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In the late 1960s, the German system of higher education was changed into a binary one by the development of the Fachhochschulen, which differ from the German universities by shorter, more structured degree programs and a strong orientation toward practice. The Fachhochschulen have not only provided opportunities for many young people from families without a tradition of advanced education, but in addition they attract a growing fraction of high school graduates who would also be qualified to enter the traditional universities. They currently enroll about one-third of all students in higher education. Their continuing growth appears limited only by the ability to allocate adequate resources.

The Increasing Importance of *Fachhochschulen* in German Higher Education

The Origin of *Fachhochschulen*

It is only since the late 1960s and early 1970s that *Fachhochschulen* have been part of higher education in the western part of the Federal Republic of Germany. Until that time, West German higher education consisted only of a substantial number of universities, all having comparable standards for the quality of their courses and the preparation and salaries of their faculty. This comparability is achieved firstly by the uniform qualification necessary to be admitted to the professoriate (the so-called *Habilitation*), secondly by the system of recruiting professors, which as a rule does not allow for the recruitment of professors from within an institution and is thus conducive to consistency in the quality of teaching, and thirdly by a uniform system of student stipends and relatively uniform admission requirements for students and for receiving study allowances.

During the 1950s and 1960s, the status of technical, teacher training, and theological colleges was enhanced. They were formally equated with the universities and acquired the right to award doctorates and *Habilitationen*. Technical colleges (*Technische Hochschulen*) were turned into technical universities. Teacher training colleges were partly

integrated into universities. The process up until the late 1960s can be regarded as one of homogenization of higher education through the upgrading and the raising of standards of several categories of post-secondary institutions, which until then had not been considered equal to universities.

Western Germany also had a substantial number of technical and other secondary vocational schools dating back to the early part of the nineteenth century. Later in the century some of the technical schools were given the status of tertiary institutions as *Technische Hochschulen*, while others became less important and for a time only trained master craftsmen and technicians. A new concept of the middle-level technical intelligentsia led early in the twentieth century to the development of engineering colleges that, however, remained part of the secondary system. Nevertheless, the engineering colleges increasingly played a special role within vocational training after 1945:

- Industry had a large and growing interest in the efficiency of the training these institutions provided and in their orientation toward future demands, since industry obtained its practical engineers from them.
- The engineering colleges played a special role as institutions enabling males who had left elementary schools or secondary schools to gain further qualifications.

The desire of students at engineering colleges to gain a higher social status and the frequent realization that a person leaving one of these schools was just as useful to an employer as an academically trained engineer led to student protests in the mid-1960s, aimed at obtaining the status of a higher education institution for their colleges. At the same time, within the framework of the European Community, there were problems with the international recognition of the engineers' school-leaving certificate. The European Ministers of Education at that time regarded at least twelve years of schooling and at least four additional years of specialized training as a formal precondition for recognition as an engineer. This proved to be a powerful argument for meeting the demands of the engineering students. In 1968, higher education in what was then West Germany was reorganized into a binary system by means of a decision that:

- engineering schools and educational institutions of similar status were to be raised to the tertiary level of education and were to be called *Fachhochschulen* (FH);
- admission to the FH was to be gained by achieving a new standard, the *Fachhochschulreife*, after at least 12 years of schooling.

The Current Situation

At this time there exist a total of 244 institutions of higher education in the western part of the Federal Republic of Germany, of which 62 are universities including technical universities, 7 are *Gesamthochschulen*,

8 teacher training colleges, 16 colleges of theology, 30 arts and crafts schools, 97 *Fachhochschulen*, and 24 FH in public administration that provide training exclusively for specific careers within the public service. The *Gesamthochschulen*, founded in the early 1970s, constituted an attempt to combine universities and *Fachhochschulen* in one institution so as to facilitate student transfer. The model has, on the whole, not been well received.

During the winter semester of 1989–90, 1.51 million students were enrolled at German institutions of higher education, of which 1.15 million were at universities and comparable institutions of higher education and 357,000 at FH, including 39,000 at public administration FH.

The various institutions of higher education vary considerably in size. Last year, only 106 students were enrolled at the smallest public institution for higher education, a fine arts conservatory in Frankfurt, whereas 61,845 students were enrolled at the largest, the University at Munich. FH are generally smaller than universities, with an average of 3,600 students as compared to an average of 17,300 at universities. Only the FH Cologne with 18,400 students and the FH Munich with 15,800 have enrollments comparable to that of a mid-sized German university.

Since October 3, 1990, the total German system of higher education also comprises 54 institutions of higher education from former East Germany, including 6 universities, 18 technical universities or colleges, 3 medical schools, 8 teachers training colleges, and 12 arts and crafts schools. The East German system had no *Fachhochschulen*.

