

# EUROPEAN REGION

# 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.

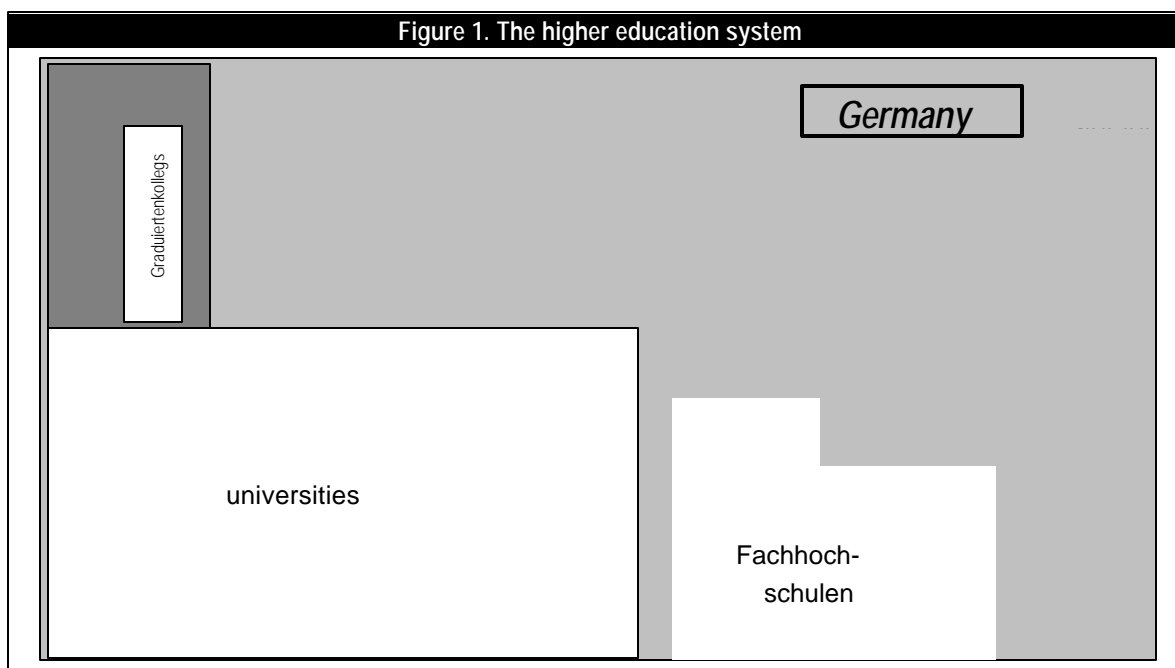
As opposed to the distinction commonly made between undergraduate and graduate studies, German university programs rather are divided into first degree programs and advanced, or postgraduate, degree programs. First degree programs have a formal duration of 4 to 4.5 years and lead to the *Staatsexamen*, *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.



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 untrammelled 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.”<sup>1</sup> Still surviving is the unity of teaching and research, which is expressed profoundly in the apprenticeship model of doctoral research: the *Doctovater* 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

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<sup>1</sup>Article 5, par. 3, as reported by Clark (1995), p. 52.

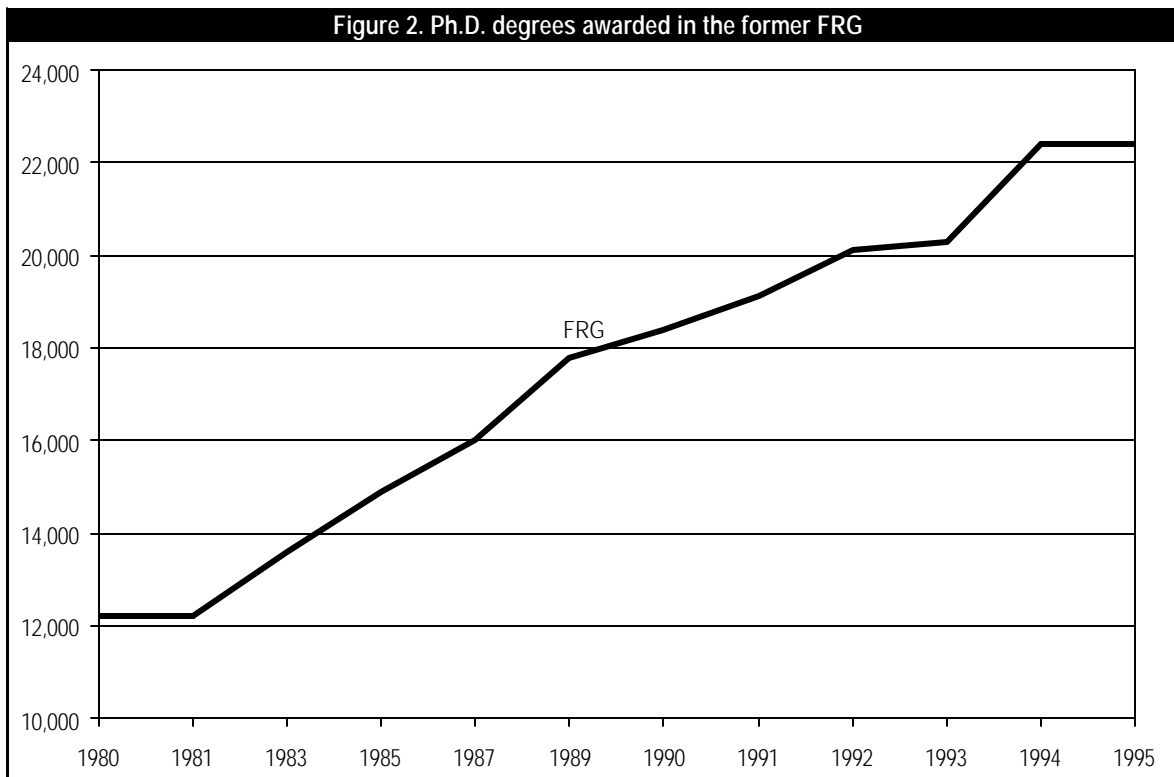
1986, p. 302). Enders (1996, p. 165) concludes that, in the 1990s, courses are increasingly being offered (for up to 50 percent of the junior staff working on a doctoral thesis), but that candidates usually perceive doctoral study as an informal learning process. In this respect, there are considerable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

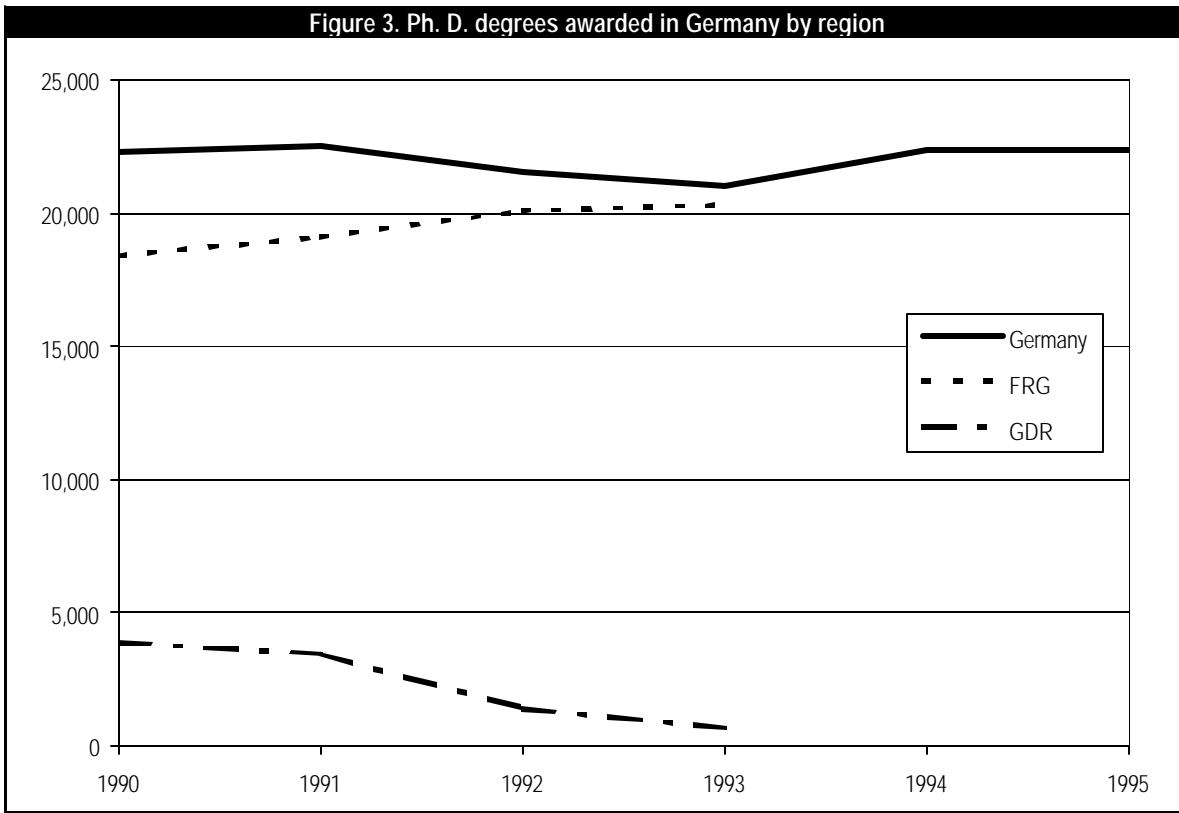
Basically, three broad developments have given an impetus to change to the German system of doctoral education (see Enders 1995,<sup>2</sup> pp. 247-51). First, degree programs were considered overloaded in terms of student numbers and years of study. In particular, the desire to educate students capable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



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

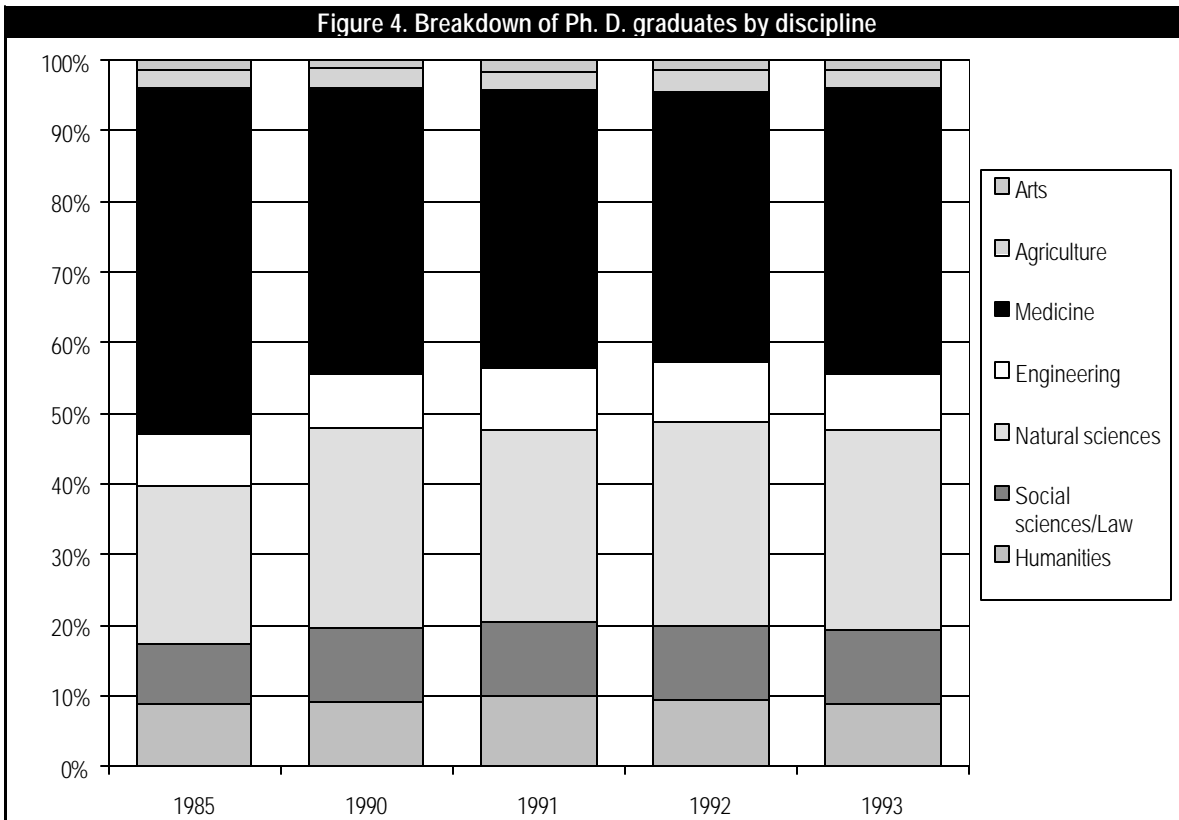
<sup>2</sup>This publication is a draft version of Enders (1996); the draft contains an analysis of the development of *Graduiertenkollegs* which was omitted in Enders (1996).

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



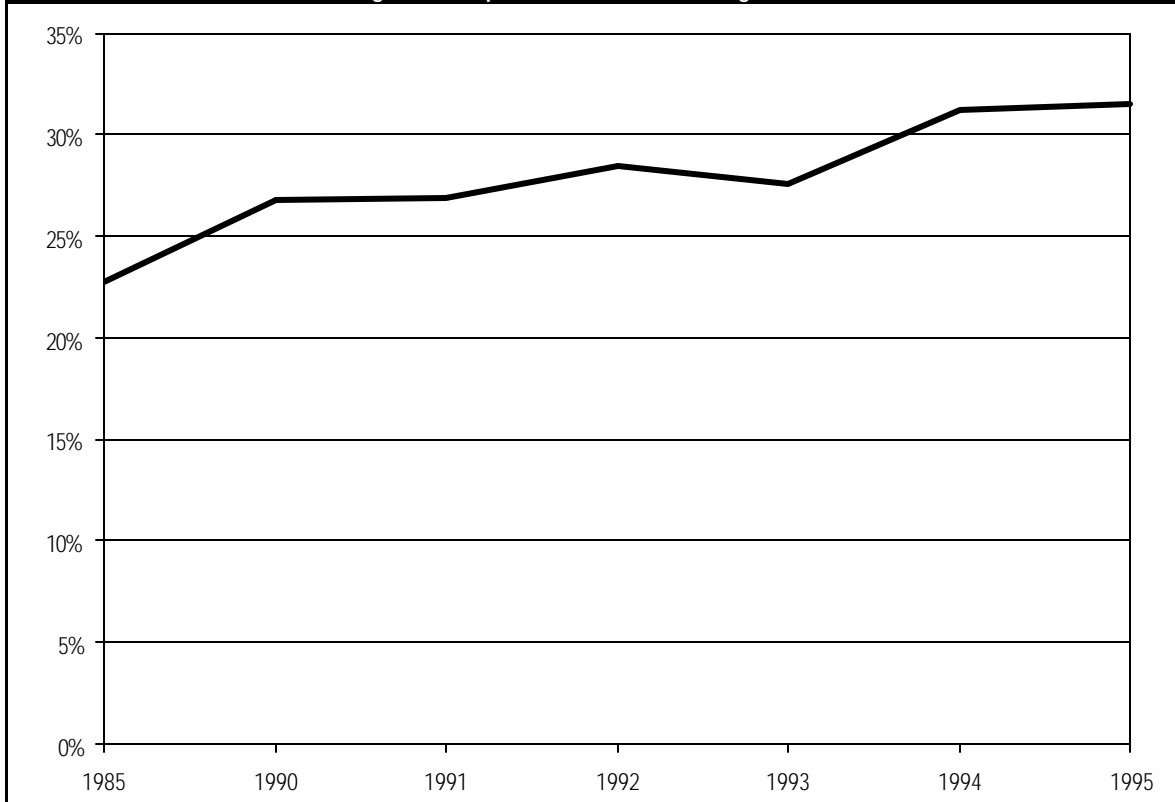
SOURCES: Bundesministerium für Bildung, 1991-92 to 1996-97; and Statistische Bundesamt (1998).

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 Forschungsgemeinschaft (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):<sup>3</sup>

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*<sup>4</sup> 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.

<sup>3</sup>Translation by authors.

<sup>4</sup>*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 <i>lander</i> .....	4	2,500
Grants DFG.....	4	2,300
Grants <i>begabten</i> .....	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).

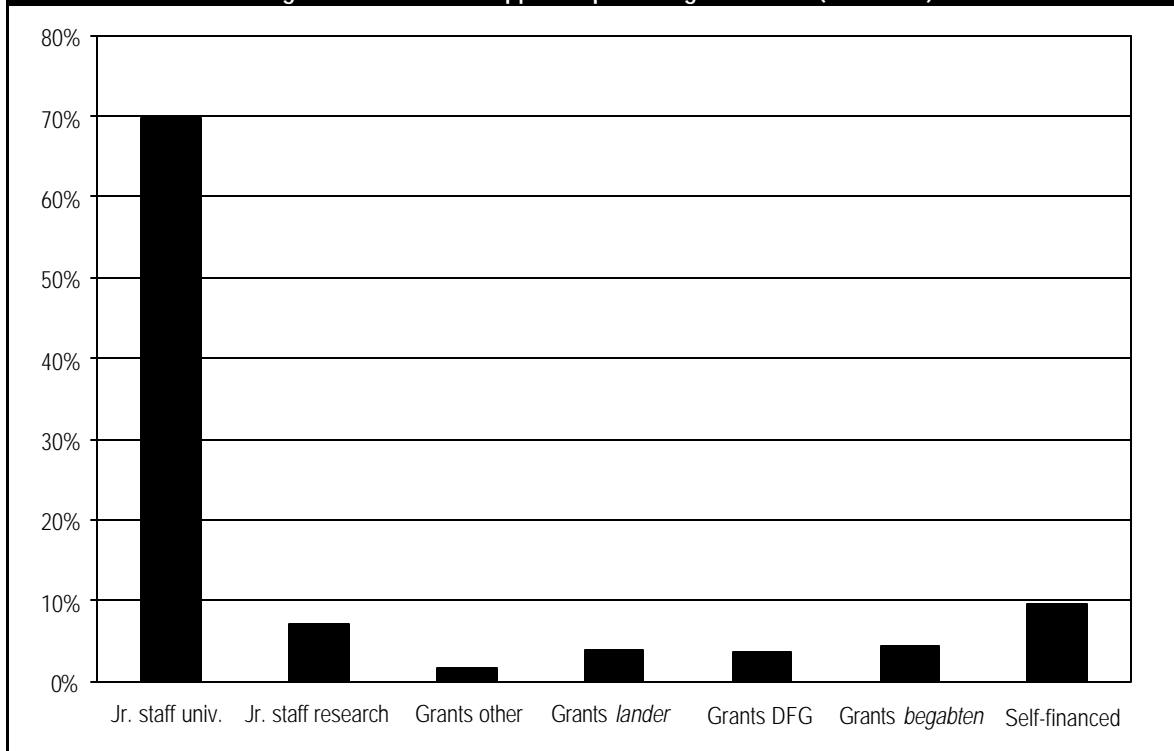
Another area of concern is the difference between DFG stipends and alternative sources of support, which seems to discourage student participation in *Graduiertenkollegs*. This contrasts strongly with the goal that *Graduiertenkollegs* should attract the most talented candidates. In a study on the institutionalization 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 Wissenschaftliche 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<sup>5</sup> 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).

