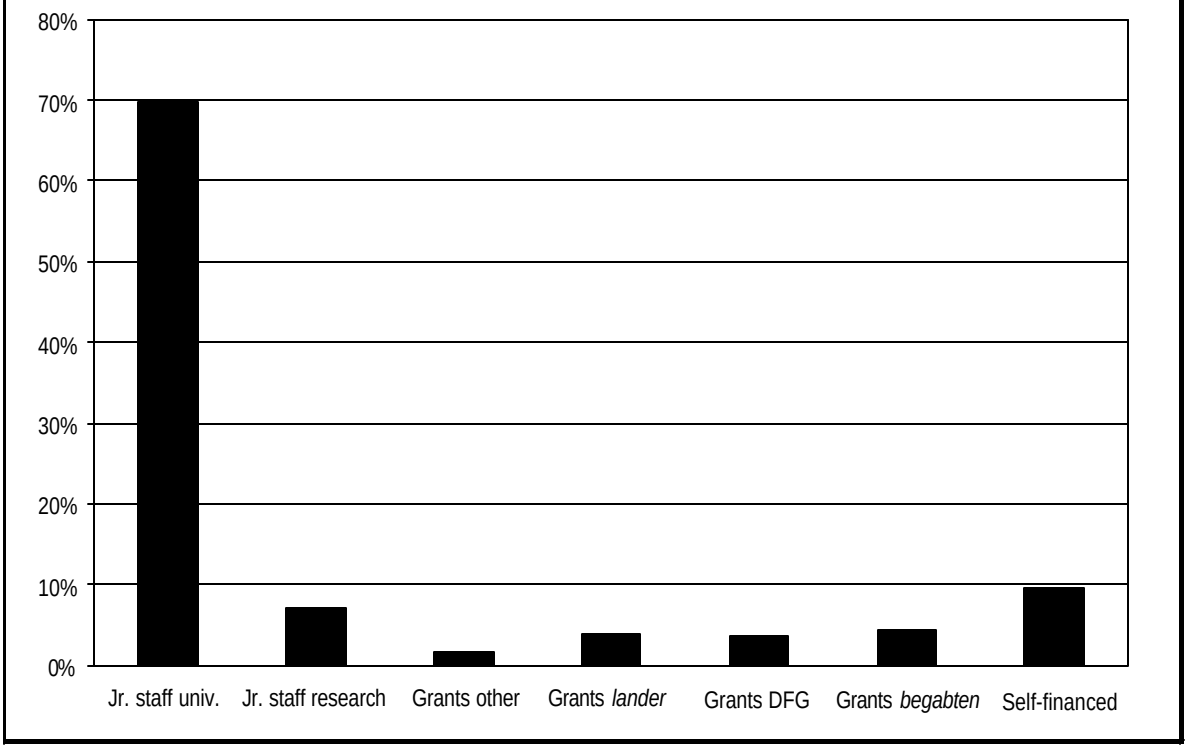
There are considerable differences in both the sources and levels of support for doctoral candidates. The majority of Ph.D. candidates in junior positions are involved in research, teaching, and contract work. They gain valuable professional experience throughout their doctoral work. A disadvantage of this situation, however, is the lengthening completion times that occur due to the dovetailing of doctoral studies and professional work (Baldauf 1998, p. 170). In this regard, work at research institutions outside universities provides a more favorable environment: around 70 percent of the candidates here complete a dissertation in 3 years. At these institutions, doctoral work is more closely supervised and thesis-related, and candidates are well funded for their work (Nerad 1994a).

Another area of concern is the difference between DFG stipends and alternative sources of support, which seems to discourage student participation in *Graduiertenkollegs*. This contrasts strongly with the goal that *Graduiertenkollegs* should attract the most talented candidates. In a study on the institutionalization of graduate schools in Germany, a respondent commented on this issue (Bartelse 1999, p. 147): "Of course, we would all like the best students to enroll in our programs. But in a number of disciplines, it is not a matter of strict selection. The grants of the DFG are relatively low, which makes it difficult to attract doctoral candidates."