The Changing Student Profile at FH

In the short time since their creation, FH have become successfully established within the German higher education system. They carried a disproportionate share of the enrollment boom of the 1970s and the early 1980s. Between 1975 and 1987, the number of first-year FH students rose from approximately 44,000 to approximately 71,000. This increase of over 60 percent compares with a 30 percent increase in the number of first-year students at universities during the same period. In 1987, 31 percent of all students entering higher education attended FH. Because of the shorter duration of studies, the proportional output of FH graduates is somewhat larger. In 1987, approximately 53,000 successfully completed their studies at FH, which corresponds to 34 percent of all graduates leaving higher education in that year.

What are the main reasons for the increasing student demand on FH education? Initially the target group for FH studies was mainly lower or intermediate secondary school graduates who had partially finished a vocational training and wanted to advance their careers. They did not normally meet the higher education entry requirements, so, at the same time as the FH were founded, it was deemed necessary to create a specific form of entry requirement, the so-called *Fachhochschulreife*, which qualifies a person to study at FH but not at universities. This qualification can be achieved in the newly created *Fachoberschulen* (upper secondary vocational schools).

To understand the meaning of this new qualification it is necessary to consider the basic tracking system of the German secondary education system. After four years of primary education all pupils must choose between three options:

- the *Hauptschule*, requiring a minimum of five further years of schooling with an optional sixth year, at the completion of which young people typically enter the well-known German Dual System, which combines part-time vocational schools with structured apprenticeship training;
- the *Realschule*, the intermediate track of secondary schools comprising the fifth to tenth year of education, leading either to apprenticeships (and part-time vocational schools) or to higher vocational schools (*Fachoberschulen*); or
- the *Gymnasium*, the academic track that typically prepares pupils for university education. This track leads after nine years (the fifth to the thirteenth year) to the *Abitur*, the final examination, which is a general certificate of aptitude for higher education. With an *Abitur*, a school leaver (*Abiturient*) is entitled to enroll in any field of study at any university. The tracking system has been opened up by making it possible to transfer from *Realschulen* to specialized *Gymnasien*, by establishing comprehensive secondary schools (*Gesamtschulen*), which combine all three tracks and in principle allow for lateral transfer, and by providing special upper secondary courses for graduates of *Real-* or *Hauptschulen* (called the second route of education).

Because of the preselection of pupils by the tracking system, the transfer rates from the *Gymnasium* to higher education institutions are high. In 1976 approximately 83 percent of all *Abiturienten* entered a higher education institution; in 1989 it was about 72 percent. The *Abitur* was and is the major linking element between the school and university system in Germany. However, with the establishment of *Fachhochschulen* and the introduction of a specific *Fachhochschulreife*, the *Abitur* lost its status as the only gateway to higher education. In 1986, 19 percent of the 198,000 graduates of secondary schools qualified to enter higher education had acquired the *Fachhochschulreife* rather than the *Abitur*. As a result, the admission to a higher education institution has become more readily available for the less educated strata of society. Among qualified graduates whose parents received a *Hauptschule* certificate or less, 29 percent had the *Fachhochschulreife* and 6 percent had received their *Abitur* via the second route of education; among those whose parents were university graduates, only 6 percent had the *Fachhochschulreife* and only 1 percent had chosen the second route of education.

However, the main reason for the very dynamic quantitative development of the *Fachhochschulen* is not their accessibility to a new sector of young people who have not attended a *Gymnasium*. Rather it is their increasing attractiveness to school leavers who have passed their *Abitur* and could enter any university, but who prefer to enroll in a FH. The increasing importance of school leavers with *Abitur* for the FH is shown by the figures in Table 1: in 1975 about 20 percent of the German first-year students at FH had passed their *Abitur*, in 1980 the fraction was 35 percent, and at present it has grown to roughly 45 percent. Today, in many areas

of study in the FH, students with *Abitur* are about equally represented with the intended clientele of FH with the *Fachhochschulreife*.

Table 1: Changing Profile of First-Year Students at FH

	Percentage Entering FH with <i>Abitur</i>			Percentage of <i>Abiturienten*</i> Entering FH	
	1975	1980	1988	1980	1988
Men:		30	40	11	17
Women:		46	58	10	13
All Students:	20	35	45	11	15

*Counting only *Abiturienten* who entered higher education.