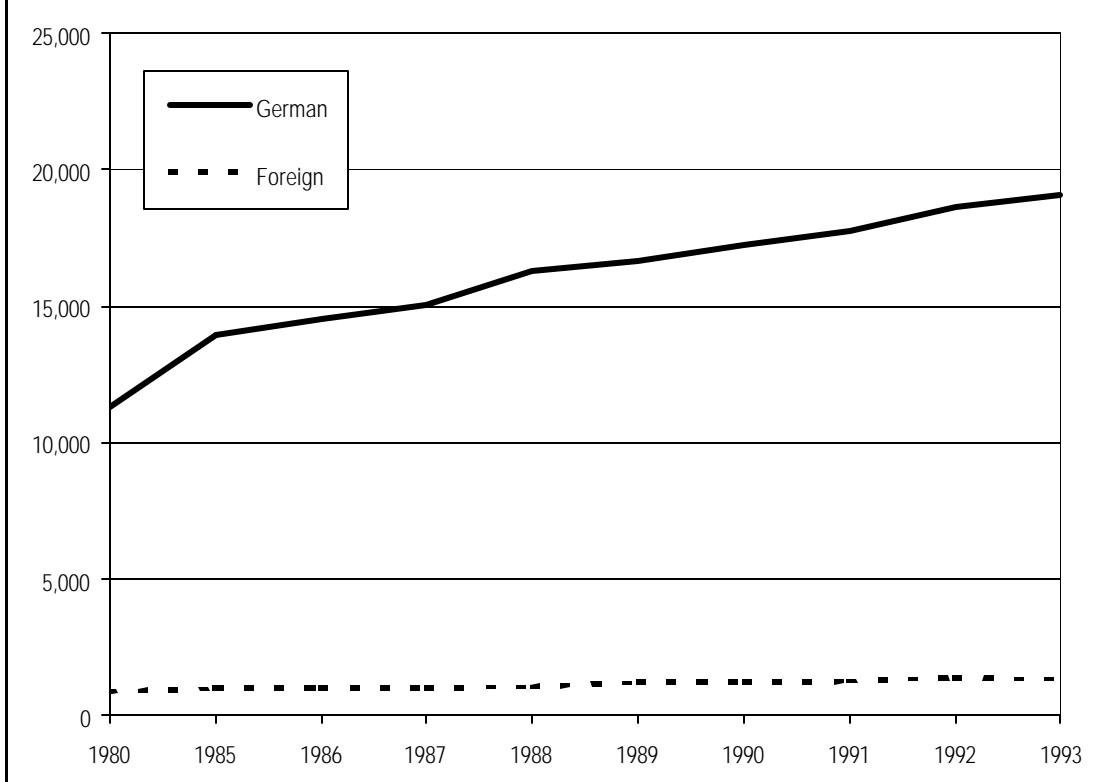
Through the *Graduiertenkollegs*, the internationalization of research and research training is supported by funding. The *Graduiertenkollegs* regard joint international projects and the exchange of doctoral candidates and research staff as important aspects of their function (DFG 1997). In 1995, 67 *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.

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<sup>5</sup>See EC (1995). The European doctorate will be accorded under the following conditions:

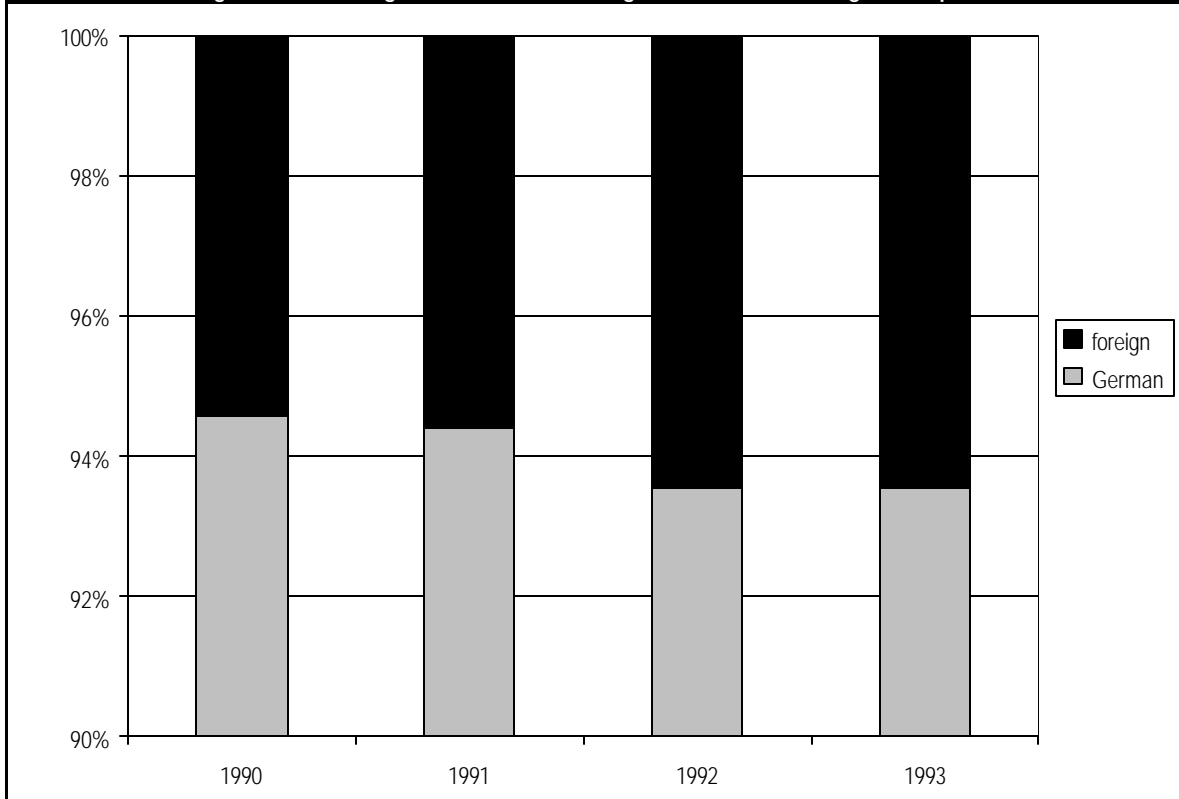
- If at least two professors from two higher education institutions of two European countries, other than the one where the Ph.D. thesis will be defended, have given their judgment.
- If at least one member of the jury comes from a higher education institution in European countries, other than the one 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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# NETHERLANDS

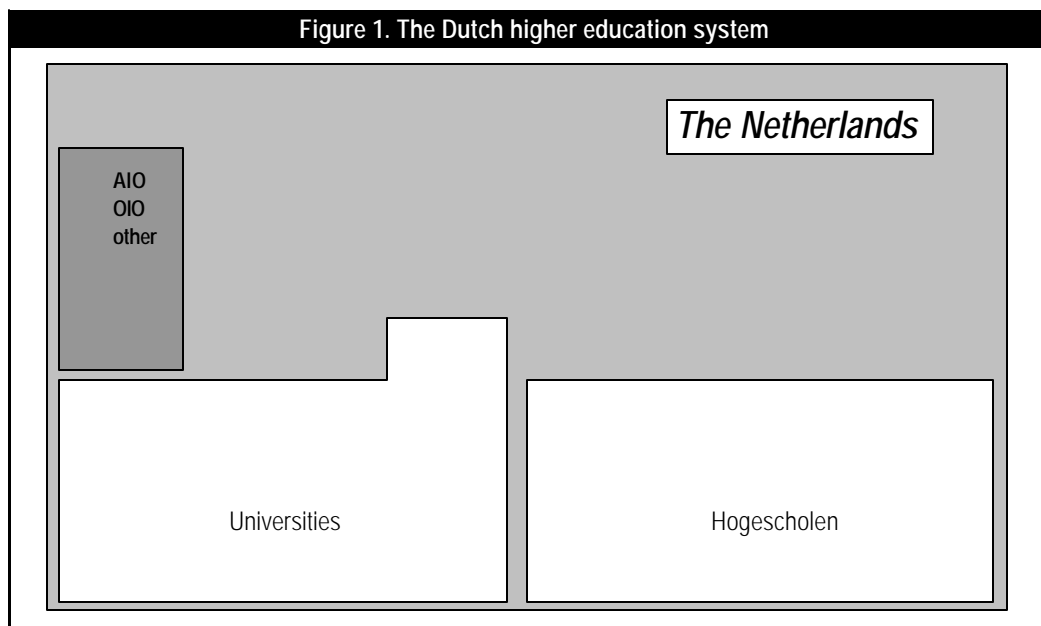
Jeroen Bartelse, Eric Beerkens, and Peter Maassen

## INTRODUCTION

The Netherlands has a binary system of higher education: a university sector and a nonuniversity sector primarily consisting of the *hogescholen*. In the *hogescholen*, advanced professional education is offered, comparable to that provided by the former British polytechnics. Around 80 *hogescholen* provide 4-year programs. Thirteen universities have been established that offer 4- to 5-year programs leading to the *doctorandus* degree. This degree roughly equates to the master's degree (Goedegebuure et al. 1994, p. 192). The *doctorandus* (which literally means "one who is entitled to become a doctor") degree is usually the minimal requirement for doctoral degree matriculation, although it is at the discretion of the universities to admit *hogeschool* graduates. Doctoral candidates may have a normal research or teaching position at universities or other research institutes, or they may hold a distinct doctoral position called the AiO or OiO.<sup>1</sup> At the initial postgraduate education level, both universities and *hogescholen* offer a variety of programs that lead to recognized degrees and generally have a market orientation. Figure 1 graphically presents the Dutch higher education system. In this report, we focus on the Dutch system of doctoral education.

## TRENDS IN GRADUATE EDUCATION

In 1644, the University of Utrecht was the first to employ the title *Philosophiae Doctor et Liberalium Artium Magister* (literally, doctor of philosophy and master of a liberal art) (Hesseling 1986, p. 25). In those days, a dissertation could be either of two types of products, each with a distinct academic tradition of defense. The first type was the *disputatio sub praeside*, where the candidate defended a set of printed propositions—later a short essay—under the direction of the professor. The second type was the *dissertatio pro gradu doctoratus*, where the candidate had to defend a thesis against the opposition of a larger academic audience of students, doctors, and magisters. The public defense often featured an extensive ritual, such as the one at the University of Leiden, which involved an elaborate processional, speeches lauding the successful candidate, a recessional, and a graduation dinner. At present, many of these rituals are still featured at Dutch universities. In the 17th and 18th centuries, the doctorate represented a "vocational" degree rather than a research degree; the holder was entitled to teach.



SOURCE: D. De Wied, Postgraduate Research Training Today: Emerging Structures for a Changing Europe, The Hague: Netherlands Ministry of Education and Science, 1991.

<sup>1</sup>These positions are described later in this paper.



In the course of the 19th and early 20th centuries, the process of obtaining the doctorate gradually changed. Although Dutch universities remained institutions of education (Wachelder 1992, p. 28), the research ethos gained importance. The functions of the degree changed under the influence of the research imperative of the German universities and laboratories. The doctorate became proof of one's capabilities to conduct independent research. In the sciences in particular, renowned scholars formed research groups where research was conducted in master-apprentice relationships. Although inspired by German universities, the Dutch doctoral system has developed within its own distinct societal and academic context, and is sometimes not comparable to the German example.<sup>2</sup>

After World War II and up until the 1980s, an individual pursuing a Ph.D. was usually employed as faculty staff—sometimes in the position of a research assistant, but also as regular (senior) staff. Apart from being a profound rite of passage, the writing of a doctoral dissertation was an informal endeavor. The process was not a fixed series of tasks dictated by university or government standards. Usually, it had the characteristics of the apprentice model: a doctoral candidate working under the guidance of a professor. Yet, unlike the German situation, the role of the supervisor or chair-holder was less authoritative. The writing of the dissertation was primarily the responsibility of the person desiring the degree. There were, of course, strong differences by discipline.

In the natural sciences, research was conducted in laboratories through collaborative effort. As early as the 1950s, preparation of a dissertation in the sciences had shifted from individual work to an educational process supervised by senior staff and a supervisor. This, together with a clear demand for qualified researchers from outside the university, led to the concentration of larger groups of doctoral candidates in university laboratories (Beenakker 1990, pp. 321-22). A representative from this field once described this situation as follows (Bartelse 1999, p. 91):

In the natural sciences there has always been a high degree of organization. The research team conducted a control function for the quality and proceedings of those working on a dissertation. The role of the pro-

fessor can be compared as a coach: he gives intense guidance to the doctoral candidates without actually conducting the specialized research himself.

In contrast to the natural sciences, the role of the dissertation featured less prominently in the social sciences and humanities. The disjointed organization of research in the humanities and social sciences stimulated individual undertakings. The dissertation was written in relative isolation, in addition to fulfilling teaching and research responsibilities. Caught between the demands of regular teaching and research loads and high ambitions, the thesis frequently became for these researchers a life-long *magnum opus*. In addition, and unlike the natural sciences, a clear labor market demand for doctors in the social sciences never developed. Hence, these fields did not experience a structuring influence on the doctoral process from the outside. The role of the supervisor was also different than in the sciences. The candidate's supervisor was actually more of a colleague who, once in a while, commented on the work in progress.

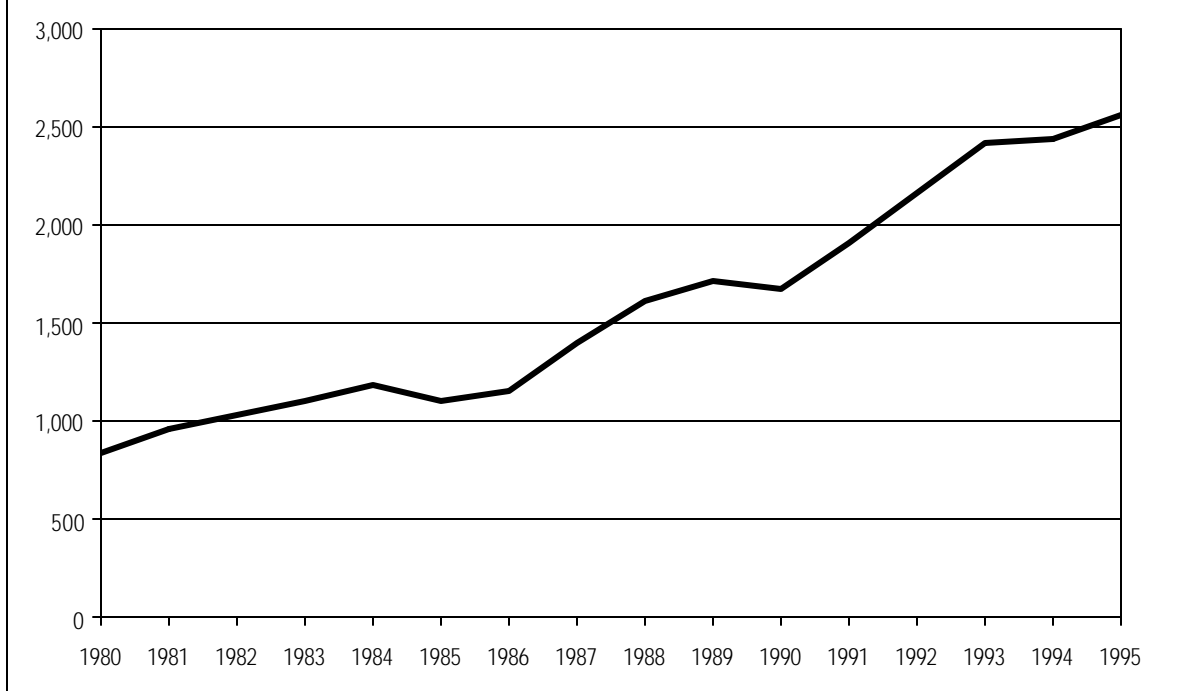
Since the 1960s, the Dutch government has moved into the area of research training. In a series of policy statements and laws, attempts have been made to adjust or reform doctoral training according to varying objectives. These are addressed in the next section. In the remainder of this section, we provide some quantitative trends on doctoral education.

As said, doctoral work can be conducted while serving in one of two junior positions that were created for doctoral candidates in 1986. Thus, a candidate can be an assistant in education (*assistent in opleiding*—AiO) if employed by a university, or a researcher in education (OiO) if employed by the Netherlands Organization for Scientific Research (NWO). Dissertations are also prepared while employed in normal research positions at universities or in a candidate's spare time. About this latter group of doctoral candidates, the available information is less detailed and less accurate. Figure 2 presents the number of Ph.D. degrees awarded between 1980 and 1995. The number of Ph.D. graduates has risen from 700 in 1980 to 2,600 in 1996. Since 1990—4 years after the introduction of the AiO system—the increase in awarded Ph.D.s is striking. Figure 3 shows a proportional breakdown of Ph.D. degrees by discipline.

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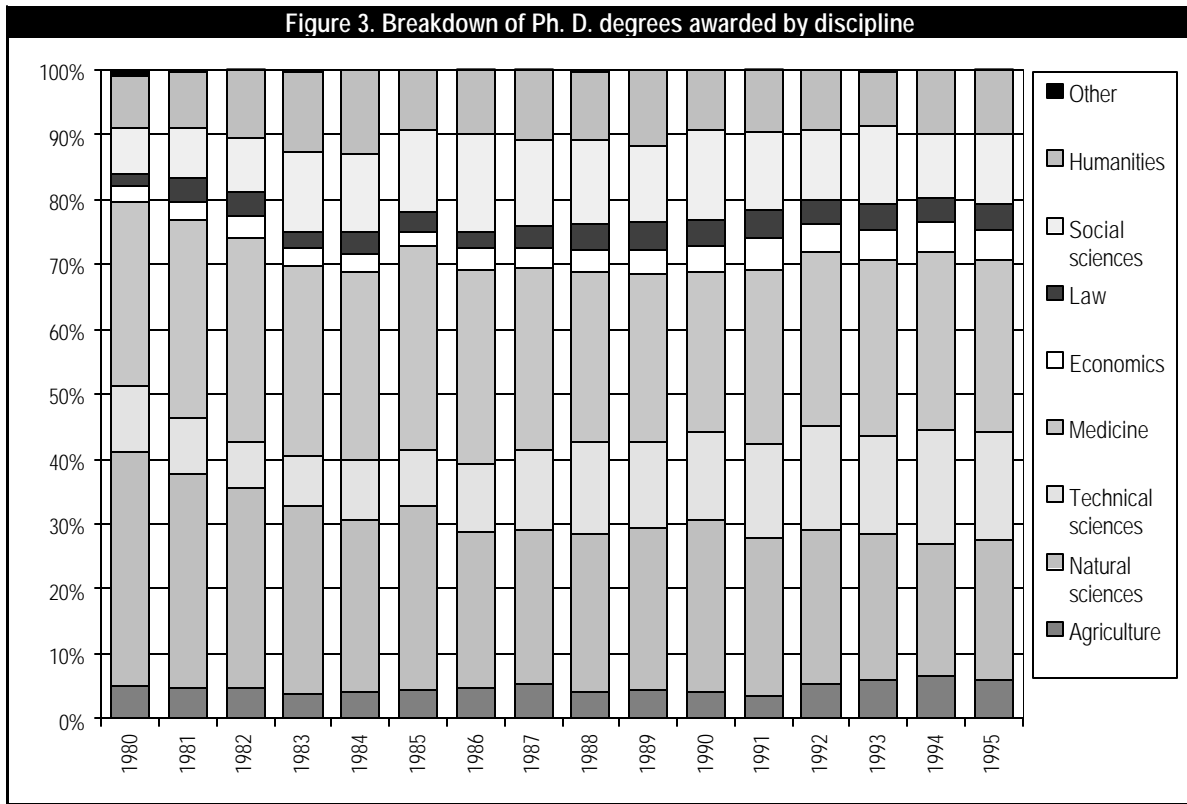
<sup>2</sup>Moreover, the German example did not provide an ambiguous model upon which to base a uniform research practice. For an elaboration of this point, see Wachelder (1992), pp. 27-22, and Clark (1995).

Figure 2. Number of Ph. D. degrees awarded, 1980-95



SOURCE: Vereniging van Samenwerkende Nederlandse Universiteiten (VSNU), *Kengetallen Universitair Onderzoek 1996/1997*. Utrecht.

