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Vocational training in Germany

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Kiel Working Papers

Kiel Working Paper No. 622

Vocational Training in Germany*

by

Hugo Dicke, Hans H. Glismann,

Sönke J. Siemßen



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Vocational Training in Germany*

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"So wie heute der Unterricht ist, so ist spaeter das ganze Volk" (The quality of today's education determines the quality of tomorrow's working population)

Pieter van Afferden (approx. 1700)

I. Introduction

1. From a bird's-eye view the German economy is still close to a miracle:
 - It ranks highly in terms of per-capita income.
 - Employees get a six weeks fully paid leave per year including a financial vacation bonus (plus 11 public holidays).
 - In cases of illness employees receive full salary from the first day on; the cost of medical treatment is covered by an obligatory health insurance system (which covers 99.6 per cent of the population).
 - The average working week (5 days) consists of 38.5 working hours.
 - Education is generally tuition-free; as a matter of fact students at universities (or at schools in case they are between 18 and 27 of age) may obtain 950 DM per month (subsidised loans for students); firms pay their apprentices on average salaries between 600 DM per month in the first year of vocational training and more than 1 000 DM per month in the third year.
 - Dismissal of employees is restricted by law: A large part of employees runs no risk of displacement because they are civil servants; the others are at least protected from instant dismissal. Job security generally rises with the time spent at the same firm.

So, for an outsider, Germany must surely look like the land of milk and honey with respect to its overall internal conditions, all the more so since it decided to actually open itself to the influx of poor people from other countries with the promise to look after the appropriate endowment of these people with accommodation and money. From an insider's view, however, the performance of the German economy does not look like a miracle at all. The (relative) decline of economic growth over the past 15 years (**Table 1**) gave birth to doubts: Did the fundamentals of the German economy crumble, is political mismanagement to be blamed, or both?

Table 1 — Rates of Growth of Per-Capita Incomes: Germany and the United States^a, 1960–1993 (per cent)

Country/Region	1960/70	1970/80	1980/90	1990/93 ^b
West Germany	3.5	2.6	1.8	0.1
United States	2.5	1.7	1.6	0.2

^a Gross domestic product per inhabitant at 1985 prices. — ^b 1993 forecasted.

Source: OECD, National Accounts, Vol. 1, 1960–1991; Main Economic Indicators, August 1993. — Own calculations.

Although it is not uncommon that insiders' views are different from those of outsiders, the interesting case in point here is that both insiders and outsiders regard human capital formation as the main causes of success or failure. Indeed, economists have long advanced the hypothesis of technical progress and along with it human capital as lying at the very core of economic growth; this paradigm is now receiving renewed consideration by the proponents of the "new" growth theory (like Romer, 1986). In a similar but more than slightly different way the Nestor of growth economics, J.A. Schumpeter (1954), stressed attitudes to be a shaping factor of economic development.

This study is based on the hypothesis that an economy is the more successful the more it is capable of positively forming attitudes. The acquisition of knowledge which is by no doubt necessary for individuals, companies and nations to remain competitive, is considered to be concomitant to the forming of attitudes. Formal education, defined by the United Nations as "organised and sustained communication designed to bring about learning" (UNESCO, 1976, pp. 259), involves educational agencies which organise the learning either at schools, universities, or firms. We shall delineate the trails and institutions of German vocational training, and show how it is inbedded in the system of general education. Finally, an attempt will be made to evaluate the effectiveness of this system.

2. For whatever reason, the world's leading economies have more and more become competitors with respect to their economic performance. It is quite natural that countries losing out in this competition search for reasons of their relative decline and, consequently, look for appropriate policies to at least catch up to the front-runner. In Germany and other continental European countries, but also in Australia, the issues of the tax burden and of regulation have been identified as the main causes for the decline vis-a-vis countries such as Japan. On the other hand, the debate in the United States seems

to have centred on the issue of education at large and, in particular, on vocational education. As a matter of fact, it was Vice Admiral Rickover (he complained of being accused to favour a system of "train the best and shoot the rest", 1962, p. 16) who pointed out both the importance of education and the "national failure" of American education decades ago. After the Reagan excursion into deregulation and tax cuts the Clinton administration seems to have rediscovered the importance of the educational system. Ways and means of how to change the American system of education are looked for. In this context, the Japanese and the German systems of education and, notably, of vocational training have gained attention. It may be worthwhile to first look briefly into the rationale of the German system as it has developed over time.