The growing number of *Abiturienten* going to FH represents a sharp break with the traditional tracking that used to separate university-bound school leavers from all others. In addition, a large fraction of *Abiturienten* enter the well-known German apprenticeship system (*Dual System*) after high school. Many of these subsequently enter FH. Thus the clientele of the nonuniversity-level institutions of higher education has changed. The upgrading of the student population at *Fachhochschulen* and the increasing downward mobility of the academic-bound students (entering Dual System and/or FH) are clearly indicated in Table 1.

The table also shows an interesting gender-based difference. Whereas the fraction of male *Abiturienten* entering FH rose from 11 to 17 percent between 1980 and 1988, for women this fraction changed only from 10 to 13 percent. This gender-related difference is partly due to the structure of courses offered at FH. Engineering, which at FH enrolls more than half of the students, remains a male domain. In the fields of mechanical and electrical engineering, for instance, only 7 percent of all students in 1989 were female. In contrast the field of social sciences was 75 percent female. Since the professional prospects for those who graduate in engineering are considerably more favorable than for those who graduate in social sciences, there is an overall disadvantageous labor market for female FH students. One can thus explain the stronger reluctance of women with *Abitur* to enroll in *Fachhochschulen*.

The general decline during the first half of the 1980s in the desire of qualified high school graduates to enter higher education affected the universities but not the FH. The latter are enrolling an increasing share of *Abiturienten*, who are weighing the advantages and disadvantages of university and FH training against each other with great care. In the winter semester of 1988–89, 12,200 first-year students with *Abitur* at FH had also considered studying at a university, while roughly 2½ times as many first-year students at universities—31,200—had also considered

studying at a FH. This interesting finding points to the fact that the potential of students with *Abitur* has not been fully tapped by the FH, and that many of those who want to study there are forced to study at a university instead because not enough places are available at FH.

Abiturienten who are studying at FH give two main reasons for justifying their decision to study there—reasons that also determine the image held by the general public of FH study:

- FH courses of study are more oriented to practical application than those at universities; and
- FH courses of study are shorter and more transparent.

Implications of the Changing Student Profile

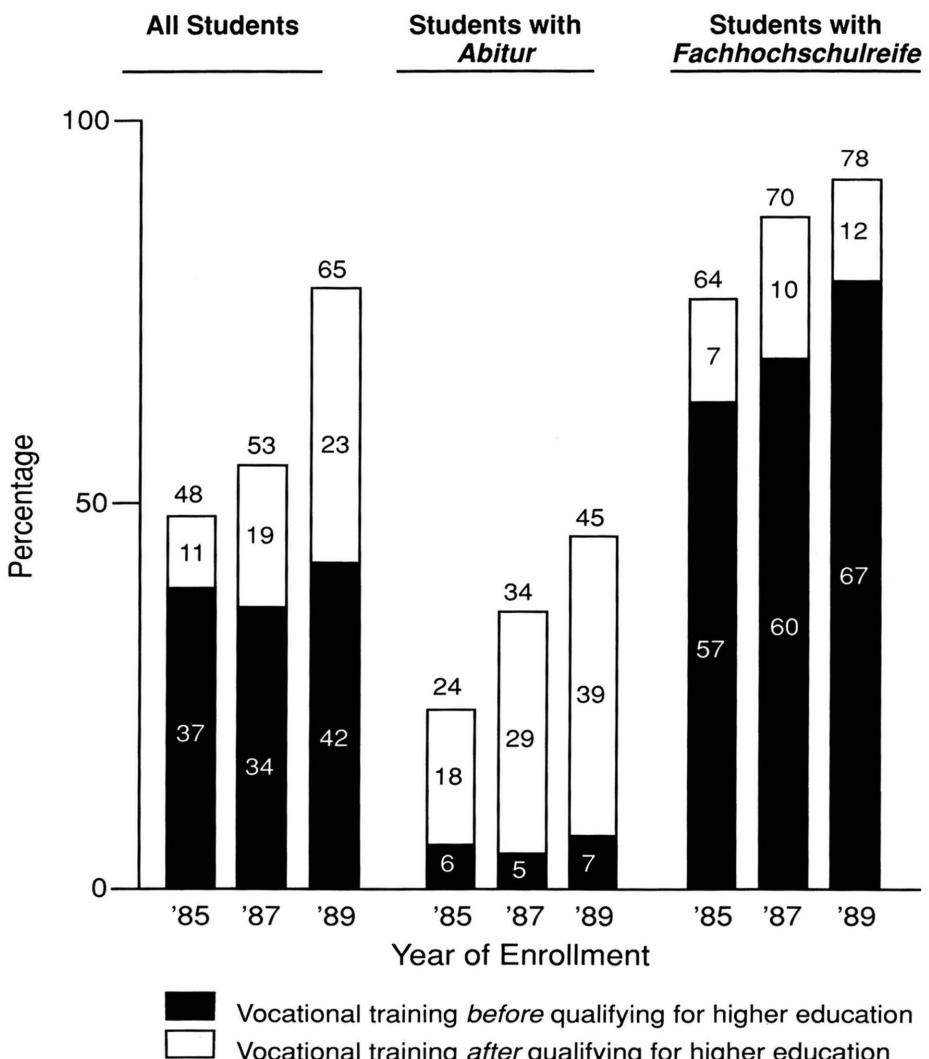
In spite of the growing proportion of *Abiturienten* in the FH, the fraction of students entering with occupational qualifications is also increasing, as shown in Figure 1. Between 1985 and 1989, the proportion of first-year FH students with prior vocational training rose from 48 percent to 65 percent. This change is primarily due to an increase from 24 to 45 percent in the fraction of *Abiturienten* completing an apprenticeship before entering FH. The corresponding change among those entering FH with *Fachhochschulreife* was from 64 to 79 percent. It is interesting to note that among the latter, apprenticeship and the acquisition of vocational qualifications occur predominantly *before* obtaining *Fachhochschulreife*, whereas *Abiturienten* mostly enter an apprenticeship *after* high school graduation.