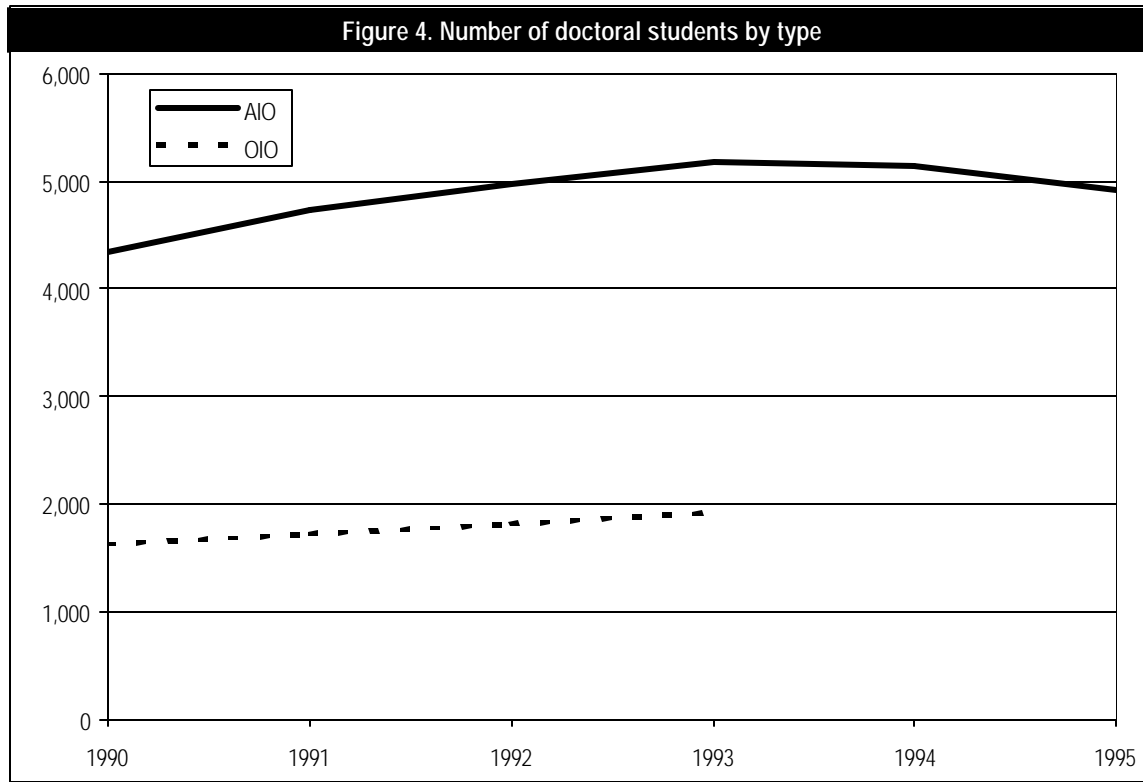
Figure 3. Breakdown of Ph. D. degrees awarded by discipline



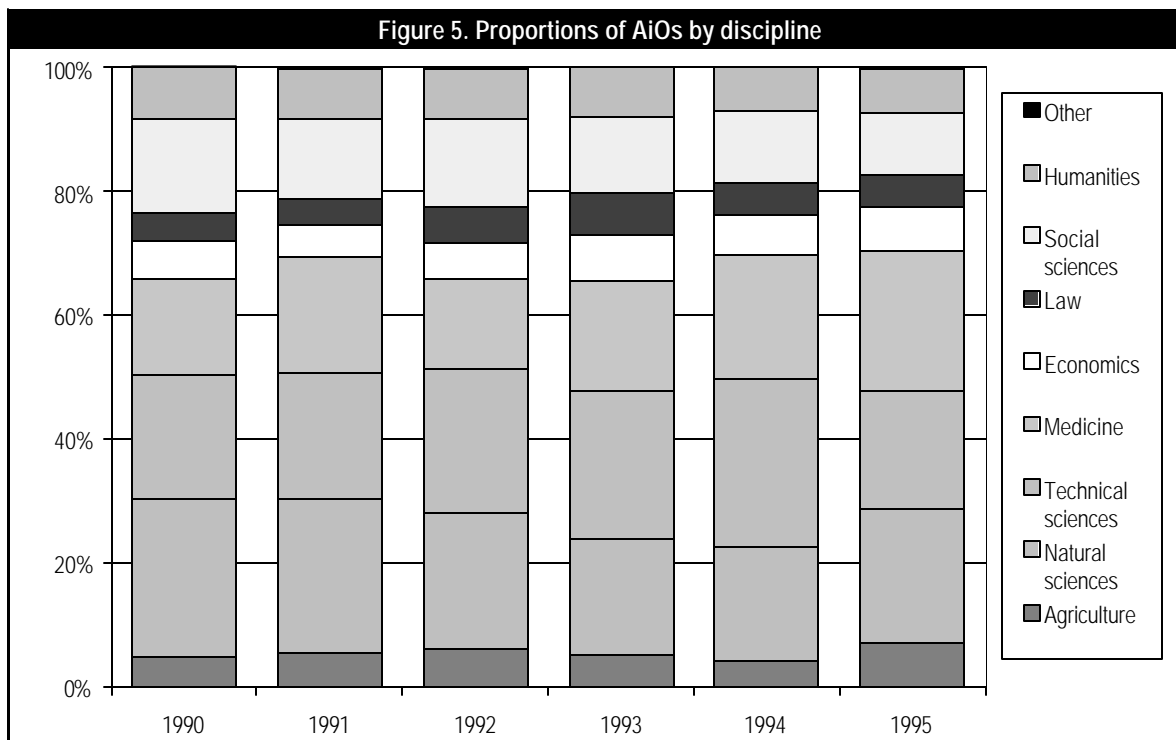
SOURCE: Vereniging van Samenwerkende Nederlandse Universiteiten (VSNU), *Kengetallen Universitair Onderzoek 1996/1997*. Utrecht.

Figure 4 presents the number of doctoral students by type (AiO and OiO). Figure 5 shows the proportion of AiOs in various disciplinary fields. Female participation in

doctoral education is reflected in figure 6: the participation of women in AiO positions has gradually increased from 29 percent in 1990 to 35 percent in 1995.

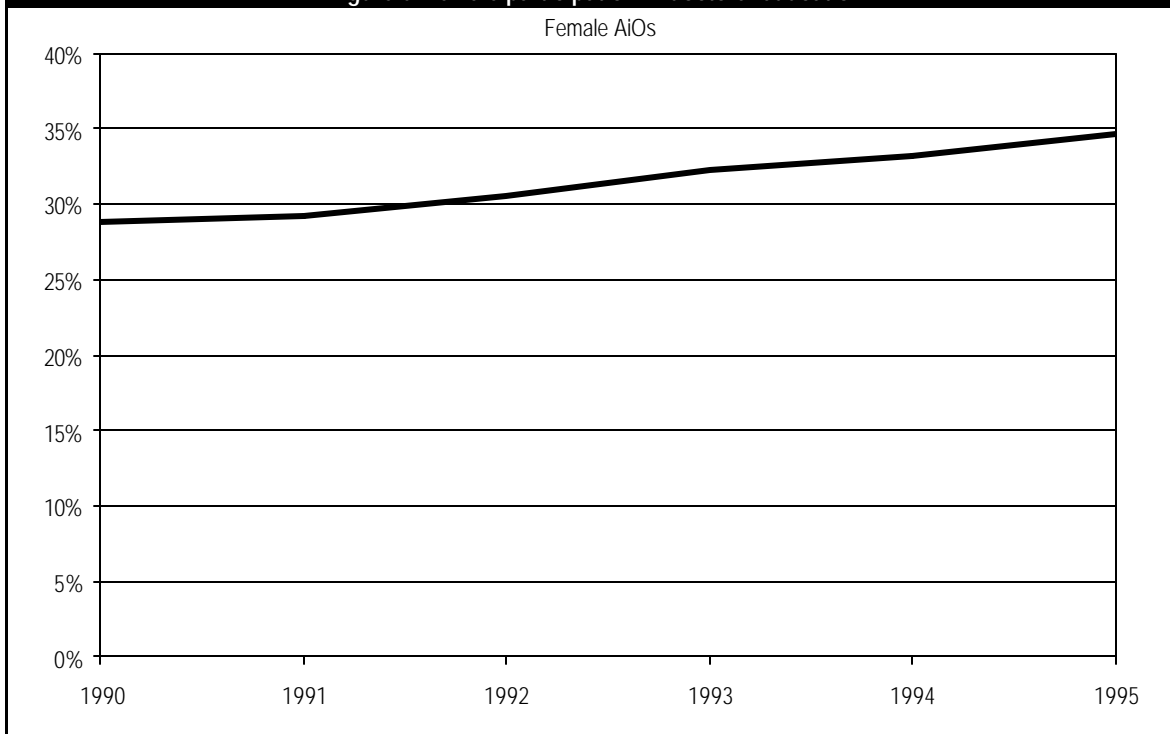


SOURCE: Vereniging van Samenwerkende Nederlandse Universiteiten (VSNU), *Kengetallen Universitair Onderzoek 1996/1997*. Utrecht.



SOURCE: Vereniging van Samenwerkende Nederlandse Universiteiten (VSNU), *Kengetallen Universitair Onderzoek 1996/1997*. Utrecht.

Figure 6. Female participation in doctoral education



SOURCE: Vereniging van Samenwerkende Nederlandse Universiteiten (VSNU), *Kengetallen Universitair Onderzoek 1996/1997*. Utrecht.

In the Netherlands, 7 percent of all Ph.D. candidates finish their degree within the nominal time of 4 years; after 5 years, this proportion is 35 percent; after 6 years, 55 percent. Eventually, 80 to 85 percent of Dutch candidates obtain a doctoral degree (VSNU 1996).

## DOCTORAL REFORMS

As mentioned in the previous section, government has moved into the business of doctoral education since the 1960s. It goes beyond the scope of this paper to describe the various policy developments that have occurred since then. We present here the main points of discussion that can be considered important impetuses to change in the doctoral system in the Netherlands.

## THE FUNCTION OF DOCTORAL TRAINING AND THE DOCTORATE

As university education massified and began to cater to a wide range of labor market positions, a discussion emerged to accommodate research training in a separate program. This implies a break with the traditional view, particularly in the social sciences and humanities, of the doctorate as a life-long masterwork. Instead, the doctorate becomes a proof of one's abilities to conduct indepen-

dent research. Still, the criteria used to judge a doctorate (an original piece of research usually written as a monograph) stem from the early tradition and not from this new conception of doctoral training.

## STRUCTURE AND DURATION OF TRAINING

Van Hout (1988) notes that two different models of doctoral training underlie the Dutch policy discussions. The first involves a 3- to 4-year period of work on a dissertation as a temporary staff member at a university. The second model consists of two stages, a 1-year student assistantship and a 2- to 3-year temporary assignment to write a dissertation. These models reflect disparate opinions as to what the time to degree should be. Until the introduction of the AiO system (see below), time to degree did not drop considerably, although the sciences were better able to restrict time to degree than the social sciences and humanities.

## THE EMPLOYED EDUCATIONAL CONCEPT

Two educational models can be distinguished in the history of Dutch doctoral education. The idea of learning by doing (the apprenticeship model) prevails in early policy documents and laws. The professional model features more explicitly in the policy documents of the 1980s. The

incorporation of coursework elements is motivated by the desire to shorten time to degree, to bring down attrition, and to be attuned to international developments.

## ACCESSIBILITY OF GRADUATE EDUCATION AND SELECTION OF CANDIDATES

As research training became a separate tier in university education, the issue of selection came to the fore. Usually, selection was considered to be based on individual competencies—although more random approaches have been proposed in the interest of greater egalitarianism (Sonneveld 1996, p. 34). The appropriate amount of first tier students to enter second tier education (more or less), and the selection procedures employed (open competition with equal chances or institutionally based competition less subject to objective criteria), were subject to discussion during almost all policy phases.

We here discuss two important, relatively recent, reforms in the Dutch doctoral system. The first regards the introduction of the AiO system in 1986; the second, the introduction of a system of graduate schools in 1991.

**AiO System.** Up until 1984, policy discussions on research training were almost a side effect of discussions on the organization of university education in general, rather than arising from perceived problems or systemic analysis of doctoral education. In 1984, a policy paper on doctoral education (Parliamentary Proceedings 1983-84, pp. 9-13) stated that the implementation of the second tier in general faced a number of problems. Concerns were expressed about the implementation of the so-called second tier as if it were a continuation of the first tier (i.e., first degree) education; about the lack of coherence in second tier program offerings; about inappropriate accessibility and selection mechanisms; and about the high expenditures in the second tier. With regard to research training specifically, the document expressed doubts about the value of the 1-year *onderzoekersopleiding* (the researcher-student) to the labor market. The policy paper suggested providing advanced research training by way of active participation of the candidates in university research and, to a limited extent (less than 25 percent), in teaching and administration. The idea was expressed of creating a separate employment position for the doctoral candidate. This position would comprise a 4-year appointment as a research trainee; this was the genesis of the above-mentioned AiO and OiO positions.

In the act that followed the policy, the AiO was introduced as a distinct academic position.<sup>3</sup> Regulations proscribing the position were published a year later. In summary, these comprised the following (Staatsblad 1986; see also Van Hout 1988, p. 15):

- The AiO has a temporary appointment in order to receive advanced scientific education.
- The objectives of the appointment are determined explicitly.
- The AiO usually holds his or her position for 4 years.
- The AiO conducts scientific research and records the results in a dissertation; the extent of this work, including instruction and supervision time, consumes at least 75 percent of his/her appointment.
- An instruction and supervision plan is drawn up for the AiO, and this plan is evaluated and adjusted after a year. In this plan is specified (1) what knowledge and skills are to be acquired and how, (2) who supervises the AiO, and (3) the number of hours the AiO is entitled to receive in personal supervision.
- After a year, an evaluation is conducted on the basis of the instruction and supervision plan. The university boards determine the evaluation procedures and criteria to be employed.
- At the end of the contract time, the AiO receives a certificate that reflects an overview of his/her publications, the education received, and his/her contributions to teaching.
- For the part of the appointment for which the AiO receives instruction and supervision (and thus does not conduct “productive labor”), he/she does not receive salary. This is specified for all AiOs in fixed percentages.

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<sup>3</sup>AiOs are employed by the universities. The Dutch Research Council [not the same term used earlier in text] also employs doctoral candidates, under slightly different employment conditions; these are called researchers in training [not the same term used earlier in text] (OiO).

Although it is still possible to write a dissertation outside the AiO system, the regulatory framework uniformly structures the position of the doctoral candidate for all disciplinary fields. Of note is the status of the instruction and supervision plan: instruction—in addition to “learning by doing”—now occupies an important, formal place in the process leading to the doctorate.

**Graduate Schools.** The AiO system as such did not provide adequate mechanisms to shape the second tier of higher education satisfactorily. In March 1990, the Dutch minister of Education and Sciences established the Committee Rinnooy Kan (named after its chairman). This committee was tasked with investigating the creation of research schools. On the committee’s establishment, the minister formulated five reasons for the development of research schools (Parliamentary Proceedings, 1990-91, p. 5; AWT 1994).

- There is a need for more structured research training. The introduction of the two-tier structure resulted in an accessible first tier limited in duration to 4 years, and a selective second tier that is expected to provide high-quality research training. As the AiO is expected to complete a dissertation in 4 years’ time, a structured and well-supervised training trajectory is necessary.
- The Dutch society and economy are developing into a knowledge-intensive system. As a consequence, there is a need, both in the private and public sectors, for highly educated people—not only for first-tier-trained individuals, but also for those who have received further (research) training.
- Although research has always been an internationally oriented activity, it is expected that the internationalization of research will continued to grow. Researchers will become more mobile, and excellent centers of research will attract these researchers across borders. This calls for a reinforcement of the Dutch infrastructure.
- In order to operate internationally, sparse and scattered research capacity must be concentrated and fragmentation avoided. It is necessary to generate critical mass through cooperation among universities and other research institutions.

- Current governmental arrangements do not guarantee selectivity, which is the prerequisite for ensuring quality of research, researchers, and research training. More emphasis on selectivity in the research system is needed.

As expressed in these five points, the reason to establish research schools not only lay in the desire to give shape to research training—although this can be seen as the original motive (Ritzen 1990, p. 315; and Hazeu 1991, p. 112). The research school was also seen as a vehicle for stimulating the emergence of research centers of excellence to operate on an international scale.

In its report, *Vorming in Vorse* (1990), the Rinnooy Kan Committee recommends a heterogeneous system of research schools, which would allow the different disciplines to retain their specific characters. The committee sees the university as the primary institution responsible for the research school. The universities serve as gatekeepers for the multitude of initiatives that may emerge at the faculty and departmental levels. Nevertheless, the committee also expects that a large number of research schools will develop (“between 50-150”). These schools should compete for resources from science foundations, industry, and European funds. Although the committee rejects to a large extent the concept of uniformity, it does formulate characteristics “that should be typical of all research schools” (Rinnooy Kan Committee 1990, p. 6). According to these characteristics, a research school should:

1. train individuals to become independent researchers;
2. be a high-quality research center;
3. be an independent organizational unit with budget responsibilities;
4. be affiliated with at least one university, but usually with more (university) institutions;
5. be of adequate size, so as to benefit from economies of scale;
6. carefully select research proposals and research assistants;
7. guarantee supervision and outstanding educational quality;

8. formulate a policy on postdoctorate positions;
9. have a good nexus with the first tier; and
10. be accountable and conduct evaluations.

The report explicitly reflects the initial call to create a satisfying structure of research training, but it also foresees the development of *topinstituten* (centers of excellence) as a means of securing high-quality research in selected areas. This latter aspect is captured in a proposal (the Snellius Program) to select two to three excellent research schools each year. These schools would receive extra financial support for a period of 5 years.

From the governmental standpoint, research schools are defined as centers of high-quality research in which structured training is offered to young researchers (Parliamentary Proceedings 1990-91). The reasoning behind this is that good training of researchers can only be conducted in an environment of high-quality research. The system of research schools should give impetus to high-quality research and education. Therefore, the minister decided to stimulate the development of a broad, yet selective, system of research schools, from which—eventually—should develop a limited number of centers of excellence. The government standpoint agrees in its main points with the advice of the Rinnooy Kan Committee. The government envisages a diverse system of research schools that share a number of common characteristics. The characteristics suggested by the Rinnooy Kan Committee are endorsed, but complemented on a few points. The minister acknowledges the importance of sufficient critical mass; he adds, however, that this consideration should not prevail over functional coherence. Therefore, the scale criterion is complemented with the condition that the school should have a sufficiently homogeneous training and research program. Another aspect in which the government standpoint adds to the committee's criteria regards the need for researchers in the labor market. In this respect, the minister stresses the importance of postdoctoral positions in a research school. Furthermore, the government stipulates that research schools should have budget responsibility; to this end, sufficient funds are to be allocated from the hosting universities to the research schools.

The government subscribes to the idea that research schools should be developed bottom-up. In order to allow this, yet to ensure quality, the government proposes a two-

step procedure for the establishment of recognized research schools. At the faculty level, initiatives are undertaken to establish a research school. The executive board of a university—or boards, if more than one university is involved—determines whether such an initiative complies with the aforementioned criteria and may give the research school a legal foundation as a research institute. Also, the university boards sign a contract as to the resources available for the school for a period of at least 5 years. The next step toward recognition lies outside the university context. The minister has delegated the task of formal recognition of research schools to the Royal Dutch Academy of Sciences (KNAW). For this task, an independent committee (organizationally linked to the KNAW) named *Erkenningscommissie Onderzoekscholen* (Commission for the Recognition of Research Schools—ECOS) has been assigned. ECOS has designed, on the basis of the 10 characteristics identified by the Rinnooy Kan Committee, a protocol designating a procedure with which research schools should comply in order to achieve formal recognition.

By March 1998, 119 research schools had been registered in virtually all disciplinary fields (VSNU 1998, p. 6). ECOS has recognized 107 of these schools (table 1). Although the system of research schools is envisaged to include all doctoral candidates, participation rates differ by field. There is also variation in the level of development of the schools across these fields. The total number of AiOs and OiOs participating in research schools is around 7,460 (as of March 1998).<sup>4</sup>

## PATTERNS OF SUPPORT

Dutch doctoral candidates are basically funded by three different sources, called first, second, and third money flows (Koelman, Vossensteyn, and Jongbloed 1998). The first flow is supplied by the Ministry of Education, Science, and Culture to the universities. The universities pay their academic staff and AiOs from these funds. The second flow of funds is allocated through the NWO. From these funds, the OiOs are paid. The third flow of funds is acquired through contracts with government, nonprofit organizations, private companies, charitable boards, and the European Community. In addition to these sources of support, doctorates can be financed by other employers or on their own.

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<sup>4</sup>Ten research schools did not submit quantitative information on this matter.