II. Human Capital Formation in Germany

1. History and Principles

3. In order to evaluate systems of education and of vocational training one should have some ideas about the past development of such a system. History seems to be more important here than in any other field. The main reason is that one has to reckon that there may be considerable time lags involved when trying to analyse the impact of certain systems of education on phenomena such as the international competitiveness of an economy or overall economic growth. For example, it may well be that economic performance of German industry between 1960 and 1970 was due to the system of vocational training between 1945 and 1955, and that the latter system was heavily influenced by both the attitudes of teachers and trainers inherited from old times, say the 1920s, and the institutions (institutes, universities, laws, etc.) created in the Kaiserreich, i.e. between 1871 and 1914.

To be more precise, if one country wants to learn from any other country what it takes to create an educational system which eventually makes a country rich, or grow faster in economic terms, it should make sure that it has the above described lags well considered. Otherwise it may just copy another bad system (which may reveal its badness only after a couple of decades).¹

4. In a historical perspective trades or occupations change in the course of economic developments. Determinants are mainly increases in the division of labour, which again changes on account of well-known factors such as technological change, changes in demand, or changes in the structure of comparative cost advantages with respect to foreign countries. There is no major difference in this respect among countries. National

¹ As a matter of fact, the success in forming positive attitudes through a system of (vocational) education may depend also on the type of a political system. For example, in a society with some sort of a "neo-classic" behaviour of the people and its elected representatives, time preferences may be so high that the existing time lags mentioned may be too long to play any role: the benefits from investments in positively forming attitudes may come too late to have a positive present value (and correlated with such a positive present value are the incentives to invest in education). If at the same time the administration and the parliament are used to think in terms of 4- or 5-years benefits there will be underinvestment in the sector of (vocational) education. In Germany it was the "Kaiserreich" which still today is thought of as having invested heavily in institutions for forming attitudes, especially in the fields of the exact sciences.

particularities can be observed, however, when looking at specific routes of adjustment in education at large and particularly in vocational training.

In the Middle Ages and well into the process of industrialisation vocational trainees in the German states were integrated into the family of a master, where social control as well as control of vocational training took place "en passant", assisted by the norms of the guilds. The ongoing industrialisation made old structures change, be it by the emergence of free "wage workers" or be it by changes in the institutional framework. As regards the latter, Prussia went ahead by introducing reforms of the labour market, such as the abolition of the mandatory membership in guilds, or the so-called liberation of farmers (from bondage, etc.), or the freedom to settle down with ones business.

5. By and by, an increasing separation between education and work led to the emergence of a system of education of its own rights.² With respect to the task of education the free citizens (citoyens) had the idea of a dichotomy existing between education and vocational training in the sense of a hierarchy: highest ranking was education in the sense of well-breeding, as a means to build up the human personality without any vocational intent. Lower ranked was the education in the form of vocational training, i.e. the passing on of a particular knowledge for certain occupations.³ The Prussian school policy in the nineteenth century can be looked upon as having reflected this dichotomy. Education at gymnasias (in Germany this is a classical secondary school) and at universities was orientated on the ideal of an education which was general and far from any material production intent. Thus, vocational training played only a minor role in public policies. Moreover, industrialisation and Taylorism reduced the economic incentives to train workers and craftsmen. From this followed a rapid decline of the quality and importance of vocational education through masters. This development climaxed in the "Gewerbeordnung des Norddeutschen Bundes" (industrial code of the Northern German Federation of 1869), which abolished the guilds and allowed practically everybody to be a vocational trainer. Consequently, the ensuing deficiencies of the system of voca-

² At the beginning of the eighteenth century Prussia introduced the general obligatory school. It was intended to thereby pass on some elementary education to the people. Besides that there were so-called "Realschulen" established at the same time. They had a more clear-cut vocational intention, in that they had to teach the "theoretical elements" of manufacturing.