The combination of a growing proportion of *Abiturienten* and of increasing completion of an apprenticeship among students entering the *Fachhochschulen* has resulted in striking changes in the qualifications that they bring to their study:

- Their occupational knowledge is much greater in spite of the higher proportion of *Abiturienten* among them.
- Because of the larger number of *Abiturienten*, their average preparation has changed to include more general education and a stronger interest in academic subjects.

The question is what effect the increasing heterogeneity of the first-year students at FH with regard to vocational experience and cognitive abilities will have on the success of their studies and on the nature of the *Fachhochschulen*. A recent study shows that students with *Abitur* find it easier to cope with the typical academic demands of their subjects at FH, an assessment that is confirmed both by the students themselves and by the professors. However, in spite of the increasing academic standard of preparation prior to FH entry, the current shift in the structure of the student body at FH regarding previous knowledge and vocational experience does not necessarily mean that there is a tendency to diminish the emphasis on practical application, which is still an important element of FH training. This is on the one hand a result of an increasing proportion of first-year students who completed an apprenticeship before entering

Figure 1: Percentage of First-Year Students at FH Entering After Completing Vocational Training



FH, so that there is still a close affinity between practically oriented training at FH and the learning and behavioral standards current in working life. On the other hand it is also the result of changes in the concept of practical application. The craftsmanship dimension of practical application in undergraduate courses is being gradually pushed into the background as a result of the changing demands made on the contents of the courses of study. These are becoming more oriented toward pertinent theories and concepts, knowing why in addition to knowing how.

The federal statute establishing the *Fachhochschulen* particularly stresses that what is taught at these institutions should be directly related

to practical applications of scientific knowledge and methods. At the same time, this law as well as the pertinent state-level statutes demand more or less explicitly that the teaching at the FH should place much emphasis on these theories and methods. FH faculty should be able to take a critical look at their discipline and develop rigorous and useful approaches to solving problems in occupational contexts. In view of this, and given the changes in FH student profiles, FH curricula are becoming more analytical and theory-based.

In spite of this trend, the main difference between *Fachhochschulen* and universities is likely to remain the continuing emphasis of FH teaching on applicability and practicality. There is no real contradiction between an increasing emphasis on theory on the one hand and a continuous stress on application-orientation on the other. The convergence of FH and universities is not likely to occur. The differences between the two are so decisive that one cannot conclude that FH are currently becoming increasingly academicized, nor is this probable in the future. "Different, but of equal merit" is currently the principal slogan used by representatives of the *Fachhochschulen*.

The *Fachhochschulen* in former West Germany have thus succeeded in establishing an independent profile as a new type of higher education institution within the German higher education system. Nobody really wants to change this status. The economy has developed a growing demand for the qualifications of FH leavers. For example, two-thirds of the engineers currently leaving higher education for an occupation have been educated at a FH. Thanks to the combination of theoretical and practical training, FH graduates in general are capable of reacting flexibly to job market conditions and of taking on new functions.