**Table 1. ECOS-recognized research schools in the Netherlands**

Discipline	1992	1993	1994	1995	1996	1997
Total.....	19	24	62	86	98	107
Agriculture.....	0	1	2	5	5	5
Economics.....	1	1	1	1	2	3
Health sciences.....	5	6	12	13	15	15
Humanities.....	1	1	6	11	14	14
Law.....	0	0	0	1	1	2
Natural sciences.....	7	8	21	25	27	28
Social sciences.....	1	2	10	15	17	18
Technical sciences...	4	5	10	15	17	22

SOURCE: Vereniging van Samenwerkende Nederlandse Universiteiten (VSNU), *Kengetallen Universitair Onderzoek 1998*. Utrecht.

Table 2 gives an overview of the sources of funding for doctoral candidates by money flow type (that is, the proportions of doctoral students using different sources of support). Table 3 shows the sources of support by field of study. These data should be taken as indicative rather than precise. The figures are taken from a study by Hulshof, Verrijt, and Kruijthoff (1996, p. 66) and reflect the characteristics of a survey population of 2,652 respondents.

**Table 2. Funding sources for doctoral candidates (percentages)**

Funding source	Total	AiO	OiO	Doctoral univ	Doctoral ext
1 <sup>st</sup> flow.....	46	81	6	47	9
2 <sup>nd</sup> flow.....	29	12	88	29	25
3 <sup>rd</sup> flow.....	27	21	8	31	17
Research inst.....	11	4	7	14	8
Other empl.....	7	2	4	3	39
Private.....	10	2	1	8	41
Total respondents...	2,652	862	455	1,086	248

SOURCE: Hulshof, Verrijt, and Kruijthoff (1996), p. 66.

**Table 3. Funding sources by field (percentages)**

Funding source	Agriculture	Natural science	Tech. science	Medicine	Economics	Law	Social science	Humanities
Total respondents...	108	868	327	447	137	85	401	278
1 <sup>st</sup> flow.....	37	42	47	36	69	81	58	52
2 <sup>nd</sup> flow.....	34	44	30	31	18	20	26	31
3 <sup>rd</sup> flow.....	33	16	35	41	12	6	20	8
Research inst.....	15	8	9	15	7	6	8	5
Other empl.....	5	5	11	6	8	1	6	4
Private.....	3	2	4	9	13	8	14	21

SOURCE: Hulshof, Verrijt, and Kruijthoff (1996), p. 66.

AiOs and OiOs receive salaries according to a special salary scale. In the first years of their appointments, salaries are cut back to compensate for the training they receive. Table 4 shows the monthly incomes for each year of their appointments (as of January 1, 1998).

**Table 4. Monthly incomes of AiOs and OiOs**

Year of appointment	Salary
1 <sup>st</sup> year.....	DFL 2.184,-
2 <sup>nd</sup> year.....	DFL 2.495,-
3 <sup>rd</sup> year.....	DFL 3.053,-
4 <sup>th</sup> year.....	DFL 3.899,-

SOURCE: Hulshof, Verrijt, and Kruijthoff (1996), p. 66.

Recently, the labor market situation forced universities to change their financial support of AiOs. In 1995, a number of Ph.D.s coming out of the AiO system could no longer be absorbed by the (academic) labor market. The universities were, however, obliged to make unemployment payments, which signified an important financial loss. Some universities decided to introduce Ph.D. grants instead of employment. This would discharge them of the responsibility of making unemployment payments. The results for doctoral candidates can be imagined: lower incomes, poorer benefits, and a feeling of being unappreciated for their work.

In the following years, however, the labor market situation for academics improved considerably. Almost all universities abandoned the grant system, which is now only in place for Ph.D. programs that aim to attract international candidates. Instead, as AiO positions became difficult to fill, universities have started to complement AiO salaries to a level comparable to that for other academic staff members. This phenomenon is particularly commonplace at the universities of technology.



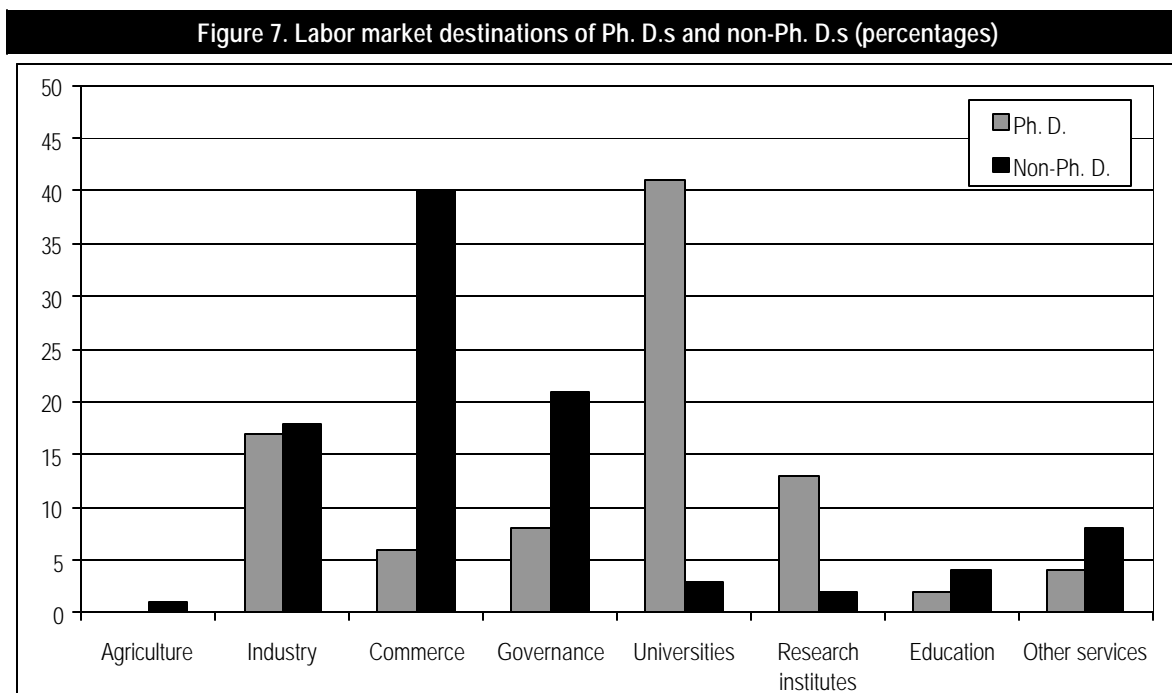
The recent developments in conditions of support illustrate the ambiguity that exists around this issue. AiOs and OiOs basically occupy a hybrid position at Dutch universities. On the one hand, they are students who receive training and supervision. On the other hand, they are considered the engine of scientific work. The financial support structure that was introduced in the framework of the AiO system basically reflects this hybrid position. But external forces, such as the labor market and the internationalization of postgraduate training, are increasingly putting pressure on this situation.

## EMPLOYMENT PATTERNS

The labor market position of doctoral degree-holders has been the subject of discussion since the mid-1990s. The Dutch academic labor market was perceived as being unable to absorb the increasing number of young doctoral degree-holders aspiring to an academic career. At discussion seminars on this topic, doctoral candidates tended to refer to themselves as a “lost generation.” In 1996, the Ministry of Education, Culture, and Science commissioned a study of the labor market situation for doctoral candidates (Hulshof, Verrijt, and Kruijthoff 1996).

Unemployment among doctorate-holders appeared to be less than among non-Ph.D.s: 6 percent versus 14 percent. For those Ph.D.s who obtained their degree through an AiO or OiO position, the unemployment figure is slightly higher: for AiOs, 9 percent; for OiOs, 12 percent (Hulshof, Verrijt, and Kruijthoff 1996, p. 51). This picture, as compared to the Dutch labor force overall, is not negative. However, employment conditions in terms of salaries and job security are generally less favorable for Ph.D.s.

Figure 7 shows the labor market destinations of Ph.D.s as compared to non-Ph.D.s. Clearly, most doctorate-holders find work in research and teaching positions at universities or research institutes (54 percent) or in industry (16 percent). There is, however, a move away from academia and into other positions. In 1983, 70 percent of Ph.D.s worked at universities; in 1995, only 38 percent were employed by a university. Although 70 percent of doctorate-holders have a research job—a figure that has been quite stable since 1983—most Ph.D.s exchange this type of work for another at some point along their career path.



SOURCE: Hulshof, Verrijt, and Kruijthoff (1996), pp. 65-66.

Ongoing discussions of the labor market for Ph.D.s have gradually become less informed by pressing labor market issues, which allows for a more fundamental discussion of the labor market itself. There is a move toward discussing the consequences of a broader labor market orientation for doctoral education. If replenishment of the professorate is not the main labor market objective for the Ph.D. degree, then how should doctoral education (which is still very much focused on academic work after doctorate award) meet the societal needs of highly educated professionals? This issue fundamentally affects the orientation of doctoral education: toward the market or toward academia (see Bartelse and Hulshof 1996)? Subsequently, the question is being asked as to what implications this changing orientation will have for the process of acquiring a doctorate. If a broader labor market orientation is accepted, then the qualifications required for a Ph.D. graduate may need to be reconsidered. There are a few experiments with the “professional doctorate”—i.e., degrees for employed professionals—but the issue is still a sensitive one.

## PATTERNS OF INTERNATIONAL MOBILITY

Systematic data on the number of foreign doctoral students in the Netherlands and the number of foreign doctoral degrees earned by Dutch citizens are not available so far. Our impression is that Dutch universities increasingly attempt to attract foreign Ph.D. students. Particularly in the sciences, which face difficulties in filling vacant doctoral positions, the number of foreign doctoral students is increasing.

At the national and supra-national levels, several initiatives have been developed to stimulate international mobility of doctoral candidates (see also the German country report included in this volume). At the initiative of the Dutch Minister of Education and Science, Belgium, France, Germany, the Netherlands, and—later—Denmark established an international advisory committee on new organizational forms of graduate research training. The committee was established with the following terms of reference: to provide an opinion on the proposal of the Dutch Committee on Graduate Schools, particularly in light of European and international aspects; “to consider and compare the new organizational forms of graduate research training on a doctoral level currently emerging in many European countries...to provide indications and recommendations that allow for more cooperation at the level

of graduate training; and to sketch ideas for the further evolution of these new systems of graduate training” (De Wied 1991, p. 9). The cooperation that evolved from this initiative has led to a letter of interest signed by Belgium, Denmark, France, Germany, and the Netherlands in January 1996. These countries have committed themselves to support the exchange of doctoral candidates and to inform each other of developments regarding doctoral programs and graduate schools.

The European Union is stimulating international cooperation in the area of doctoral training. 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<sup>5</sup> 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.

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<sup>5</sup>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.



# ACKNOWLEDGMENTS

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# SWEDEN

*Jeroen Bartelse, Eric Beerkens, and Peter Maassen*

## INTRODUCTION

The Swedish higher education system before 1977 can be characterized as heterogeneous and centralized. After the Second World War, a large variety of schools, colleges, and courses existed. Labor market and economic forces stimulated the government to introduce an ambitious policy and administrative measures that would expand the whole education system above grade 7. These measures led to an expansion of higher education that was probably faster than in any other Organisation for Economic Co-operation and Development country (Svanfeldt 1994). This expansion occurred mainly in the 1960s: at the end of this decade, there were about three times as many students in higher education as at the start of the decade. The capacity of the existing institutions was not sufficient to accommodate the student explosion. This resulted in the establishment of a parliamentary committee in 1968. The report by this committee, published in 1973, led to thorough reforms of the entire Swedish higher education system in 1977. Under these reforms, all higher education institutions became integrated into one system of tertiary-level education called the *högskola*. This is the Swedish collective name for higher education, encompassing not only traditional university studies but also those at the various professional institutes and university colleges, as well as a number of programs previously taught in other forms of the educational system. Most of the programs included in the broadened definition of higher education are under the jurisdiction of the Ministry of Education and Science, others are under the Ministry of Agriculture, and paramedical programs are under the county councils.

Between 1977 and 1993, a system of national programs existed in the Swedish higher education sector. The state determined the curricula, program length, overall aims, etc., of all higher education programs offered. The educational system was organized into general study programs, local study programs, and single subject courses. In 1993, the government decided to loosen requirements in order to allow for more variation at the local level, and thus more correspondence with the labor market. Under these reforms, institutions were allowed to develop their own programs.

With the 1993 reform of higher education, institutions were given increased autonomy in the organization of their studies, admissions, use of resources, and general organization. Under the present system, the government only specifies program lengths of degrees. Different degrees correspond to the number of “study points” needed to complete them. In figure 1, a graphical overview is presented of the Swedish higher education system. Three types of undergraduate degrees are offered. After 2 years, students earn 80 points and are eligible to receive a diploma (*Högskole*). Completion of a three-year program (120 points) is rewarded with a bachelor’s degree (*Kandidat*), and students who complete 4 years (160 points) receive a master’s degree (*Magister*). The Swedish system also offers two types of postgraduate degrees: the licentiate and the doctorate.<sup>1</sup> These are addressed in detail below. The total number of higher education students in 1996-97 was 300,380, of whom 16,550 were active postgraduate students. In this academic year, 840 licentiate degrees and 1,720 Ph.D.s were awarded (Högskoleverket 1998a). Professional degrees are also offered. The program lengths for these professional degrees vary from 1 to 5.5 years.

## TRENDS IN GRADUATE EDUCATION

Until 1969, Sweden had a *Licentiatexamen* and a traditional doctorate. The median time of study from the *kandidatexamen* or *magisterexamen* to the licentiate was about 5 to 6 years, and the time from the licentiate to the doctorate was about 5 years. This means that, after completion of the undergraduate degree, the time to completion of the doctoral program was 10 years or more.

During the research training reforms of 1969, these degrees were replaced by the *doktorsexamen* with a time restriction and compulsory courses. The new postgraduate education system that was launched in 1969 had two main purposes (Zetterblom 1993):

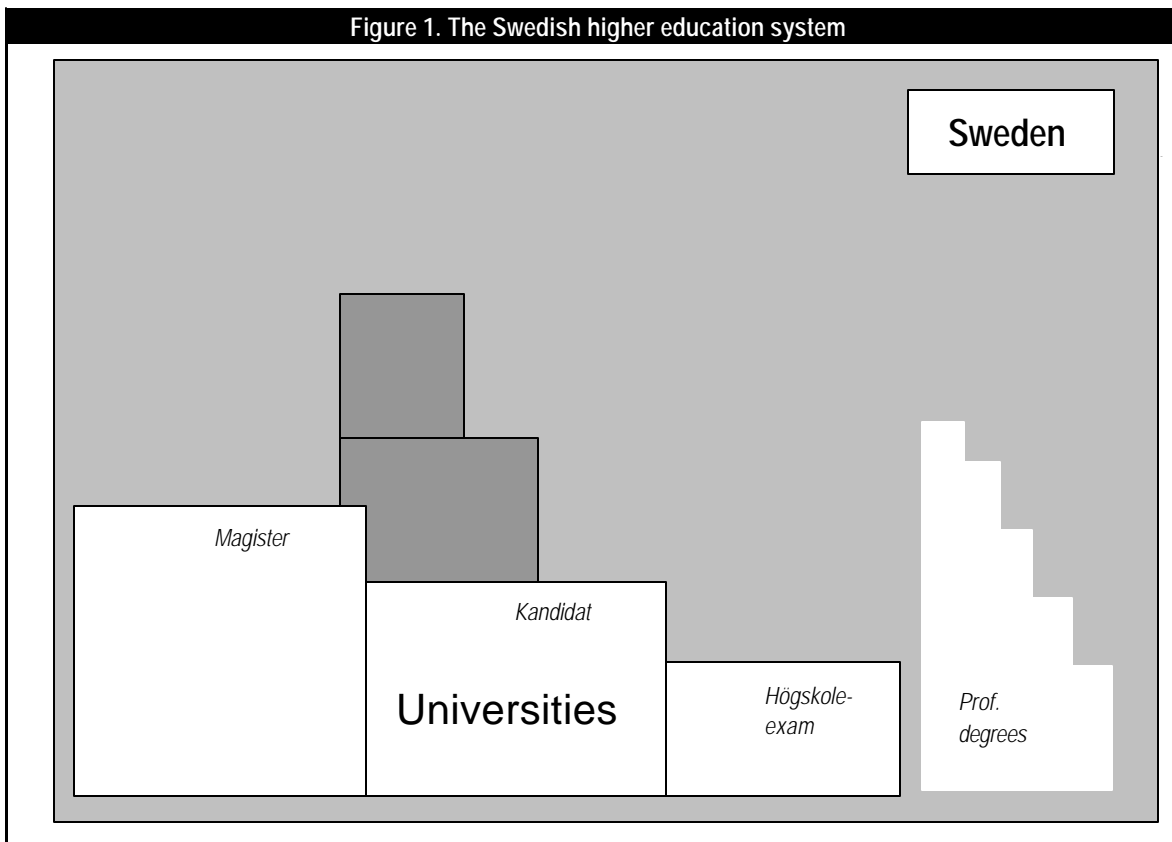
- to shorten the time spent in graduate studies by introducing courses instead of literature studies, improving supervision of thesis work, and reduc-

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<sup>1</sup>Throughout this report, we use the term “postgraduate” to refer to students in either licentiate or doctorate programs.



Figure 1. The Swedish higher education system



SOURCE: Statistiska Centralbyrån (1997). *Universitet och högskolor Forskarutbildning: Nyantagna, registrerade och examinerade lasaret 1993/94, 1995/96, and 1996/97. Örebro.*

ing demands on the thesis so that completion of the dissertation was seen as a career step instead of a life-long project; and

- to bring graduate education in Sweden closer to what was considered an international norm: the Anglo-Saxon Ph.D.

Since the 1969 reforms, the formal length of the program from enrollment to completion of dissertation has been 4 years. The average length of study, however, is still higher. For those who took the *doktorsexamen* in 1994, the program took an average of 7 years from admission to research training to thesis defense (Kyvik and Tvede 1998).

Across different faculties, however, there are large differences between lengths of study. The average duration of study in the humanities and social sciences, for instance, is considerably longer than in engineering, the natural sciences, and medicine.

In figure 2, the numbers of postgraduate students and degree recipients are presented by discipline from 1980 until 1996. The large difference between the pro-

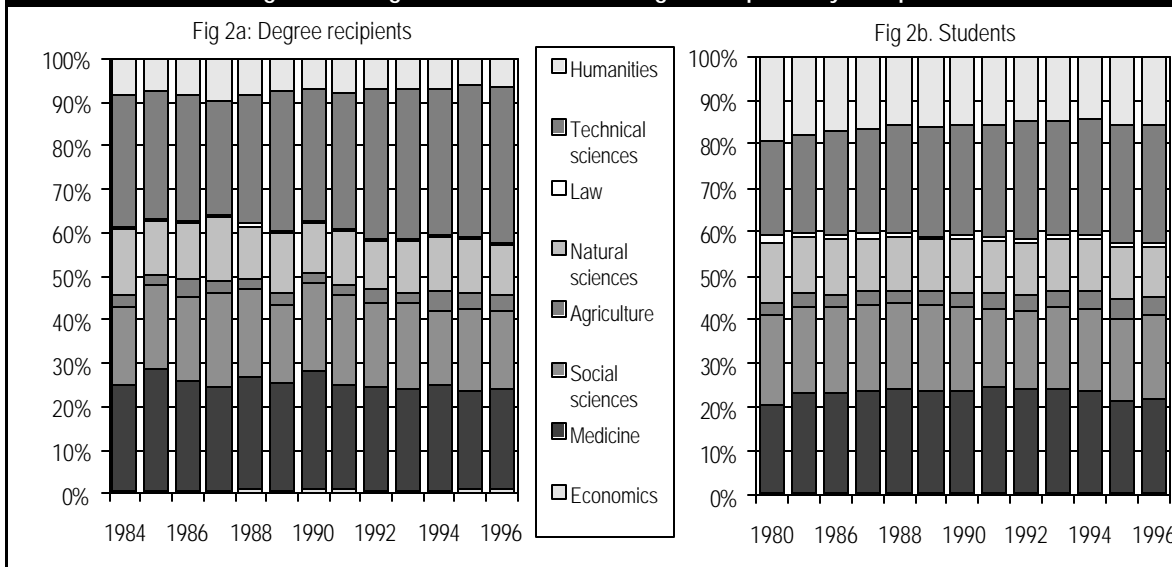
portion of students and the proportion of graduates in certain fields indicates that a high percentage of graduate students do not complete the program or complete it more slowly; for example, compare the data for students in the social sciences versus those in the natural sciences.