³ The dichotomy between vocational training and education is attributed to Wilhelm von Humboldt (1767-1835); it is said that Humboldt put emphasis on the holistic development of an individual personality as opposed to the alienation and one-sided specialisation supposedly going hand in hand with vocational training.

tional training lay at the very core of studies and treatises, published for instance by the "Verein fuer Socialpolitik".

6. The consecutive endeavours towards reforming vocational training led to a new set of rules which eventually created the basis for today's dual system of vocational training. This system again reproduced the dichotomy between education and vocational training as advocated by Wilhelm von Humboldt. In 1897, the so-called craftsman law (Handwerkergesetz) was passed, which handed over certain rights of control to vocational chambers. These chambers were self-managing institutions of the manufacturing sector. From then on vocational training has been delegated to the self-managing organisations of the economy.⁴ Initiatives from the side of the liberal citizens led to an enrichment of vocational training by providing also for some general education, to be supplied by schools, in order to form the future grown-up citizens (Blankertz, 1975).

To be sure, trade unions as well as employers and employers' organisations tried also to pursue their own interests since the time of Bismarck. This again put a stamp on the German system of vocational training. For example, the allowance to educate apprentices was made dependent on a so-called "minor certificate of qualification" (kleiner Befähigungsnachweis) since 1908; due to this quasi-monopoly of the craftsmen this led to shortages in the overall supply of well-trained labour since demand from manufacturing for this kind of labour was not met. In response, the industrial manufacturers argued that vocational training in the craftsmen business did not meet the different qualifications needed in the manufacturing; the systematic and theoretical element necessary for handling complicated machines was supposedly missing in vocational training. Employers and employers' organisations in manufacturing achieved their end of breaking the monopoly of craftsmen in vocational training by becoming part of the board of examiners. In addition, specific trails of industrial apprenticeship were established. In that way the vocational training in Germany, and basically the dual system, developed evolutionary rather than according to any planned conception.

7. The vocational school as it is today was formed during the 1920s and 1930s. It was a school structured according to occupations. It was in 1938 that vocational schools became mandatory for all those who wanted to take part in vocational training.

⁴ The "Handwerkergesetz" was part and product of Bismarck's (German chancellor between 1871 and 1890) policy aiming at social stabilisation by an appeasement of social groups: the traditional vocational training of craftsmen was thought of as being an insufficient protecting device against social and political upheavals of the workers.

The traditional German model of vocational training places the emphasis on training within the firm, with an additional part-time education in a public vocational school (Berufsschule).⁵ This system exists in German-speaking countries (Germany, Austria, Switzerland) as well as in Denmark. This is why it has also been labelled the continental European system of first vocational qualification.⁶

8. The dual system of vocational training in the Federal Republic of Germany got its name "dual system" from the "German Committee for Education and Vocational Training" (Deutscher Ausschuss fuer das Erziehungs- und Bildungswesen), which wanted to indicate by the word "dual" the simultaneous education within the firm and at a governmental vocational school. "Simultaneous" was not intended to refer to equal weights or to equivalents. Indeed, vocational school attendancy takes place at one or two days per week today. In addition, the report of the vocational school plays no role at all in the final examinations of vocational training. This irrelevancy of vocational schools is often considered degrading and demotivates scholars as well as teachers.

Table 2 describes some of the characteristics of the German vocational training system, with the emphasis put on the interaction between government regulations and private regulations.

2. Present Structure and Design

9. The German Basic Law (Art. 7) stipulates the supervision on schools to be in the public domain. It also provides for a hierarchy of competences in educational affairs. Principally, cultural and educational affairs are in the domain of the states, not the Federal State. As far as the setting of objectives, methods, contents, and duration of formal education ("education planning") is concerned cooperation among the states and the federal government prevails and limits the room for autonomous actions of the states.