EMPLOYMENT PATTERNS

Investigations into the labor market situation of doctoral degree-holders are few. Baldauf (1998) mentions that most studies are small scale or date back to the mid-1980s. There is a strong need for research into this area, and, as a matter of fact, the Wissenschaftlichees Zentrum für Berufs- und Hochschulforschung at the University of

Figure 6. Sources of support in percentages for 1995 (estimated)



SOURCES: Wissenschaftsrat (1995), pp. 23-36 and Baldauf (1998), p.169.

Kassel is conducting a research project on this issue. For quantitative information on employment patterns, we must await the outcomes of this study.

The material available on the labor market situation of Ph.D.s in Germany suggests a mixed picture. Depending on the discipline, the orientation of the individual doctorate-holder will be toward an academic research position, industrial research position, or job in policy and management. Outside academia, the doctorate seems to be esteemed. The number of doctoral degree-holders in top positions in German businesses is disproportionate, reflecting the high status of the doctorate in the German private sector. Several authors indicate that doctoral degree-holders will increasingly move out of the university sector. A study on junior staff working on their doctoral theses concludes that:

> Data show that the academic work and further qualifications of doctoral staff cannot be interpreted as the preparation for an academic career, but must also be interpreted as preparation for future employment outside higher education. The majority of doctoral staff do not intend to continue an academic career and…nearly all of these junior staff members in all fields expect that they will have to leave their university and the area of higher education (Enders and Teichler 1994, p. 31).

The issue of the labor market position of Ph.D.s is rather controversial (Baldauf 1998, p. 176). Even within the broad discussions of the *Graduiertenkollegs*, the subject is barely touched upon. The *Graduiertenkolleg* is meant to prevent doctoral candidates from conducting their work in isolation and specialization. But despite the introduction of more breadth, the labor market orientation of doctoral research in a *Graduiertenkolleg* remains focused on the university and research. As such, no challenge to the existing situation is imposed. There is no explicit broader labor market perspective required for the establishment of a school. A representative from the Wissenschaftsrat commented on this (Bartelse 1999, p. 148): "Currently, the issue of a broader employability perspective is slowly gaining ground in the discussions on doctoral education. However, I do not believe that it was on our minds at the outset of the system of *Graduiertenkollegs*."

PATTERNS OF INTERNATIONAL MOBILITY

Doctoral education has always been international, and the area now known as Germany has been an important place for research training. In medieval times, students traveled all over Europe in search of knowledge and a good education. Throughout the course of history, these journeys sometimes abated due to political tensions or for protectionist reasons. But during the heyday of the German research universities, voyages for knowledge were commonplace. In reaction to these travels, doctoral programs were established on the other side of the Atlantic to keep young American scholars home.

In the post-war decades, international exchange often took place on the basis of personal contacts between individual professors. Recent visions of the European Union and of several European governments see these exchanges as insufficient (Blume 1993). The scope of European Community action in the field of education is defined in article 126(1) of the Maastricht Treaty (EU 1992): "The Community shall contribute to the development of quality education by encouraging cooperation between member states, while fully respecting the responsibility of the member states for the content of teaching and the organization of education systems and their cultural and linguistic diversity." Efforts to cooperate in the area of research training so far focus on mobility of researchers, particularly through the Training and Mobility of Researchers program, which is part of the European Commission's Framework Programmes. There have been suggestions to create a European doctorate[5] and to establish international, or rather, European centers for research training. As yet, however, these suggestions have not led to more extensive forms of cooperation in the area of doctoral training.

Another initiative to foster international exchange in the area of doctoral training involves a letter of interest signed between Belgium, Denmark, France, Germany, and the Netherlands in January 1996. These countries have committed themselves to support the exchange of doctoral candidates and inform each other on developments regarding doctoral programs and graduate schools.