Since the mid-1980s, the licentiate degree has been reintroduced as an intermediate qualification in postgraduate education. The standard time for completing this new degree is 2 years. The request for the new licentiate came primarily from engineering faculty, in which field a licentiate can be regarded as adequate preparation for work in industry. Most holders of licentiate degrees are in the technical sciences (computer science, mechanics, engineering, architecture, etc.) (figure 3).

As shown in figure 4, the number of licentiate and doctoral students has gone up considerably since the early 1980s. Also, although there is still a big difference between the number of students who enroll and the number of students who actually complete postgraduate studies, the difference has declined relatively.

The doctoral degree program in the current higher education system officially takes approximately 4 years

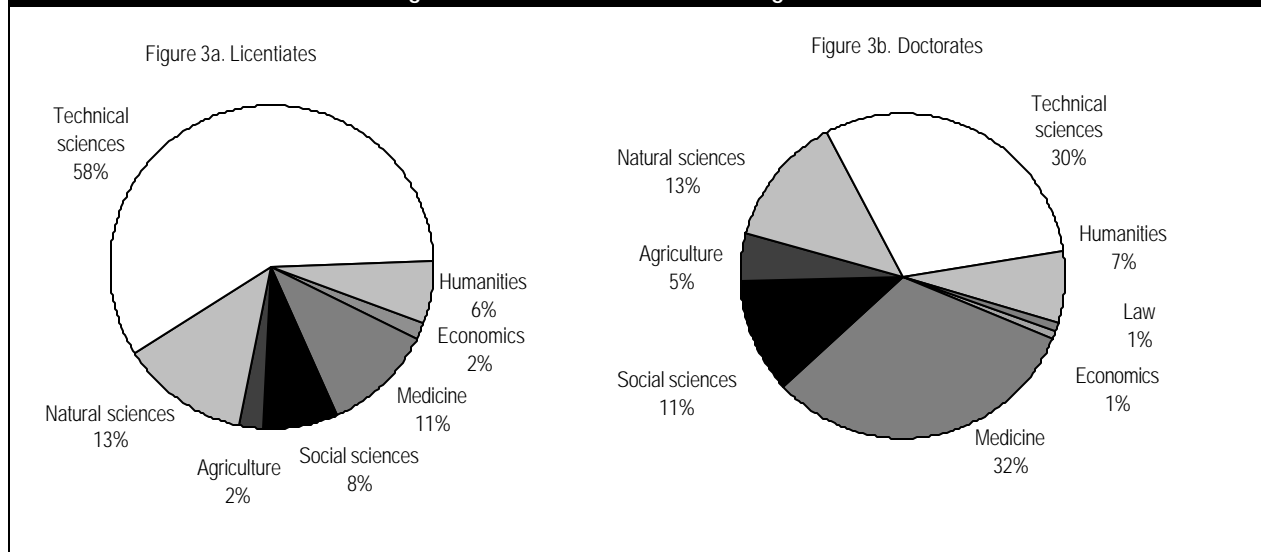
**Figure 2. Postgraduate students and degree recipients by discipline**



**NOTES:** Natural sciences includes physical, chemical, biological, and mathematical sciences. Technical sciences include engineering, mechanics, computer sciences, and architecture.

**SOURCE:** Statistiska Centralbyrån (1997). Universitet och högskolor Forskarutbildning: Nyantagna, registrerade och examinerade lasaret 1993/94, 1995/96, and 1996/97. Örebro.

**Figure 3. Licentiate and doctorate degree awards**



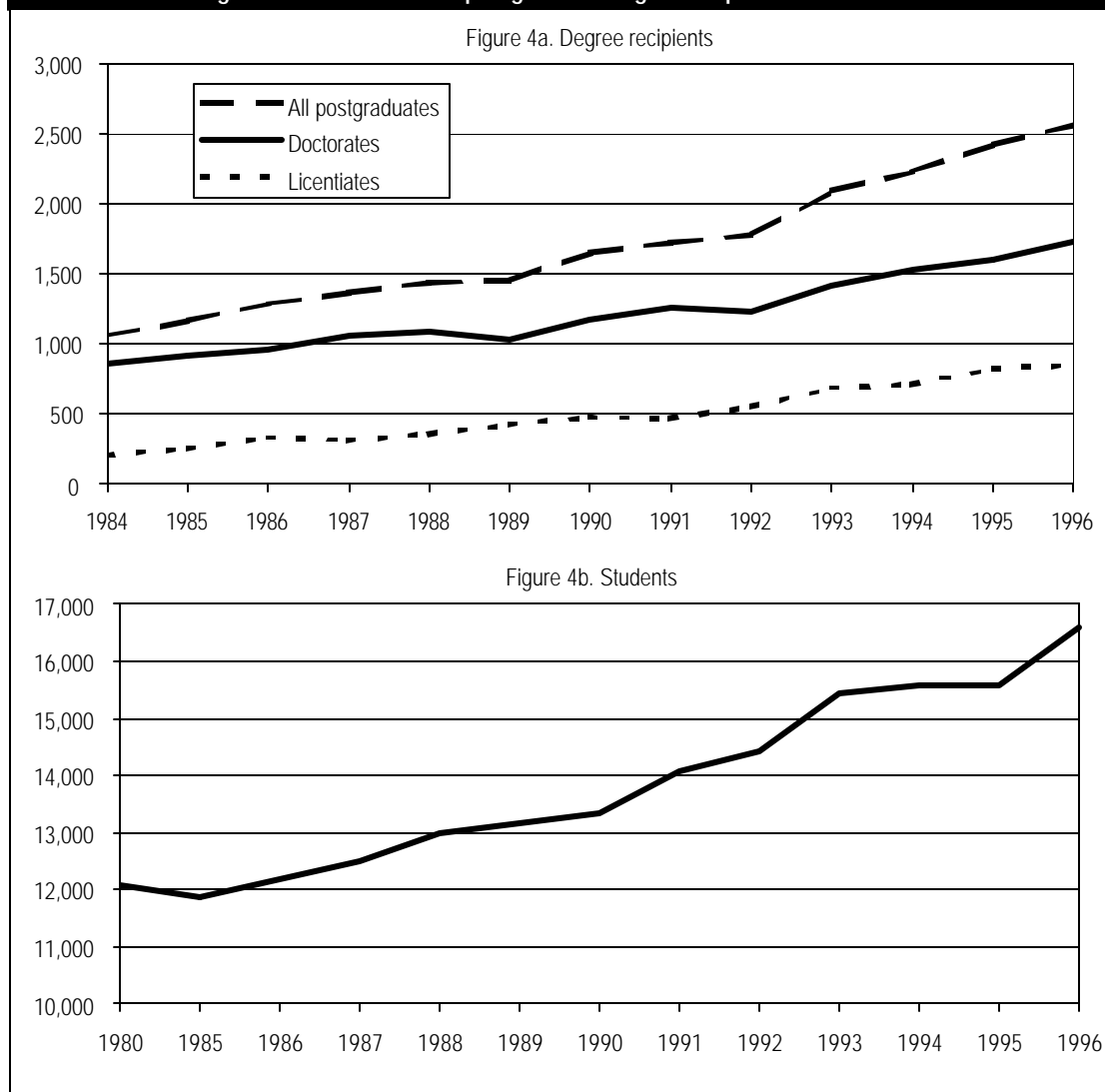
**NOTES:** Natural sciences includes physical, chemical, biological, and mathematical sciences. Technical sciences include engineering, mechanics, computer sciences, and architecture.

**SOURCE:** Statistiska Centralbyrån (1997). Universitet och högskolor Forskarutbildning: Nyantagna, registrerade och examinerade lasaret 1993/94, 1995/96, and 1996/97. Örebro.

to complete, which equals 160 study points. All graduate programs provide in-depth study in the field, training in methodology, and research experience. Required courses take about 1.5 years (60 points). The student, together with an advisor, decides upon a study plan and a topic for the dissertation during the first year; this must be approved by the department. Doctoral dissertations are usually writ-

ten in Swedish or English, but may also be written in other languages. All postgraduate students receive individual tutoring. Dissertations must be defended in public before a committee. The thesis may be published as a monograph or as a composite dissertation consisting of a number of research papers and a summary.

Figure 4. Total number of postgraduate degree recipients and students



SOURCE: Statistiska Centralbyrån (1997). *Universitet och högskolor Forskarutbildning: Nyantagna, registrerade och examinerade lasaret 1993/94, 1995/96, and 1996/97. Örebro.*

The participation of women in graduate education in Sweden shows a consistent growth during the last decades, although the proportion of female students is higher than the proportion of female graduates (figure 5 and table 1).

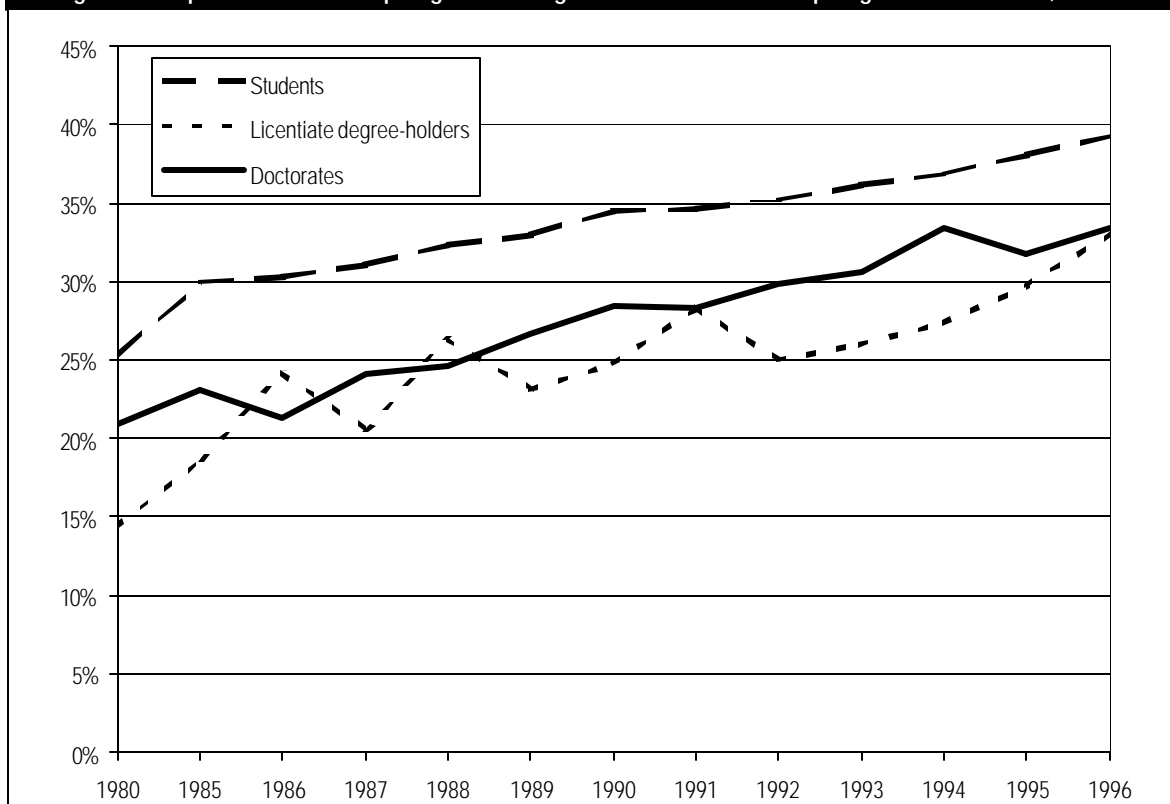
In the 1980s, the balance of the two main activities of the education sector—providing undergraduate education and conducting research—has shifted more toward research. During this decade, government appropriations for undergraduate education decreased from 40 to 30 percent of the total budget for universities and university colleges. During the same period, government grants for research and postgraduate education increased; even greater increases were seen in the funding from other sources.

In comparing the Swedish model with other systems of postgraduate education, a shift can be discerned from the apprenticeship model (e.g., of Germany) to the professional model (e.g., of the United States). Since the reforms of 1969, a considerable proportion of the current licentiate and doctoral programs have consisted of coursework and participation in seminars in the field or related areas. Research and dissertation work are mainly carried out in the final stages of the program.

## DOCTORAL REFORMS

As part of larger reforms in higher education in its entirety, graduate education has changed considerably since the Second World War. The doctoral education program introduced in 1969 was designed to boost the num-

Figure 5. Proportions of female postgraduate degree-holders and female postgraduate students, 1980-96



SOURCE: Statistiska Centralbyrån (1997). *Universitet och högskolor Forskarutbildning: Nyantagna, registrerade och examinerade lasaret 1993/94, 1995/96, and 1996/97. Örebro.*

Table 1. Number and percent of new female postgraduate students by major field

Field	1986-87		1989-90		1992-93		1995-96	
	Total number	Percent of women	Total number	Percent of Women	Total number	Percent of Women	Total number	Percent of Women
Total.....	2,260	32	2,450	34	3,470	35	3,100	40
Humanities.....	280	43	270	45	410	48	340	53
Social sciences.....	340	38	370	34	560	41	470	46
Medicine.....	490	37	560	38	760	41	780	48
Mathematics/natural sciences.....	220	27	300	35	390	38	310	39
Technology.....	570	21	570	20	780	24	760	24
Technology/natural sciences.....	120	28	120	26	160	32	150	32

SOURCE: Högskoleverket (1998b). *Women and Men in Higher Education*. Högskoleverkets Reports 1998:13 R.

ber of candidates, lower the average age of the candidates, and increase completion rates. This policy, however, did not lead to the expected results. In the 1980s, there were increasing concerns about the quality of Ph.D. education in Sweden. This resulted in a strategy focusing more strongly on quality and loosening the rigid formal requirements that gave priority to quantitative performance (Bleiklie 1993). In this period, government grants for Ph.D. education were increased, and doctoral students were provided an additional year of government support. The basis of most current reforms in postgradu-

ate education can be traced back to the change of government in 1991. In the 1990s, education at all levels has become more decentralized. The new research policies introduced in 1993 involve changes designed to increase flexibility, efficiency, and competitiveness. Traditionally, Swedish researchers were supported by the government through basic research grants given to universities, personal grants from research councils, and grants from various applied science funding organizations. Additional sources of funding have been introduced to increase opportunities for supporting research in areas that are al-

ready on their way to becoming world class. Instead of focusing on specific fields, support is concentrated on specially gifted individuals and outstanding research environments.

The priorities of the new research policies, as described in the *1993 White Paper on Research* (Swedish Ministry of Education and Science 1993, p. 170), are:

- to strengthen links between universities and industries, and
- to increase efforts to promote concentrated and major world-class research projects.

## STRENGTHENING LINKS BETWEEN UNIVERSITIES AND INDUSTRIES

A major share of government spending on research is directed to universities, and not to specific research institutes. This university-focused orientation may cause problems in the exchange of knowledge between the university and business sectors. Therefore, a program to widen and deepen contacts between universities and industry is being introduced. This program consists of, among other things, an increase in the number of Ph.D.s in industry, the establishment of special research companies connected to the universities, and the introduction of special postgraduate programs in industry. The new research policies adopted in 1993 state that the new projects should include the training of young researchers.

## PROMOTING CONCENTRATED AND MAJOR RESEARCH PROJECTS

For efforts to promote concentrated and major research projects, 10 billion SEK—to be used over a period of 15 years—has been allocated to promote internationally competitive research programs. This sum has been divided among three areas: 60 percent to strategic research (support for technical, scientific, and medical research); 25 percent to strategic environmental research; and 15 percent to research in the humanities and social sciences (Swedish Ministry of Education and Science 1993). Furthermore, special “centers of excellence” have been established at universities and university colleges. These centers are financed by the Swedish Industrial and Technical Development Administration.

Further policy measures focus on flexibility, recruitment, and internationalization. Flexibility is considered necessary to develop creative research environments and to cope with the rapid advancement of knowledge. Increased autonomy and pluralism within the university system should create opportunities to achieve this. The recruitment of additional researchers is important both for the development of Swedish industry and for the promotion of quality in university education and research. A specific program has been introduced to support the recruitment of women into higher education and research. Finally, a number of measures have been undertaken to extend international relations in Swedish research.

During the 1980s, there were discussions as to whether there was a need for a special agency at the faculty level for planning and leading research training on the model of American graduate schools. However, these suggestions didn’t receive strong support at the universities, and some institutions have developed their own agencies for research training. The discussion about an agency at the university or faculty level was renewed by the *1993 White Paper on Research*.

The reforms presented above should lead to the creation of a higher education structure that can deal with future challenges. Following the creation of such a structure, the transformation of Sweden’s educational and research systems is to be carried out in a project entitled “Agenda 2000, Knowledge and Competence for the Next Century.” This project maps out a strategy to link together policies for schools, universities, and research. It is based on the belief that governments and parliaments should not interfere with educational and research systems by regulating and deciding on minor details, but should concentrate instead on encouraging individuals to strive for excellence.

## PATTERNS OF SUPPORT

Before the 1980s, postgraduate students were financed out of the research appropriation to which each university faculty was entitled. The way the money was spent was decided by the faculty board of the individual institution. The board could decide to spend it on positions for postgraduate studies or on fellowships. The students with posts were to spend the majority of their time on research, but could combine this with teaching. Fellowship-holders could combine research studies with a job on a research project or a part-time job as a teaching or administrative assistant. Another possibility for financing

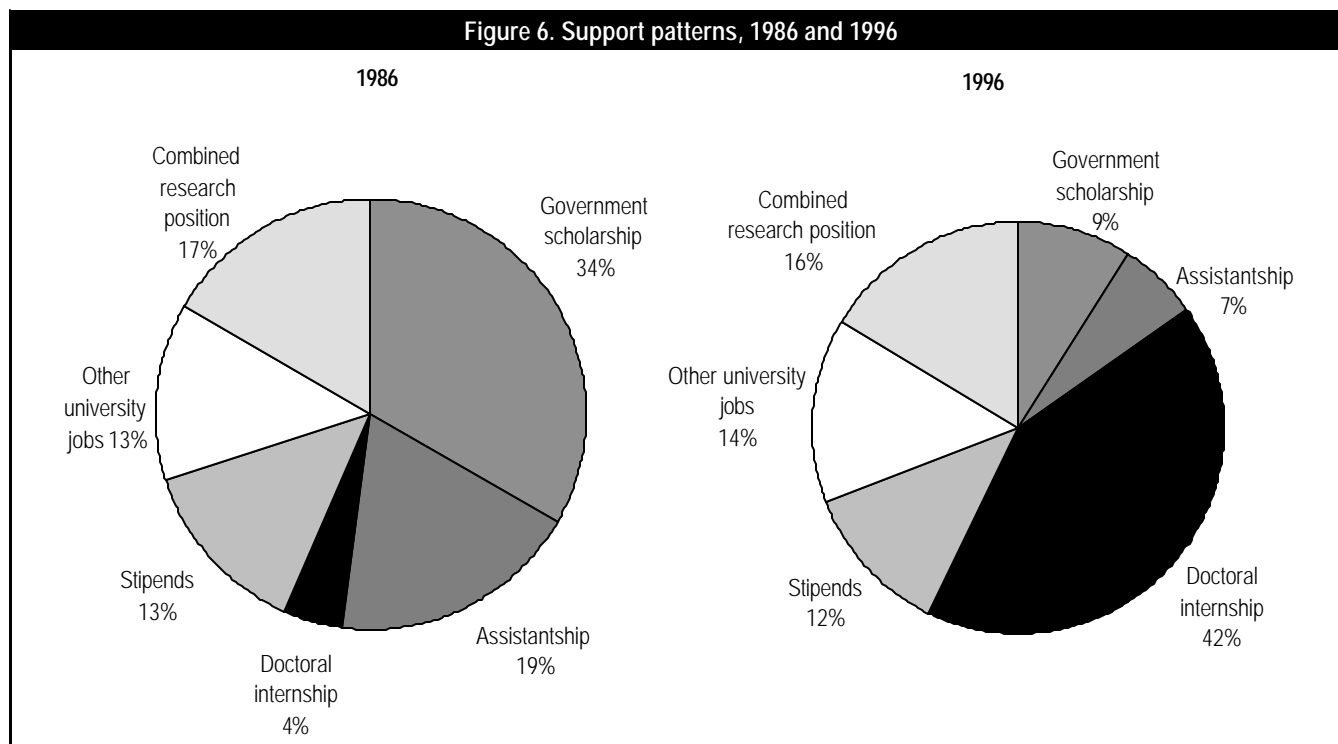
postgraduate studies was to combine one's studies with research on a project funded by external sources or by one of the research councils. Some educational institutions required that students participate in teaching and administration. Although there were great differences across faculties in the application of the regulations, postgraduates typically were either required to work as teaching assistants or volunteered to use about 20 percent of their time for teaching. This was paid work in addition to the normal sources of financial support they received.