⁵ There also is a very small share of vocational training taking place in central institutions, some supra-firm education, so to speak.

⁶ In an international comparison one might distinguish among three models of vocational training (Heintze, 1988): (1) the model of intra-firm vocational training, (2) the model of full-time vocational training at school, (3) the model of firm-related vocational training at central supra-firm locations of vocational training. The first type may be labelled the German system, the second type has been applied especially in Belgium and Sweden and, mixed with other systems, in Italy, France and Finland. The third type of vocational training has been applied in the United Kingdom mainly. In addition to the United Kingdom, the Netherlands and Luxemburg are considered to apply the third type of vocational training.

Table 2 — The Elements of the German Dual System of Vocational Training (v.t.)

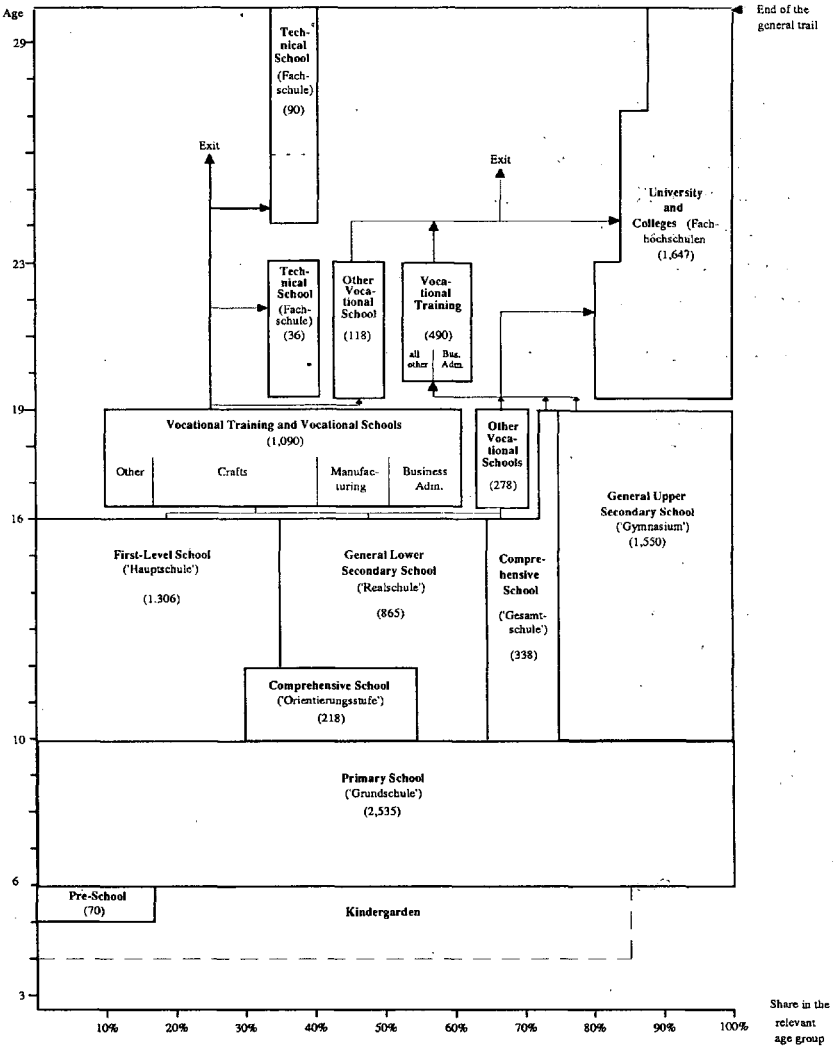
Criterion	School	In-house training
V.t. contents	a. Job-related theory b. General education	Job-specific training
Institutional device	General framework of education provided by the states' administrations ("Rahmenlehrpläne")	V.t.-regulations ("Ausbildungsordnungen")
Legal provisions	School laws of the states	1. (Traditional) private rules and regulations 2. Federal laws for in-house as well as general v.t.
V.t.-personnel	V.t.-school teacher (with a university degree)	In-house vocational trainers ("masters" or equivalents)
Place of v.t.	School building	Firm's building
Source of funding	The tax payer	The firm
Controlled by	State governments	1. The employer 2. Federal regulations 3. Agreements between employer and employees' organisations