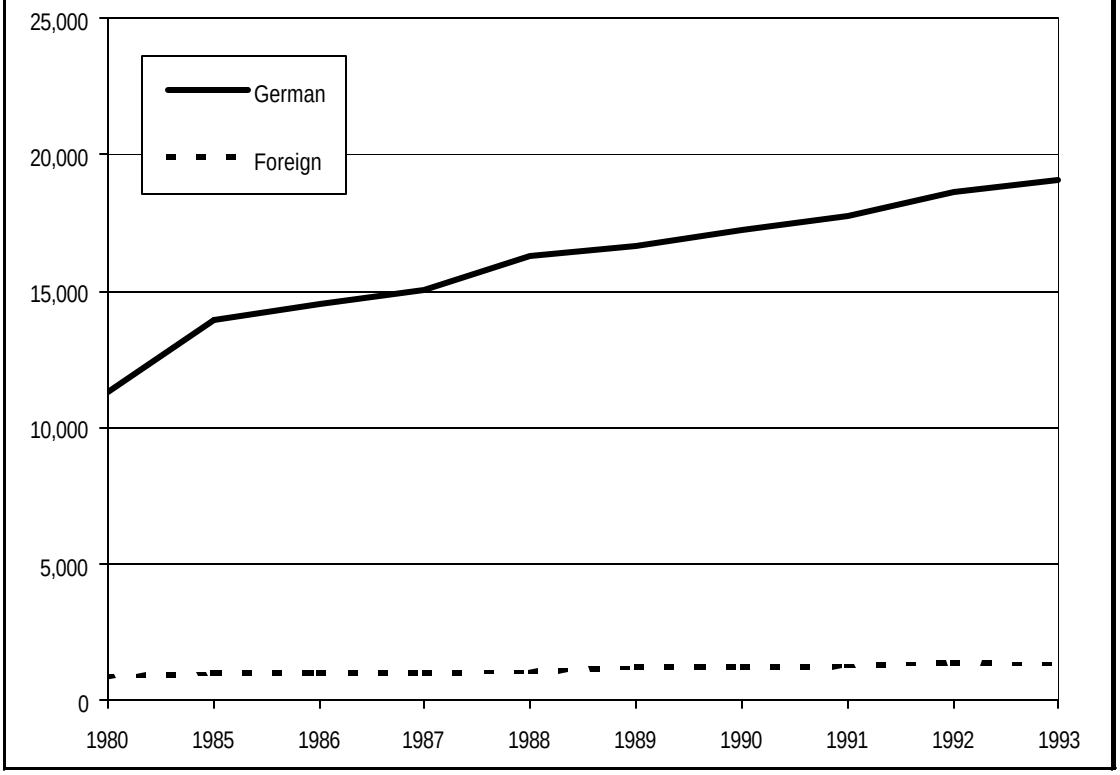
The data available for Germany on international mobility in doctoral education and citizenship of doctoral candidates are scant. Figure 7 presents the absolute numbers of doctoral graduates with German citizenship, as compared to the number of doctoral graduates with foreign citizenship. Figure 8 reflects these data in percentages. A gradual increase of foreign doctoral degree recipients can be observed (from 5.5 percent in 1990 to 6.5 percent in 1993).

Through the *Graduiertenkollegs*, the internationalization of research and research training is supported by funding. The *Graduiertenkollegs* regard joint international projects and the exchange of doctoral candidates and research staff as important aspects of their function (DFG 1997). In 1995, 67 *Graduiertenkollegs* (33 percent) were involved in these international activities; by 1996, the number had risen to 81 *Graduiertenkollegs* (37 percent); and in 1997, to 133 *Graduiertenkollegs* (47.5 percent). The majority (53 percent) of these projects are with West European partners (53 percent); in 23 percent of the cases, cooperation is with U.S. or Canadian partners; 15 percent involve cooperation with Eastern Europe; and 9 percent with other countries.