In 1982, the system for financial support of postgraduate students was changed from study grants to what is called *doktorandjänster*. These are doctoral internships by which students are temporarily employed at the university with full benefits and a salary corresponding to a starting salary in the public sector. Another way of funding students is the *utbildningsbidrag* (stipend), which gives students a lower gross income and poor benefits. In addition, some students finance their studies through work, loans, or scholarships. In 1994, of those who received funding for doctoral studies, 59 percent had a *doktorandjänst*, 16 percent had an *utbildningsbidrag*, and 25 percent used another funding mechanism. Figure 6 shows that the proportion of postgraduate students supported by a *doktorandjänst* has grown rapidly from 1986-96, mainly at the expense of government scholarships and assistantships.

The availability of financial support varies by discipline. In figure 7, different types of financial support are presented for the different disciplines.

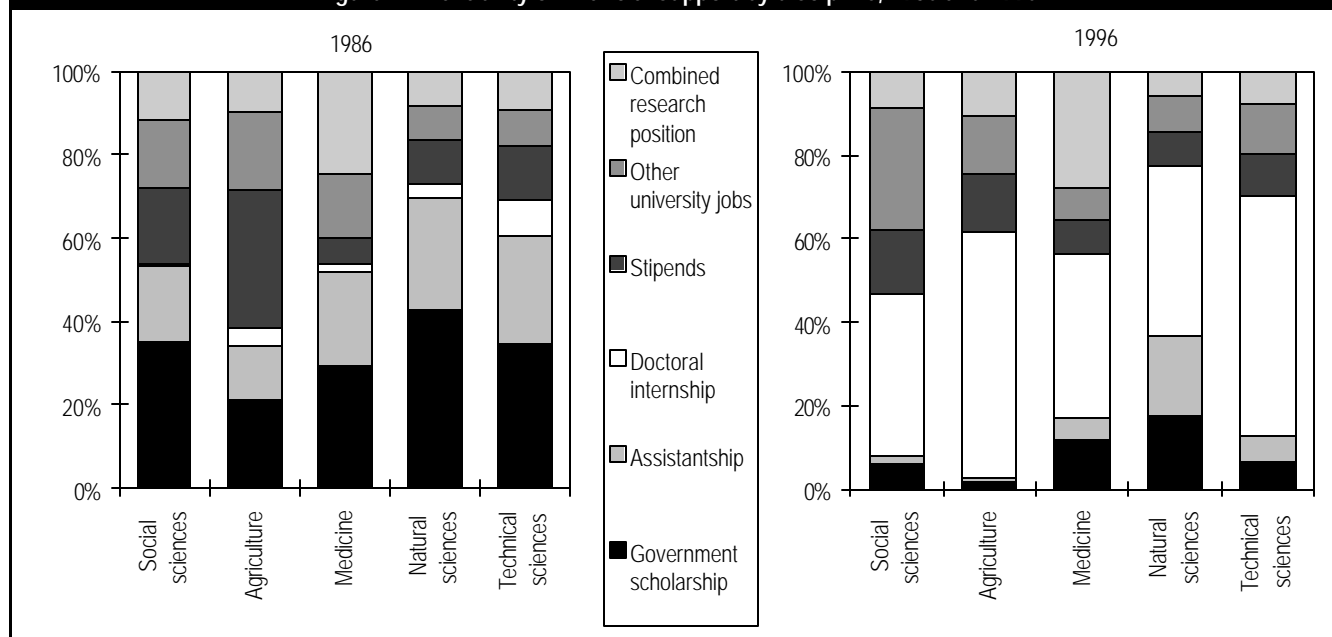
Funding has had a considerable impact on postgraduate completion rates (Zetterblom 1993). Completion rates differ greatly across groups of postgraduate students with different amounts of financial support. In the fields with the lowest rates of completion, the humanities and social sciences, about half of the students received no financial support from the university. In the natural sciences, the corresponding figure is only a fourth. With the exception of students in the clinical subjects of medicine, the completion rates were low among students who received no support. In the humanities and social sciences, the completion rate of this nonsupported group was about 5 percent; for the group most favored with study support, this proportion was 40 percent (table 2).

Various reasons may explain the differences in completion rates between groups with different amounts of study support. Of great importance seems to be the opportunity to perform research work on a full-time basis. In addition, the requirement of yearly applications for grants or assistantships stimulates substantial progress in their studies.



SOURCE: Statistiska Centralbyrån (1997). *Universitet och högskolor Forskarutbildning: Nyantagna, registrerade och examinerade lasaret 1993/94, 1995/96, and 1996/97. Örebro.*

Figure 7. Availability of financial support by discipline, 1986 and 1996



SOURCE: Statistiska Centralbyrån (1997). *Universitet och högskolor Forskarutbildning: Nyantagna, registrerade och examinerade lasaret 1993/94, 1995/96, and 1996/97. Örebro.*

Table 2. Proportion of students with a doctoral degree after 13 years (admitted in cohorts of 1972-73 to 1977-78), by field

Field	Regular support ≥ 3 year	Regular support < 3 years	No study support	Total
Humanities.....	41	24	6	18
Social sciences.....	40	23	5	19
Natural sciences.....	71	39	20	50
Medicine, theoretical.....	82	45	56	67
Medicine, clinical.....	70	66	59	63
Engineering.....	57	27	18	36

SOURCE: Zetterblom, G. The Development in Graduate Education in Sweden. Paper presented at the Sixth CHER Conference, July 1-3, 1993, Stockholm.

In 1998, the rules for funding postgraduate studies were modified. Now, only applicants employed in a postgraduate post or awarded a study grant may be admitted to postgraduate training. In other cases, the applicant must have guaranteed study funding for the whole period of study.

## EMPLOYMENT PATTERNS

The rapid growth of postgraduate students in the 1960s raised concerns about the opportunities for gradu-

ates to find suitable employment in the future. A government committee set up to develop a system for quantitative planning proposed an elaborate system for balancing supply and demand in postgraduate education. The plans to implement such a system, however, were cancelled, as the rising growth of postgraduate students appeared to be temporary. In the 1980s, the attention given to the relation between the labor market and postgraduate education was based on more qualitative considerations. In the last decade, government policy has mainly been directed at stimulating cooperation between industry and research to train high-quality researchers.

There is little quantitative information available on employment of Ph.D.s in Sweden. We therefore give some rudimentary figures. Statistics show that almost all of the new doctoral degree-holders from 1991-92 were employed in 1994 (Kyvik and Tvede 1998). Fourteen percent were unemployed during parts of this period from 1991-94. There are large differences in the percentages of postgraduates from different disciplines who are employed by universities. Around 1980, over 50 percent of all Ph.D.s in the social sciences were employed by a university. The corresponding rates for recipients of doctorates in the humanities and natural sciences are between 40 and 50 percent. The smallest proportion of postgraduate degree-holders employed in universities can be found within the clinical subjects of medicine (Zetterblom 1993).

## PATTERNS OF INTERNATIONAL MOBILITY

In the 1980s, most Swedish universities developed their own plans of action to set priorities for internationalizing curricula and research networks. In 1993, however, the Royal Swedish Academy of Sciences stated that too few researchers—including postgraduate students—engaged in research stays abroad and that this situation should be changed. The government supported this view and recommended the use of existing bilateral agreements, programs, and networks; it also advised that special attention be given to the development of shorter courses, summer schools, etc. In addition, the universities themselves were expected to be responsible for enhancing the internationalization of research training.

A general trend toward the internationalization of education and research can be detected in Sweden. For example, the proportion of Ph.D. graduates in Sweden with a first degree from another country grew from 3 percent in 1973-74 to 19 percent in 1993-94. In 1994, there were almost 1,000 incoming people—both tempo-

rary and permanent residents—with postgraduate education in Sweden, compared to 340 persons outgoing. For outgoing students, the United States seem to be the most popular country to stay abroad. In addition to language reasons, students claim that the best research environments in their fields are in the United States. In Europe, the United Kingdom, Germany, and France are the most popular countries. Only 3 percent of the students going abroad chose to study in Africa, Asia, or Latin America.

With respect to the internationalization of research training, the regional cooperation between the Nordic countries in postgraduate education is especially remarkable. In 1990, the various Scandinavian countries tried to further their cooperation by establishing the Nordic Academy for Advanced Study. This organization currently funds approximately 6,000 research students and researchers involved in cooperative Nordic projects. The objective of this cooperation is that the Nordic countries function as one common research training region. Graduate students will thus have the opportunity to make use of courses in countries other than their home country.





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# UNITED KINGDOM

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## INTRODUCTION

In the post-war period, the British higher education system experienced a major expansion. By the end of the 1950s, however, it became clear that the route pursued was not going to yield the expansion the system actually required. This was mainly because universities raised their entry requirements to cope with increased demand, rather than accommodate larger groups of students within the existing infrastructure. These growing tensions resulted in the establishment of the Robbins Committee to inquire into the future of higher education. The report published by this committee stated that “all young persons qualified by ability and attainment to pursue a full time course in higher education should have the opportunity to do so” (Committee on Higher Education 1963, p. 49). This reflection provided a guide for the development of the British higher education system thereafter. During the 1960s, several new universities and a wholly new sector of higher education were established. Despite the recommendations of the Robbins Committee, further expansion of higher education did not take place in the universities but mainly in the newly established public sector in higher education: the polytechnics and colleges. This binary system lasted until 1992, when the polytechnics were granted university titles.

Virtually all institutions in British higher education offer the 3-year bachelor’s degree program; most also offer postgraduate degrees leading to master and doctoral qualifications. Undergraduate education consists of 3-year programs. These can be concluded at different levels: the lowest level is the bachelor “pass-degree,” and the highest level is the bachelor “first-class honors degree.” Overcrowding in the undergraduate programs and a decrease in standards have resulted in an inadequate inflow into graduate education—and, consequently, have led to a discussion about extension of undergraduate programs to 4 years. Following undergraduate education, three types of graduate programs are offered leading to three types of qualifications: postgraduate diplomas; master’s degrees (the so-called “taught master’s,” which are curriculum based, and the research master’s degrees); and doctoral degrees (figure 1). This country report discusses graduate education in the United Kingdom and focuses specifically on the doctoral degree.

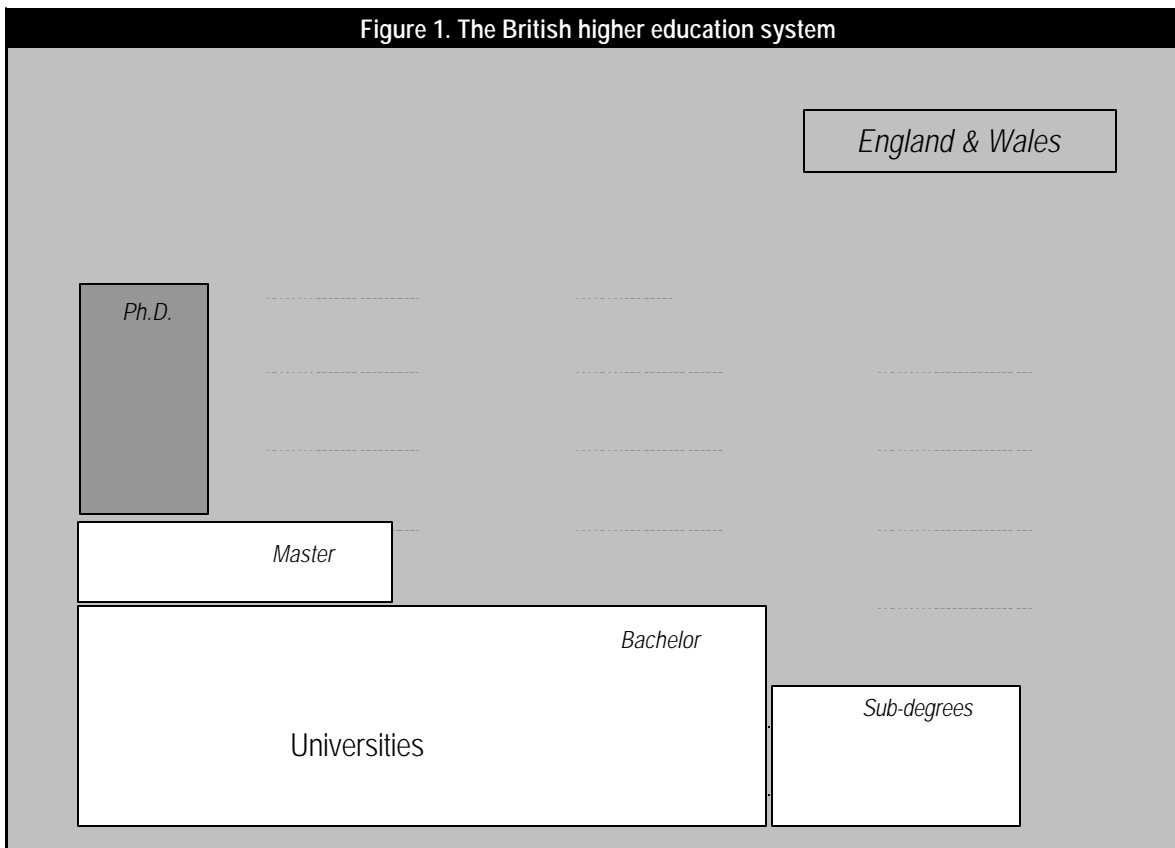
The next section discusses trends in graduate education in the United Kingdom. This discussion is limited to policy developments up until the late 1980s and the effects of these policies on the current number and division of graduate students. Following this, the various policy papers issued in the 1980s and 1990s are discussed. These papers form the basis of the actual reforms that are still ongoing at this time. Finally, support patterns, employment patterns, and international mobility are discussed.

## TRENDS IN GRADUATE EDUCATION

In the binary higher education system of the United Kingdom, universities were supposed to maintain their traditional academic role, including basic research; while public sector institutions were meant to develop vocational types of higher education. The polytechnics, however, took a more complex view of their role in the system, striving to become more equal to, and less different from, the universities. After the polytechnics were granted university titles in 1992, the binary system practically changed into a unitary system: 74 universities enroll 90 percent of all students in higher education, and 143 other institutions provide education for the remaining 10 percent (Brennan and Shah 1994).

In general, the British higher education system, both in the past and in the present, can be characterized as specialized, elitist, small-scale, and focused on first degree provision (Becher 1993). Two universities, Oxford and Cambridge, monopolized higher learning in England for six centuries, until the foundation of the Universities of London and Durham in the second quarter of the 19th century. In 1917, Oxford was the first British university to introduce the Ph.D., largely to attract American scholars away from Britain’s wartime enemy, Germany (Simpson 1983). Professors had begun to incorporate research work into their own activities, but still research was considered subordinate to teaching activities, rather than the basis of professorial orientation and university organization. This might account for the moderate integration of the Ph.D. degree in the British system. In 1938, there were only 3,000 postgraduates in British universities; these represented only 6 percent of the full-time total student population.

Figure 1. The British higher education system



Although the number of doctoral graduates has grown rapidly during the several decades following the Second World War, its growth was considerably slower than in most other countries in Europe. In the *Robbins Report* of 1963, therefore, expansion of participation in graduate education was recommended. The committee gave two reasons why these increases were needed. First of all, there should be more graduate students in order to provide more teachers for the rapidly expanding system of higher education. Second, more students were needed to keep up with the fast pace of change in the scientific and technological revolution. It was assumed that the demand for people with graduate degrees would increase with supply.

The *Robbins Report* proposed a new structure for graduate degrees, in which a 3-year Ph.D. would follow a 1-year master's degree program. The reforms proposed in this report emphasized the importance of a close relationship between graduate education and the labor market. It was envisioned that American graduate schools would be copied in terms of training through formal instruction and seminars. This way, doctoral students would no longer be dependent on a single supervisor. After the *Robbins Report*, governmental statements on graduate education were largely absent. In 1982, the Association

of British Research Councils published the *Report of the Working Party on Postgraduate Education*, better known as the *Swinerton-Dyer Report*. This report called for labor market information and employment trends to be taken into consideration when deciding upon the number of grants to be allocated by the research councils. Like the *Robbins Report*, the *Swinerton-Dyer Report* also recommended the inclusion of coursework as part of the doctoral program.

In the late 1980s, there was a shift in power concerning research and science policy from leading academies, the funding bodies, and the research councils to the government. The British government started to play a more definitive role in the setting of research objectives. These developments and the various papers issued in the 1990s (discussed later in this report) form the basis of the current graduate education system.

The commitment to personal teacher-student relationships still exists in this system. The British approach to university organization does not focus on research as a primary university activity, prevailing over teaching and study, as it does in Germany. The orientation toward research came rather late and was mainly a reaction to scientific progress and improvement in research training

and research in other countries. Research gradually developed into a standard and subsidized component of faculty activity.

Nonetheless, in terms of number of students, the training component in research has remained relatively underemphasized in British universities. It generally involves a few carefully chosen students who conduct research in a close relationship with their mentors. This has resulted in a doctoral program with little or no curricular provision. Most graduate students register for the Ph.D., which normally requires 3 years of full-time study. Some students register with the intention of obtaining a master's degree, usually either a master of arts or a master of science taken full time in 1 year, or a master of philosophy taken full time in 2 years.

In the current system, only students who achieve a bachelor first-class or upper second-class honors degree are admitted to a graduate program, although exceptions are made for people with relevant professional experience. Admittance to a graduate program occurs in two stages. The first stage is the provision of a studentship (scholarship) by the British Academy or a research council, in which the results of the undergraduate career are taken into account. Second, the student has to be accepted by the department. Expectations regarding time to completion of the program and chances of success of the research proposal are leading criteria for admission by the institutions (Kaiser, Hezemans, and Vossensteyn 1994).

Small size, selectivity, and high quality go together along with personal relations between teacher and student. This apprenticeship model has been a major characteristic of the British system and has the advantage of being easy to operate, with clear lines of responsibility between student and supervisor. The theses produced are made publicly available and consist of a monograph or series of selected papers in learned journals.

Within the various disciplines, there are important differences in this traditional model. In the natural sciences, a graduate student joins a research team and works on a research thesis while contributing to the overall efforts of the group. In the humanities and social sciences, however, students normally select their own topics and work independently. Formal contact is much greater in science departments.

As a result of the reforms in the higher education system in the early 1990s, the number of university graduate students boomed between 1993 and 1994. As the poly-

technics were awarded the university title, the number of taught master's degrees, in particular, showed a large increase (figure 2). With the expansion of the number of universities, and therefore of the number of accrediting institutions, taught master's degrees are being offered in more institutions than before the 1993 reforms.

Figure 3 shows the enrollment of graduate students in various disciplines, broken down by year. The differences on either side of 1993 can be explained by the higher education reforms implemented at that time. Figure 4 shows the differences in enrollment across various disciplines for taught (curriculum-based) programs and research-based programs.

The enrollment of women in graduate education shows a steady increase in the past decade (figure 5). Currently, the numbers of male and female graduate students are practically equal.