Source: Hegelheimer (1974); Heintze (1988)

Yet, the operating of public schools and universities as well as the public funding rests solely with the states. This is different regarding vocational training where the competence to regulate rests with the federal government. The founding of universities and the enlargement of existing universities are also matters where the federal government has the right to participate in the decision-making and where the Laender have to cooperate with the federal government.

10. The typical trails of German education are portrayed in **Graph 1**. The horizontal axis indicates the percentage of the population in the age group which is enrolled at a certain level of education and the vertical axis indicates the age of pupils or students. The graph clearly exhibits the pivotal role vocational training plays for the age group 16-19 at the secondary level of education. 1.09 mill. scholars attended vocational training in crafts, manufacturing, business administration and other occupations in 1989/90. Another 0.49 mill. scholars of the age group 20-24 took part in vocational training as well. It is also noteworthy that the German educational system has a high degree of permeability. After completing vocational training the graduates can attend part- and full-time schools offering further education or schools which grant their

Graph 1 — Trails of Education in Germany (as of 1990)



Notes: Number of students in thousands in parenthesis. — "Other Schools" are occupation orientated but provide a regular school degree after which it is possible to attend a "technical school" or a university/college.

Source: Statistisches Bundesamt, Fachserie 11: Bildung und Kultur, various issues. — Own calculations.

graduates the right of entry to tertiary level education at universities or colleges. It should be noted that general and vocational education in Germany absorbs a significant part of man's lifespan. This has been criticised heavily from time to time by experts, politicians and industrial organisations, among others because that part of life could possibly be allocated more productively (instead of just rote learning).

11. Public funding of education in Germany amounted to 4.3 per cent of GDP in 1988; private funding was negligible (Table 3). As opposed to Germany the US spent significantly more, also in relative terms, on both public and private education. Of the Federal- and Laender-budgets in Germany, 9.1 per cent is earmarked for expenditures on education which is below the 13.7 per cent in the case of the US (still Table 3).

The lion's share of education funding goes to the schools, in Germany as well as in the US. The schools' share in total educational expenditures is 61.8 per cent in Germany and 73.2 per cent in the US. Expenditures per student are rather low in Germany as compared to the US. On the average, Germany spent 3 047 \$ per student (expenditures in DM valued at purchasing power parities), and the US spent 4 301 \$ per student. The difference in per capita expenditures on education between the two countries is the largest for children at pre-schools and relatively small for students at public universities.

12. Alas, definition of resources devoted to education might differ between the two countries and higher education expenditures in the US may be due to divergencies in the accounting system. The composition of the staff employed in education (No. 7 in Table 3) lends some relevance to this suggestion: In Germany, only 0.6 per cent of the total labour force is employed in the administration and 2.7 per cent are teachers whereas in the US the share of administration in the total labour force amounts to 2.3 per cent and that of teachers to 2.2 per cent. It is hard to believe that the German system of education has so much less administrative work to do. It rather seems plausible to assume that in the German statistics part of the administrative staff in education is reported elsewhere. What remains is that, in the context of this study, Germany employs a slightly larger proportion of her total labour force as teachers than the US. This shows up in the pupils/teacher ratio. The ratio is 22 at German primary schools and 14 at secondary schools (18 and 16 respectively in the US).