The Situation in Former East Germany

In the former East Germany, the situation is very different. In 1969, ten engineering colleges were raised from upper secondary to tertiary status. This transformation was made in the expectation that, in the context of rationalization and automatization processes in the field of technology, there would be a demand for new qualifications within industry, marked by an interrelation of theoretical knowledge and production practice. The *Fachhochschulen* were founded in West Germany at the same time with similar intentions. However, the engineering colleges in the East were less successful in developing their own profile as independent higher education institutions with specific functions such as practice-oriented teaching and technology transfer. On the one hand the demand for technological management capacity fell short of the expectations; on the other hand the engineering colleges attempted to be like technical universities instead of creating their own profile. The result was that the duration of study was extended to four years in the 1970s and that in 1976 the colleges received the right to award the *Diplom*, approximately equivalent to the American master's degree, and a little later the right to award doctorates.

At the moment, there are only two nonuniversity engineering colleges in the East. They will be changed into *Fachhochschulen*. Given the urgent

need for investment in existing institutions because of the neglect in the past, it will take a major effort to establish additional FH soon in the East German states. However, there are strong political pressures to develop the FH sector in these states, not only because of the importance of achieving a uniform higher education system throughout the unified Germany but also because the FH with their practice-oriented training have a positive effect on the regional economic development.

Prospects for the Further Development of *Fachhochschulen*

In December 1990, the *Wissenschaftsrat*—the body responsible for higher education planning run jointly by the central government and the federal states—presented its latest recommendations for the development of the *Fachhochschulen* during the 1990s. The report calls for a quick and energetic consolidation and conceptual development of the FH, aimed at further strengthening the current FH profile: job-oriented study of short duration through a structured curriculum and integration of practical experience into training at an institution of higher education where teaching is prevalent.

The *Wissenschaftsrat* recommended the expansion of the FH sector by 50,000 to a nominal capacity of 200,000 study places. Three reasons were given:

- The demand from those who want to study has been exceeding the supply for years. The *Fachhochschulen* should strengthen their position in the competition among the higher education institutions for students. More and more *Abiturienten* prefer to study at a FH where the period of study is shorter and courses are more job-oriented compared with those at universities. These students should not need to enter a university because there are not enough places for FH study.
- The demand for FH graduates within the occupational system is strong and will increase in the future since many occupations that today are still performed by technicians, craftsmen, and merchants without higher education will soon require individuals with higher education degrees, particularly from *Fachhochschulen*.
- The expansion of *Fachhochschulen* is favorable in economic terms as well. With an average length of study of eight semesters, FH graduates can enter the labor market earlier than university graduates. Their education thus takes up less time in relation to their working life.

The *Wissenschaftsrat* recommended expansion in the field of applied economics, electrical engineering, and mechanical engineering. It also proposed a broadening of the course spectrum (e.g., modern languages in connection with applied economics, courses of study for nondoctoral medical professions, etc.). The report also calls for the establishment of part-time courses that would allow for the combination of occupation and study. At the moment part-time courses are only available to a limited degree at a single FH. Experience there has so far been very good and the demand relatively high. Because of their job orientation, the FH are well suited to providing part-time courses. In the long term, part-time studies

should be considered as an integral part of all plans for expanding the *Fachhochschulen*.

The federal government is currently also determined to expand the *Fachhochschulen* to a total of 200,000 study places. The number of statutory study places indicates the nominal capacity of the system. In actual fact, FH are subject to a striking overload: during the winter semester of 1989–90 about 318,000 students had enrolled at FH (not counting the public administration FH) with only 150,000 nominal places. Such an overload, which clearly is likely to continue even if nominal capacity is expanded, results in high student/faculty ratios and teaching loads. It creates major difficulties in the further development of the FH sector. As is more fully described in a second article on *Fachhochschulen*, there is need not only for increased FH student capacity but also for greater opportunities for faculty to carry out applied research. To accomplish this, the teaching obligation for FH professors, which at the moment amounts to 24 hours per week, would have to be reduced considerably. That is to say that the FH teaching staff needs to increase proportionally more than the number in student places. Yet that will be difficult. The demand for teaching capacity is currently, and will in the near future continue to be, so strong that the personnel resources for research activities will at first remain very limited. Applied research at *Fachhochschulen* will need to be developed only gradually if one wishes to improve or even just to maintain the quality of teaching.

Overall, the idea seems to be gaining ground that investment in *Fachhochschulen*, including research activities, is an economically well chosen investment for the future. The *Wissenschaftsrat* recommends the foundation of new FH to be regionally located in such a way as to meet the criteria of planned regional development. A further concentration of public infrastructure in congested urban areas, which would lead to strain on the local housing market, should be avoided. With the regionalization of *Fachhochschulen*, further locations could be economically strengthened. For such a kind of regionalization FH are exactly the right type of higher education institution, given, for example, their importance in technology transfer to small- and medium-sized enterprises as discussed in Dietmar von Hoyningen-Huene's article on these interesting innovations in German higher education.