[5] See EC (1995). The European doctorate will be accorded under the following conditions:

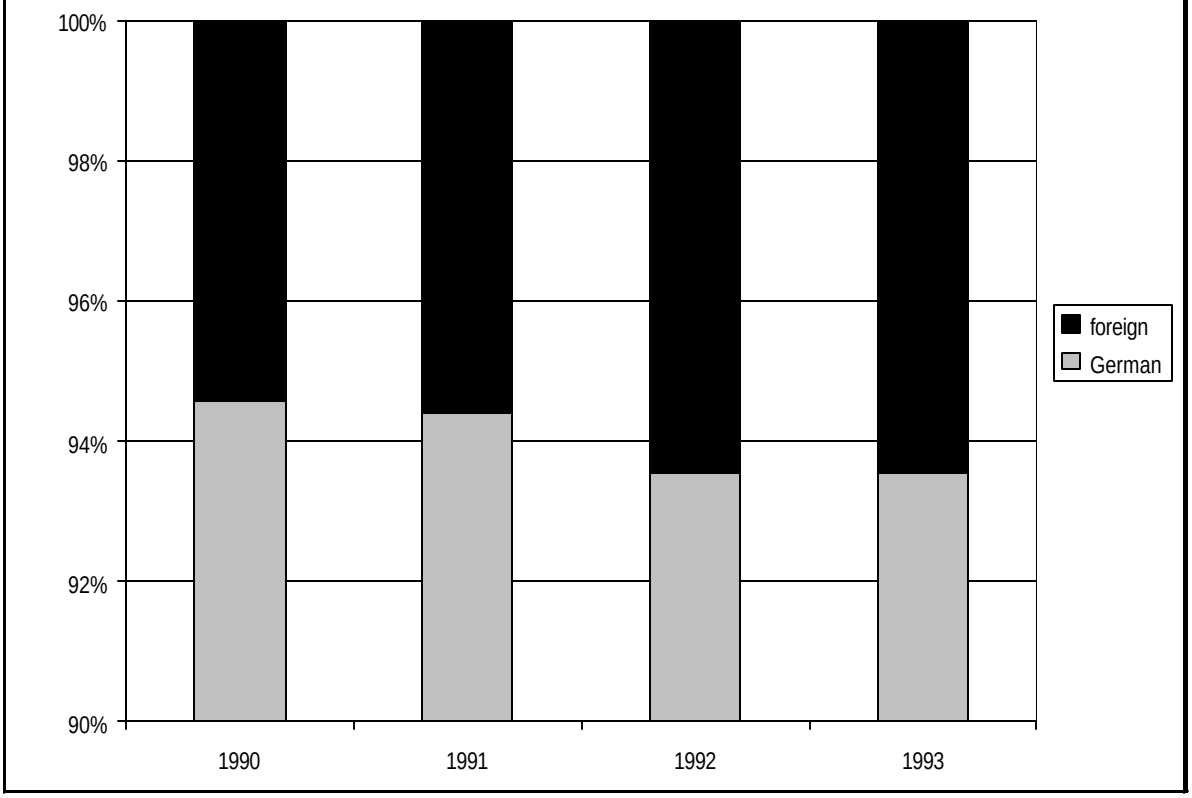
- If at least two professors from two higher education institutions of two European countries, other than the one where the Ph.D. thesis will be defended, have given their judgment.
- If at least one member of the jury comes from a higher education institution in European countries, other than the one where the Ph.D. thesis will be defended.
- If part of the defense takes place in one of the official languages, other than the one(s) of the country where the Ph.D. thesis will be defended.
- If the Ph.D. thesis has been prepared partly as a result of a period of research of at least one trimester spent in another European country.

Figure 7. Number of German and foreign citizen doctoral degree recipients



SOURCE: Bundesministerium für Bildung, 1991-92 to 1996-97.

Figure 8. Percentage of German and foreign citizen doctoral degree recipients



SOURCE: Bundesministerium für Bildung, 1991-92 to 1996-97.

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