Since Germany as well as the US grant the individual right of education, and also have compulsory education, compulsory school attendance differs only slightly: It amounts to 12 years in Germany, and 11 years in the US. In Germany, secondary level educa-

Table 3 — Indicators of Education for Germany and the United States, 1988

Indicator		Germany	USA
1. Expenditures on education % of GDP	Public Private Total	4.3 0.2 ^a 4.5	5.0 0.7 5.7
2. Public expenditures on education % of total public expenditures		9.1	13.7
3. Shares of educational expenditures by school level ^b % of total expenditures	Pre-School ^c School University Other	4.0 61.8 21.4 12.9	4.9 73.2 26.8 0
4. Current and capital expenditures (only public) % of public expenditures	Current exp. Capital exp.	90.4 9.6	91.0 9.0
5. Expenditures per scholar in purchasing power equivalent USD	Pre-school pub. School pub. University pub. University priv. Total pub.	941.0 2263.0 5085.0 n.a. 3047.0	2278.0 3843.0 6386.0 9844.0 4301.0
6. Relative expenditures per scholar Index: Primary School = 100	Pre-school Primary School Secondary School University	45.0 100.0 127.0 242.0	78.0 100.0 123.0 179.0
7. Staff employed in education (public sector only) % of total labour force	Teacher Administration Total Staff	2.7 0.6 3.3	2.2 2.3 4.5
8. Pupil/Teacher ratio	Pre-Primary Primary-School Secondary-School	16.6 ^d 21.7 13.7	n.a. 17.5 15.8
9. Participation in formal education % of population age 2-29	Full time Part time Full time equiv.	54.2 0.2 54.4	48.3 9.3 54.9
10. Pre-primary school attendance % of age group		85.4	87.2
11. Upper secondary education attendance % of age group (16-19 years)	General Vocational Total	38.1 50.5 88.6	90.2 — 90.2
12. Upper secondary degrees % of age group	Completers ^e Graduates	134.4 112.1	80.6 73.7
13. Entry ratio to tertiary education % of age group	College ^f Universities Total	9.2 19.5 28.7	18.3 47.5 69.5
14. Non-university tertiary education (attendance) % of age group		6.7	44.6
15. Higher education attendance % of age group		19.1	24.9
16. Higher education degrees % of age group (22 years)	Graduates	13.3	25.6
17. Science and engineering degrees % of total degrees	Natural sciences ^g Math and Comp. Engineering Total	7.8 2.8 18.7 29.3	5.5 4.8 8.7 19.0

^a1986 data from OECD (1990); OECD (1992) quote 1.9 %, but this is not plausible. — ^bExceeds 100 %, possibly because pre-primary education has to be excluded. — ^cData were given in ISCED Classifications: 'Primary School' refers to ISC 0; 'Secondary School' to ISC 2+3 including German vocational schools, 'University' refers to ISC 5+6+7, i.e. tertiary education leading to a university degree (ISC 6) or a post graduate degree (ISC 7); 'Other' is not specified tertiary education. — ^dBased on Statistisches Bundesamt, Fachreihe 11: Bildung und Kultur, Reihe 1: Allgemeinbildende Schulen, and own calculations. — ^eRefers to students who attend the final year of the program. — ^fRefers to ISCED Level 5, tertiary education without university degree (e.g. Vocational Academics, Fachschulen). — ^gBiology, Chemistry, Physics.

Source: OECD, "Education at a glance, The OECD indicators", Sep. 1992. — United Nations Educational Scientific and Cultural Organization, World Education Report 1991.

tion which comprises general and vocational training is attended by roughly 89 per cent of the population in the age group 16–19 and by 90 per cent in the US (no. 11 in Table 3). The overwhelming part of the German population in this age group, namely 50.5 per cent, attends vocational training.

As regards tertiary education, 29 per cent of the German population is involved. This is far below the figures for the US. In addition, the composition of degrees by faculties awarded by universities and other establishments of higher education differ strikingly between Germany and the US: 29.3 per cent of the degrees awarded in Germany in 1988 were degrees in "natural sciences"⁷, mathematics and computer science, and engineering, as compared to only 19 per cent in the US. It should be noted that students attend tertiary education much longer in Germany than in the US. For this and other reasons such as the slightly longer primary and secondary education, and the compulsory military service — Germans are on average much older than Americans when graduating.⁸

⁷ Id est biology, chemistry, and physics.