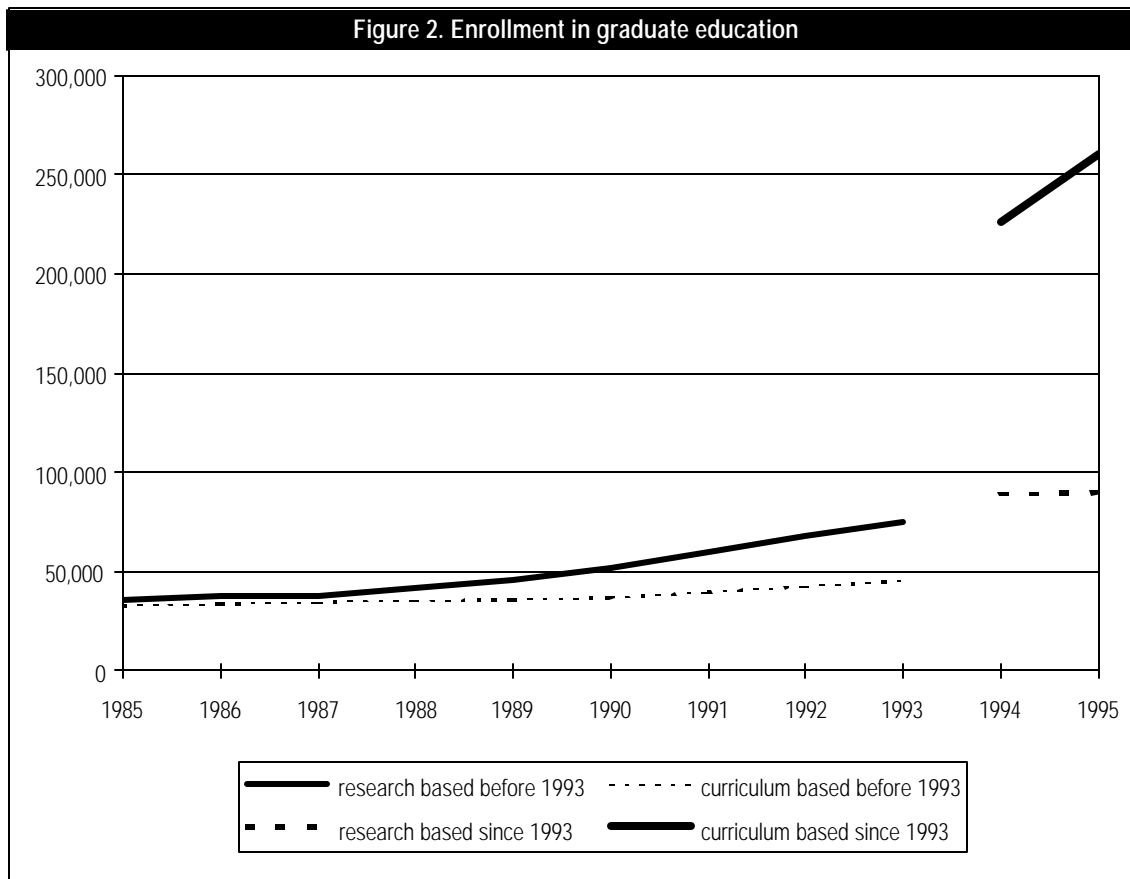
In figure 6, doctoral degrees and total graduate degrees awarded in 1994 are presented by discipline. Figure 7 shows number of doctorates by discipline.

## DOCTORAL REFORMS

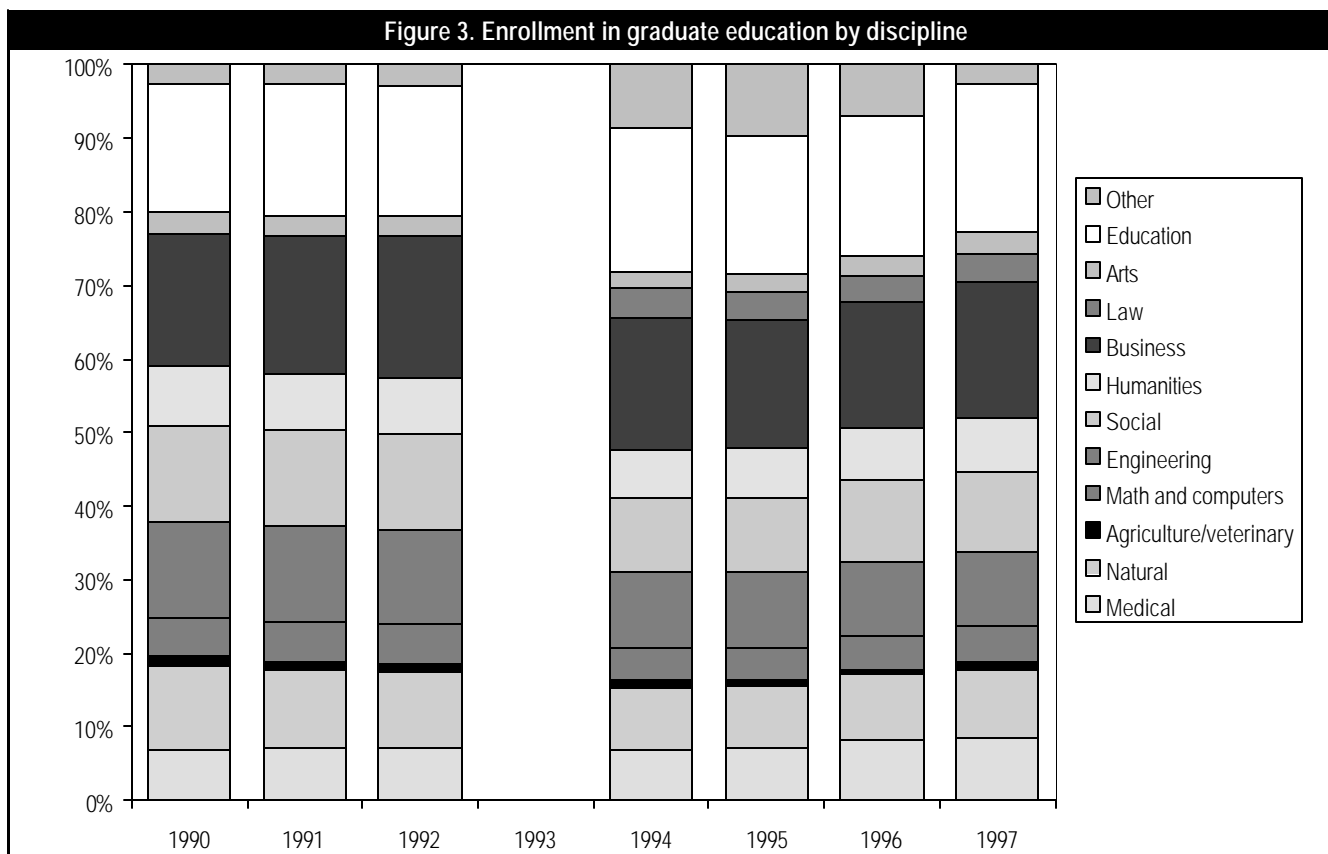
While government interference was relatively absent between the publication of the *Robbins Report* in 1963 and the *Swinerton-Dyer Report* in 1982, the role of government in graduate education increased considerably at the end of the 1980s. Until 1993, this was mainly through references to graduate education in general papers about higher education. The policy statements show a consistent interest in linking the number of graduate students to labor market demands. Therefore, an interest in the content of graduate education and its relevance to the needs of industry and commerce were incorporated in the policymaking process. At the same time, the relevance of basic research, which contributes to fundamental knowledge, was recognized. In this section, the reforms in British graduate education—which are still going on—are examined on the basis of the various policy documents issued in the 1980s and 1990s.

Many of the changes to the British traditional apprenticeship model have been inspired by the American graduate education system. This latter system places more emphasis on teaching as a means of introducing substantial elements of training. Furthermore, it is a system in which teams of academics act as advisors for Ph.D. projects. Some of these practices have recently appeared



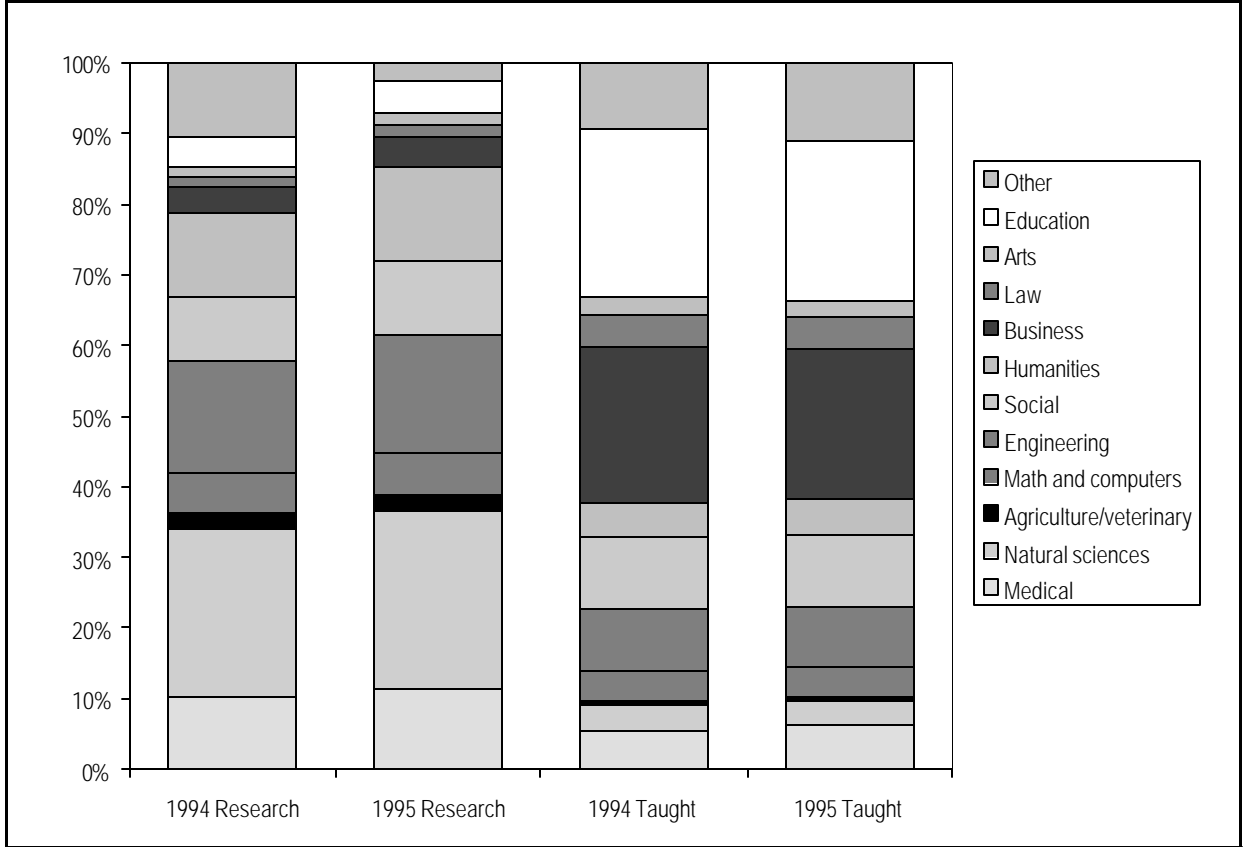


SOURCE: Higher Education Statistical Agency.



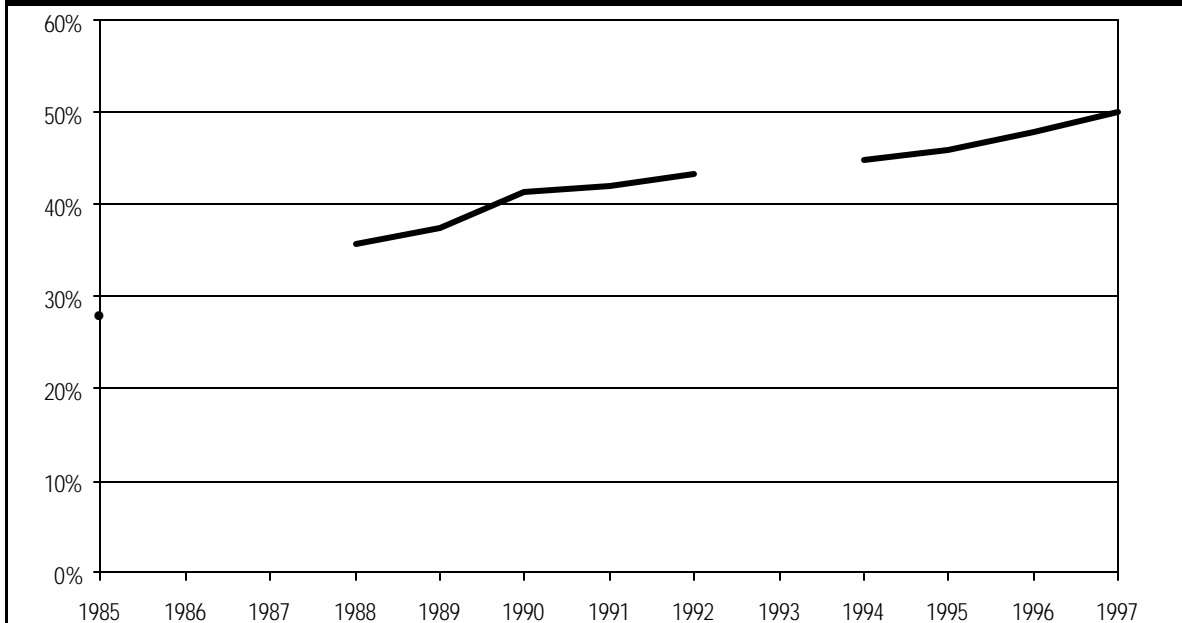
SOURCE: Higher Education Statistical Agency.

Figure 4. Postgraduate enrollment by course and discipline in 1994 and 1995



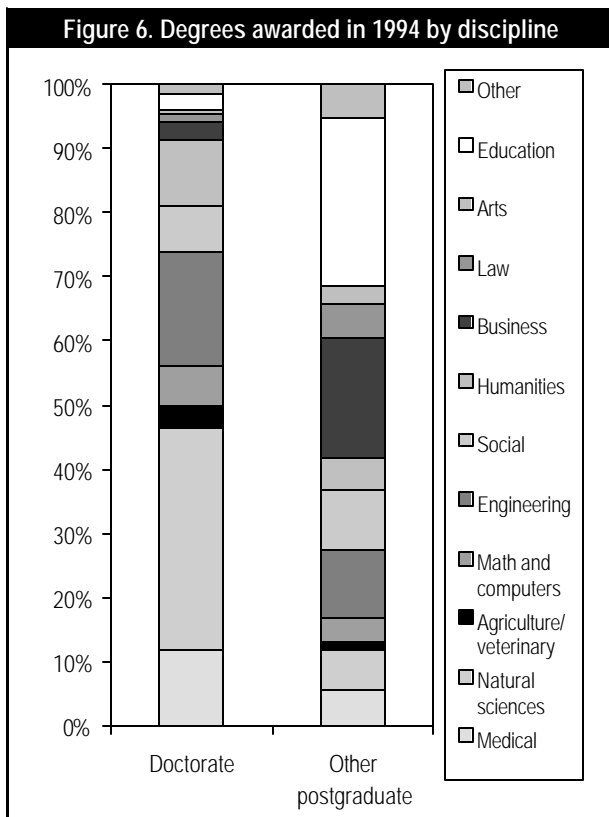
SOURCE: Higher Education Statistical Agency.

Figure 5. Female enrollment in graduate education



SOURCE: Higher Education Statistical Agency.

Figure 6. Degrees awarded in 1994 by discipline



SOURCE: Higher Education Statistical Agency.

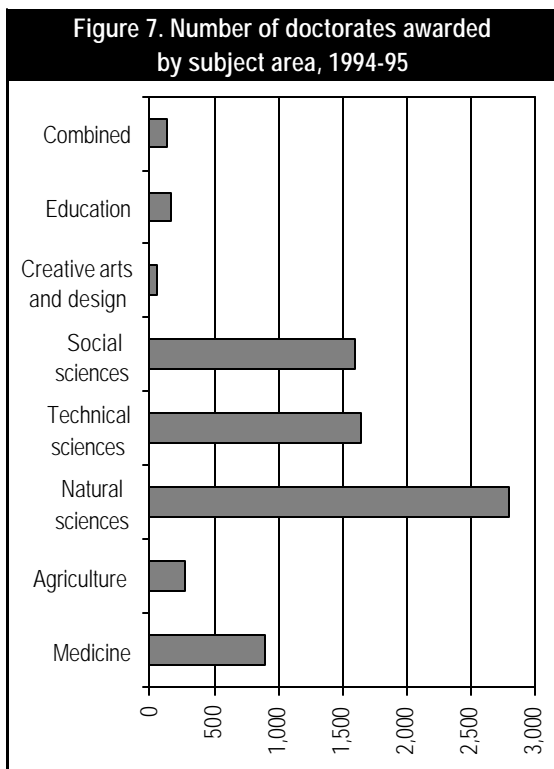
in the United Kingdom, as efforts have been made to incorporate coursework into the Ph.D. program. These courses are designed to broaden students' perceptions of their disciplines, but also to teach the research skills needed to complete a research thesis. Since the *Swinnerton-Dyer Report*, the debate about research training—and hence the criticism about the traditional model—has mainly been about the length of time to degree and the poor submission rates of Ph.D. theses, and about the elements of training to be incorporated into the Ph.D. program. These are addressed below.

### SUBMISSION RATES AND PROGRAM LENGTH

In its report, the Advisory Board of Research Councils recommended that full-time Ph.D. students should complete their program within 4 years. The traditional Ph.D. was being criticized as overly ambitious, and the board suggested that topics should be defined so that completion within a 4-year period would become feasible. The reasons the report gave for poor completion rates were as follows (ABRC 1982):

- poor supervision, especially in the early stages;
- lack of adequate knowledge of research techniques; and
- low student motivation.

Figure 7. Number of doctorates awarded by subject area, 1994-95



SOURCE: Higher Education Statistical Agency (1998c).

Since the publication of the report, the research councils have introduced a sanctions policy to improve national submission rates by disqualifying departments or universities with a low number of students submitting a thesis within 4 years of receiving financial support. The attention to submission rates was caused by reasons concerning funding of graduate education and by the future employment prospects of Ph.D.s (Burgess et al. 1995). Concern has been expressed about the large amount of government funding used to support research students for 3 years of full-time study when the return on this investment, in terms of completed Ph.D.s, is low. Furthermore, it was recognized that, in an environment of limited job opportunities in higher education, it was in the students' best interest to complete as quickly as possible.

## TRAINING PROCESS IN THE PH.D. PROGRAM

The question of whether the education and training process in the Ph.D. program should be emphasized has been a much-debated issue. According to the Committee of Vice Chancellors and Principals of British universities, the Ph.D. should be both a *product*—an original contribution to knowledge—and a *process*, involving the training of a researcher. The only way to accomplish this goal within 4 years is to define the thesis topic carefully and to accept the notion of a Ph.D. program with formal training elements complementing the original research work. This structure was regarded as a way of broadening the narrow, traditional Ph.D., while helping to improve completion rates. Critics of this approach note that it is difficult to combine both formal training elements and research into a coherent package. There have also been suggestions that the Ph.D. thesis should be replaced by a series of research papers on a variety of topics linked to a central theme. However, the idea of a single thesis making a substantial contribution to a discipline is considered a powerful concept which seems likely to remain dominant (ABRC 1982).

The main participants in this debate were the funding councils and the higher education institutions. Much of the pressure to reform the graduate research training process in the 1980s came from agencies responsible for funding training rather than from the universities that provided the training. There was considerable opposition within universities to the introduction of the research councils' sanctions policy and considerable argument about the nature of the Ph.D. Now that a consensus has been reached over the fundamental requirements of the Ph.D. (an original contribution to knowledge carried out as part of a research training process in a fixed period of time), the debate has moved on to the functioning of institutional policies and practices. Questions have been raised as to whether these policies sufficiently contribute to the production of trained researchers. The academic structures of most institutions were developed primarily to cater to undergraduates. Graduate education is mainly still managed as an extension of undergraduate programs, often without the necessary resources. In addition to its structure, the size of graduate training programs might create problems. Many departments are too small to support a doctoral program with a thriving graduate community (Burgess et al. 1995).