⁸ See also Boemsen, Glismann, Horn (1985), pp. 93 sqq. for a more extensive discussion.

III. The German Vocational Education System

1. Structure

a. Customers

13. It was argued above that the structure of the German system of education has at the same time a universal and a country-specific feature (cf. para 9 sq.). The German system of vocational training can be described by making use of the market concept of demand and supply. Firstly, on the demand side, there are graduates from all kinds of schools who have to decide among

- taking up an unskilled-labour job,
- applying for apprenticeship in the dual system (i.e. in-firm education and vocational schooling),
- directly going into occupational training at a full-time vocational school,⁹
- going on studying at a polytechnic or a university.

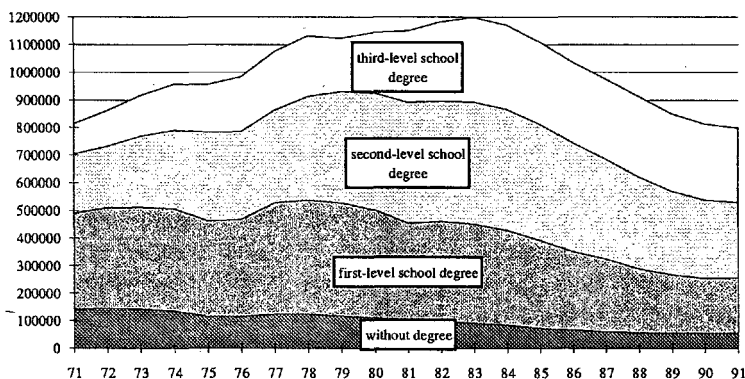
Thus, these graduates are the customers in the market for apprenticeships.

Secondly, on the supply side of the market we find firms, or public institutions, who choose among the applicants for vocational training. These suppliers, of course, can also decide among different options, such as doing less vocational training and, instead, hiring labour which was fully trained elsewhere; they may also opt for unskilled labour, or for graduates from universities. For example an expected shortage in the market for qualified workers would increase the incentive for firms to provide additional vocational training in order to satisfy their demand for future qualified labour (cf. chapter IV).

14. The number of potential customers, i.e. graduates leaving schools, was increasing until 1983. Since then the number has been decreasing to 800 000 and is expected to decline even more over the next decade (**Graph 2**). The unification of Germany in 1990 led to an increase in the number of potential customers by about 200 000. Due to a lack of data in the former GDR we shall focus on West Germany.

⁹ These schools are partly government run and partly private. They are most common in the health professions and in the teaching of foreign languages. Certificates of these schools are officially accepted and statistically reported under the heading "vocational schools". The share of participants, however, is small.

Graph 2 — Graduates from Various Schools, 1971–1991



Source: Statistisches Bundesamt, Fachserie 11, Reihe 1: Allgemeinbildende Schulen, various issues.

Some three decades ago, the bulk (i.e. roughly 95 per cent in 1960) of customers for apprenticeships came from the first-level schools.¹⁰ This has changed considerably. As of today, the major demand is from the second-level school graduates, and the share of third-level school graduates is increasing as well.¹¹ As regards the graduates from gymnasias (i.e. those who achieved third-level school degrees), **Graph 3** shows the estimated maximum demand derived from panel questionnaires about the future education plans of these graduates. A university education became less and less popular among these graduates in the seventies. Only 59 per cent of third-level school graduates were looking for a university education in 1985/86, and 40 per cent planned to take up vocational training or were undecided.¹² As this went along with a continuously high number of