After the release of the *Swinerton-Dyer Report*, the government remained rather quiet about graduate education until the early 1990s. In a 1993 White Paper on Research, *Realising Our Potential*, the Technology Foresight Initiative was announced; its intent was to bring together the industrial community and the communities of science and engineering. In this report, attention is paid to the relationship between higher education and the research base. Part of the Technology Foresight Program was a wide-ranging consultation of panels representing key sectors of the economy. Although many issues raised by this consultation have a general rather than a specific relevance to graduate education, some of the wider concerns might have implications for graduates in terms of funding structures and priorities for research topics. The specific objectives of the Technology Foresight Program were as follows:

- to encourage close interaction and networking between the science, engineering, academic, business, and government communities;
- to build a common understanding between these communities of the challenges, concerns, and emerging opportunities in markets and technologies; and
- to provide guidance on priority areas of the 1993 white paper.

In the mid-1990s, two committees were key in the development of graduate education. Their reports were named after their chairmen: the *Harris Report* (HEFCE, CVCP, and SCOP 1996) and the *Dearing Report* (National Committee of Inquiry Into Higher Education 1997). The *Harris Report* focused solely on graduate education and recommended a framework of degrees, specifying the length, level, and title of each program; it also noted that there should be sufficient public funding to support graduate students. The *Dearing Report*, on the other hand, focused on the entire higher education sector and hardly mentioned graduate education in particular. It did, however, endorse the recommendations of the Harris Committee. One of the recommendations in this latter report was to develop a framework of standardized degrees and qualifications, and to increase the transferability of credits between institutions. It was put forward that master's degrees should be standardized and awarded only at the

graduate level. The standardization of degrees should prevent this diverging range of recognition of degrees. The committee further recommended taught program degrees.

According to Blume (1995, p. 29), “graduate training is being gradually decoupled from its traditional association with an academic career toward education and training.” The U.K. research councils have developed a number of schemes, which include a variety of relationships between students, industry, and educational institutions. The production of original research, however, remains central to the purpose of graduate education. The current challenge is to ensure high-quality training in research (given political priorities and financial constraints) that emphasizes both product and process (Burgess, Band, and Pole 1998).

In general, one might say that universities have made efforts to reform graduate education. There has been a move away from the apprenticeship model toward a program of research training that includes coursework, the appointment of joint supervisors, and a careful monitoring of progress by a research committee. Most institutions now have strict limits on the length of the research thesis. To ensure and control the quality of graduate education, some institutions have looked at the American graduate school model. In the early 1990s, a few graduate schools were established in the United Kingdom; presently, there are indications that certain other institutions will also change the administration of graduate education. In 1992, the chairman of the Advisory Board of Research Councils stated that (Ince 1992, p. 18):

The idea of British graduate schools represented a strand of thinking which is now becoming quite common. A new center of gravity has to be found which gives a greater role to the research mentality. Leading universities increasingly need to be places that think of themselves as producers of research and as centers of systematic research training instead of places that happen to do some research and research training alongside their undergraduate training.

Changes in this direction are being made, but are still in progress.

## PATTERNS OF SUPPORT

Public funding for graduate education comes mainly from two sources: the funding councils and the research councils. The funding councils do not provide financial

support for graduate students but provide the capital and some of the equipment for both research and teaching. The research councils make grants available for research and studentships for graduate education. Sources of support for postgraduate students in 1996-97 are shown in table 1.

Source	Full-time	Part-time
Total.....	7,629	13,551
No award or financial backing.....	3,344	6,308
UK LEA mandatory/discretionary awards.....	2,095	333
Institutional waiver of support costs.....	296	426
Local government.....	8	1
Research councils and British Academy.....	593	18
Charities and international agencies.....	60	39
Governmental authorities.....	440	1,152
EU Commission.....	65	103
Other overseas sources.....	63	13
UK industry and commerce.....	202	3,867
Absent/no fees.....	29	176
Unknown.....	434	1,115

SOURCE: Higher Education Statistical Agency (1998).

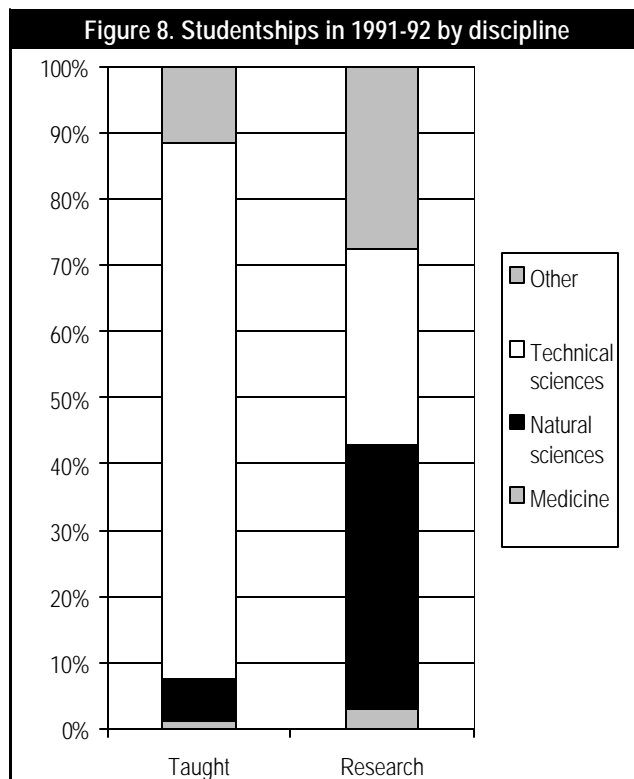
The research councils are public bodies funded by the government. The roles of the three principal public funding bodies before 1993 are explained below.

- **Economic and Social Research Council (ESRC).** The ESRC makes available approximately 300 research awards for full-time graduate research training (M.Phil. or Ph.D.) in the social sciences at recognized institutions. The council makes a distinction between so-called “Mode A” and “Mode B” departments. Mode A departments have demonstrated that they can provide formal training in research methods and techniques in the first or foundation year of the program, according to ESRC guidelines. They accept ESRC-funded students without previous graduate research training for full 3-year awards. Mode B departments can only take ESRC-funded students with a foundation in research training; usually, these students have completed a master’s program that teaches research methods.
- **Science and Engineering Research Council (SERC).** The SERC awards approximately 2,355 research studentships each year. There are two types of awards: standard awards and the Coop-

erative Awards in Science and Engineering (CASE). Standard awards are allocated by the SERC as quotas to departments in institutions, which nominate eligible candidates. A small number are awarded to individuals on a competitive basis. The cooperative awards give students experience in research in an industrial environment.

- **British Academy.** Before 1992, the British Academy gave approximately 500 major studentships each year through its national awards competition. The majority of these provided 3 years of funding for research students in the humanities. Since 1992, the total number of awards as well as the number of 3-year awards have increased. Of the 400 3-year awards offered each year, 100 would be available to students without postgraduate experience and 300 would be restricted to students with 1 year's postgraduate research training.

Other research councils are the Medical Council and the Natural Environment Research Council. The research councils' studentships vary across disciplines. Figure 8 shows the number of studentships in 1991-92 by discipline.



SOURCE: Office for Science and Technology (OST). Annual Review of Postgraduate Awards 1992/1993. Unpublished.

Although the ESRC started to fund part-time students through a national competition, most part-time graduate students finance their own studies or are financed by their employers. The latter source of support is more common for taught master's degrees than for research master's or Ph.D.s because of the link between master's degrees and employment. Some universities provide their own studentships, which are mainly awarded to students who have been unsuccessful in the research councils' or British Academy's competitions. A studentship generally involves a maintenance award (equivalent to a research council or British Academy grant), together with payment of fees (Burgess et al. 1995). Furthermore, universities employ graduate students as class teachers or have developed teaching assistant programs.

Following the publication of the government white paper *Realising Our Potential* in May 1993, the research councils' system of funding has changed. There are now six research councils, five that provide funding for sciences and technology, and one funding the economic and social sciences:

- Biotechnology and Biological Sciences Research Council,
- Engineering and Physical Sciences Research Council,
- Medical Research Council,
- Natural Environment Research Council,
- Particle Physics and Astronomy Research Council, and
- Economic and Social Research Council.

In addition, the British Academy looks after the humanities.

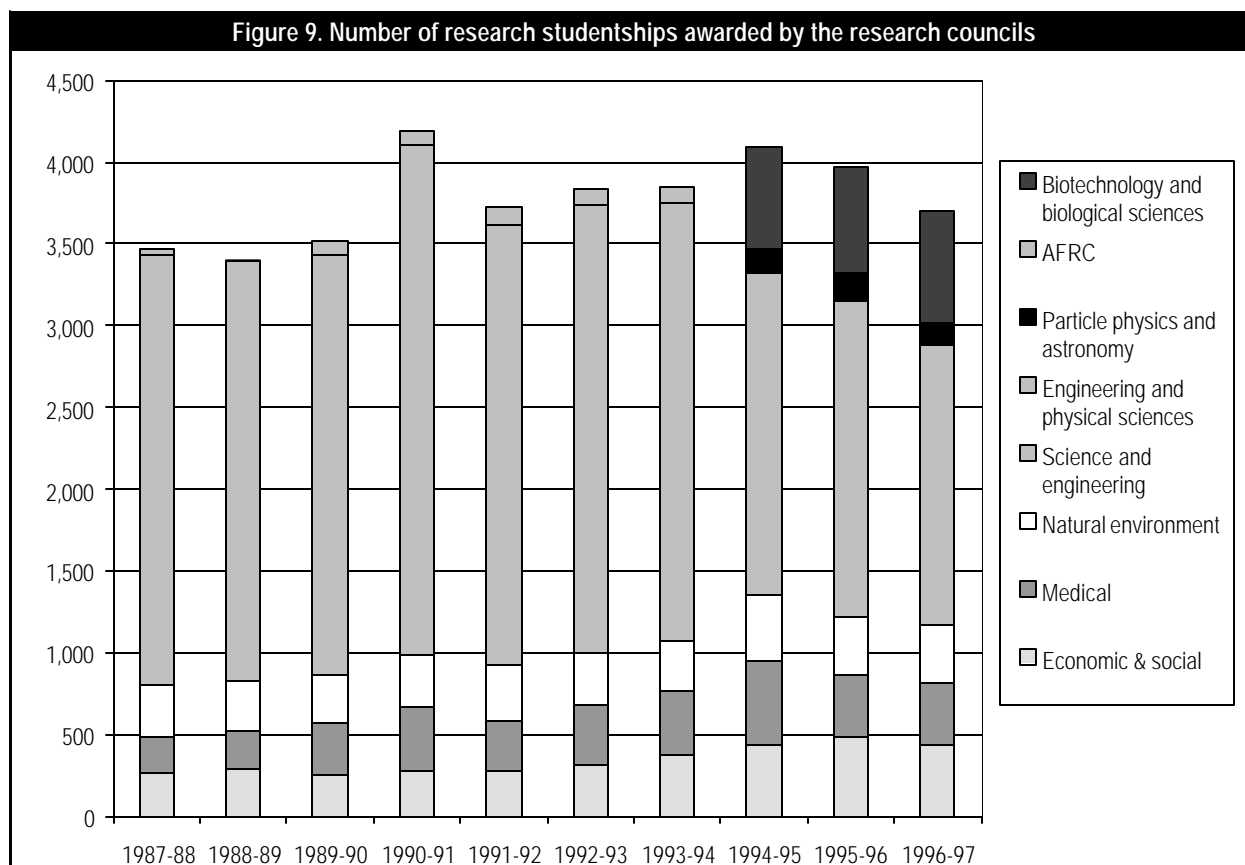
The six councils are government agencies reporting to the Office of Science and Technology; they grant funding for individual postgraduates. The competition for research funding is intense, with only a small percentage of candidates making successful applications. There are three types of funding given by the research councils (CSU 1998): advanced course studentships, which are master's level taught courses; research master's training awards; and standard research studentships, which are for Ph.D. or M.Phil. students for programs of up to 3 years full time

or 5 years part time. Some of the research councils give CASEs, which are similar to standard research studentships but involve cooperation with a partner in industry. The research councils set their own level of payment, but all awards for British students include tuition fees (a payment straight to the institutions); a maintenance grant; and a contribution toward travel, fieldwork, materials, and other expenses.

To qualify for a full award, candidates should be resident in the United Kingdom and possess a first-class or an upper second-class degree (a lower second-class degree is the minimum requirement for an advanced course studentship from the Natural Environment Research Council or Engineering and Physical Sciences Research Council). Each council regularly reviews academic departments and programs, and allocates advanced course studentships through a quota system to the departments of the approved programs. The departments can select the candidates they believe to be most qualified. Figure 9 shows the number of research council studentships from 1987-88 until 1996-97.

## EMPLOYMENT PATTERNS

For most of those who start a graduate program, an academic career remains the central objective (Becher, Henkel, and Kogan 1994). The strength of this aspiration, however, varies by discipline. In the humanities and social sciences, academic careers are the prime goal of those who register for doctorates. Although this goal is also strong in the natural sciences and technology, the aspiration level in these disciplines is lower when there are good employment possibilities in commercial or other nonacademic activities. Especially in many branches of chemistry and biochemistry, doctoral training is considered applicable to both theoretical and applied areas. Various studies of the employment of social science Ph.D.s show that employers generally do not consider a doctorate to be a significant advantage (Pearson et al. 1991). Employment trends for people with a Ph.D. degree in the social sciences indicate that higher education is the major employer. A larger proportion of those holding a taught master's than of Ph.D. recipients go into industry and commerce or the public sector; a smaller proportion enters academic life (table 2).



SOURCE: Office for Science and Technology (OST). Annual Review of Postgraduate Awards. Unpublished.

**Table 2. First employment destinations of Ph.D. and Master's degree recipients, 1989 and 1992 (percentages)**

Destination	Ph.D.		Master's	
	1989	1992	1989	1992
Permanent academic appointment.....	4.2	3.6	2.0	2.0
Fixed term academic appointment.....	23.1	22.5	5.0	4.0
Further training.....	1.6	2.6	9.5	9.0
(School) - teacher training.....	1.0	1.1	0.8	1.0
Private sector (industry or commerce).....	22.7	17.7	35.7	29.0
Government or other public sector.....	5.5	6.1	9.5	9.0
Other employment.....	1.8	1.8	1.0	2.0
Not employed.....	7.0	8.6	3.0	3.0
Unknown.....	22.6	25.4	28.5	38.0
Overseas.....	10.6	10.6	4.0	3.0

SOURCE: Office for Science and Technology (OST). Annual Review of Postgraduate Awards. Unpublished.

The first destinations of U.K. resident postgraduates in 1996-97 are shown in table 3.

One of the primary purposes of the Ph.D. is still considered to be the preparation of the future generation of academics. The limited number of vacancies available, however, largely frustrates this aim. At the same time, outside the research context, the Ph.D. does not appear to enhance job prospects. Employers are likely to be more impressed with the promise of all-around capability of a master's degree-holder than with the more narrowly focused competency associated with doctoral qualifications.

For the most part, research education is a risky investment. On the one hand, the advantage of a Ph.D. compared to undergraduate degrees is absent in a whole range of nonacademic occupations. On the other hand, only a minority of Ph.D.s are given the opportunity to secure their most preferred employment. The policies

**Table 3. First employment destinations of U.K. resident postgraduates, 1996-97**

Destination	Doctorate degree	Other postgraduates
Entered work.....	3,356	8,258
Returned to/remained with previous employer.....	573	1,802
Self-employed.....	83	450
Entered study or training.....	163	2,022
Seeking employment or training.....	97	687
Not available for employment/studies/training.....	83	350
Percentage with known destinations.....	77.5	73.2

SOURCE: Higher Education Statistical Agency (1998a).

proposed in the 1993 white paper could reduce some of these uncertainties. The taught master's program can function as a selection mechanism through which all potential doctoral students should pass. The resulting fewer entrants will in this way find less competition for academic posts. In fact, their employment possibilities will be even better, since more academic posts will become available due to a large outflow of retired academics. By increasing the number of master's degrees and reducing the number of Ph.D.s in areas where there is a surplus of Ph.D.s as compared with academic labor market requirements, the connection with the labor market should be recovered.

## PATTERNS OF INTERNATIONAL MOBILITY

In 1991, over 46 percent of the graduate students in British institutions were from overseas. The large increase in overseas full-time graduate students, both in absolute numbers and in comparison with U.K. students, is shown in table 4.

In the 1990s, the relative number of all overseas full-time postgraduate students decreased. British postgraduate education, however, remained an attractive destination for European Union (EU) students. In 1994, 9 percent of full-time postgraduate students were from non-British EU countries (figure 10). This was mainly because students from EU countries were eligible for tuition fees

**Table 4. Numbers of U.K. and overseas students from 1981-82 to 1990-91**

Year	Total students in postgraduate program	Number of U.K. students	Number of overseas students	Overseas students as percentage of total
1981-82	34,276	20,941	13,335	38.9
1982-83	33,903	20,610	13,293	39.2
1983-84	35,928	21,582	14,346	39.9
1984-85	37,563	22,377	15,186	40.4
1985-86	40,498	23,384	17,114	42.3
1986-87	42,824	24,144	18,680	43.6
1987-88	43,733	23,465	19,268	44.1
1988-89	44,175	23,899	20,276	45.9
1989-90	45,644	24,247	21,397	46.9
1990-91	49,950	26,537	23,413	46.9

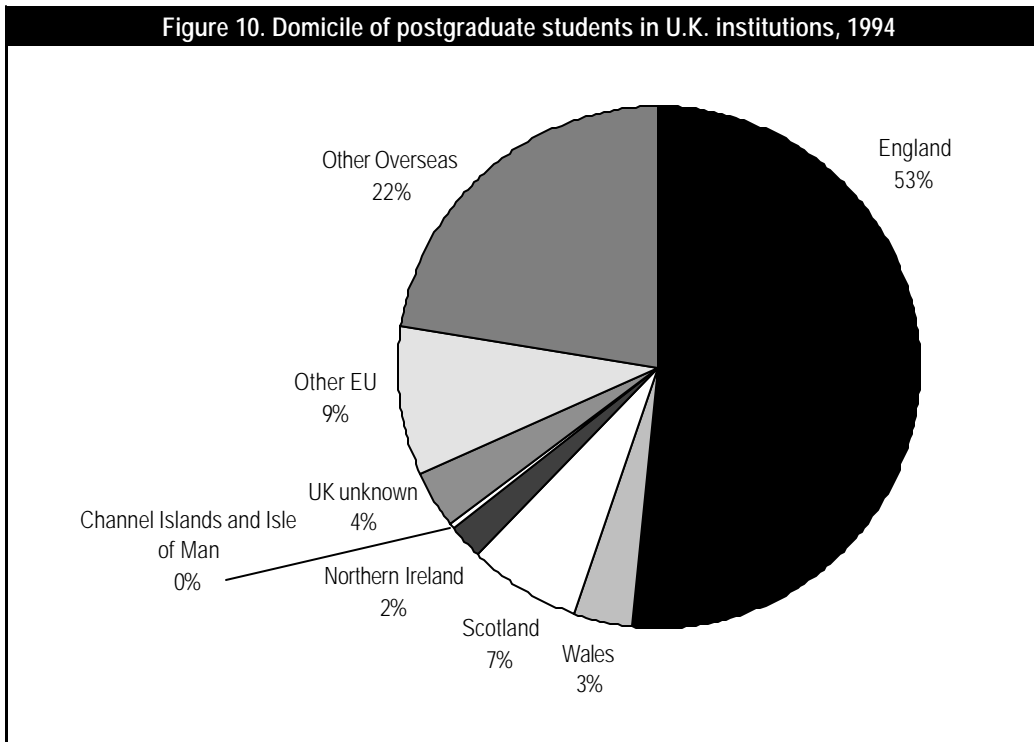
SOURCE: Office for Science and Technology (OST). Annual Review of Postgraduate Awards. Unpublished.



at U.K. rates. In four subject areas, overseas students even outnumbered British students: veterinary science, agriculture and related studies, business and financial studies, and engineering and technology.

The internationalization of graduate education in the United Kingdom has raised several policy questions. Some

programs are fashioned deliberately to meet the needs of overseas students. In some cases, it is expected that programs would not even be viable without overseas students. Because departments gain no financial advantage from overseas students—and, in some cases, might even lose money offering these programs—a ceiling may be placed on EU admissions.



SOURCE: Higher Education Statistical Agency (1998c).

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