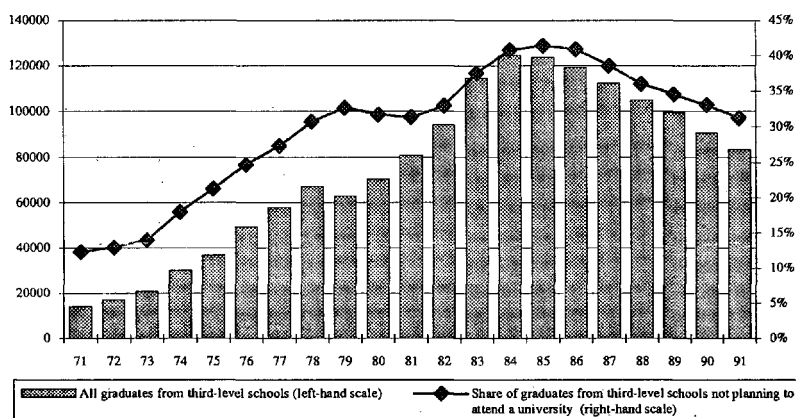
¹⁰ First-level school refers to "Hauptschule", second-level school to "Realschule", and third-level school to "Gymnasium".

¹¹ For some of the third-level graduates, this is a complementary education to the university degree which they are still seeking as their final goal. For others it is a pure substitute. These considerations are important insofar as the absolute number of third-level school graduates looking for vocational training is increasing.

¹² Quite remarkably, the interest in taking part in vocational training as well as achieving a university degree was strongly increasing at that same time, possibly in view of the decline in the demand for university graduates.

graduates from second-level schools the demand for vocational training increased in a parallel fashion. Among the first-level school graduates some 70 per cent are looking for ordinary apprenticeship, and 27 per cent want to attend a full-time vocational school (according to polls by the Federal Chamber of Industry and Commerce). This is without discrimination according to sex; it can be observed, however, that female graduates are less interested in a university education than male ones.

Graph 3 — Third-Level School Graduates Not Planning to Attend a University^a, 1971–1991



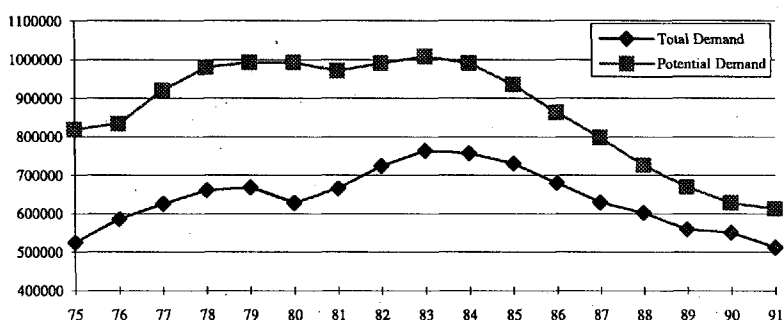
^a Including those who are undecided.

Source: Bundesminister fuer Bildung und Wissenschaft, Grund- und Strukturdaten, various issues.

15. The actual demand for vocational training is also dependent on the time-lag between the date of graduating from school and the start of vocational training: two thirds of applicants for vocational training leave school in the same year, one sixth one year later and one sixth two years later (Bundesanstalt fuer Arbeit, 1991/92, p. 24). This time lag is, among others, due to the compulsory military service for the male population which regularly starts at an age between 18 and 20 years. In addition, some graduates are taking one year off (a case in point are female graduates who go abroad as au-pair). The average time lag has been slightly increasing on account of the increasing number of third-level school graduates (which is why it is not a meaningful indicator for market imbalances).

16. **Graph 4** presents a comparison between the potential and actual demand for vocational training between 1975 and 1991. Potential demand is defined here as the number of graduates from all kinds of schools minus graduates who plan to go directly to a university. Actual demand is defined as applications for vocational training registered by the Federal Labour Office. The gap between potential and actual demand has been closing. Thus, vocational training has become relatively more popular among school graduates over the last decade.

Graph 4 — Potential and Actual Demand for Vocational Training, 1975–1991



Source: Bundesanstalt fuer Arbeit, Berufsberatung (1991/1992); Bundesminister fuer Bildung und Wissenschaft, Grund- und Strukturdaten, various issues.

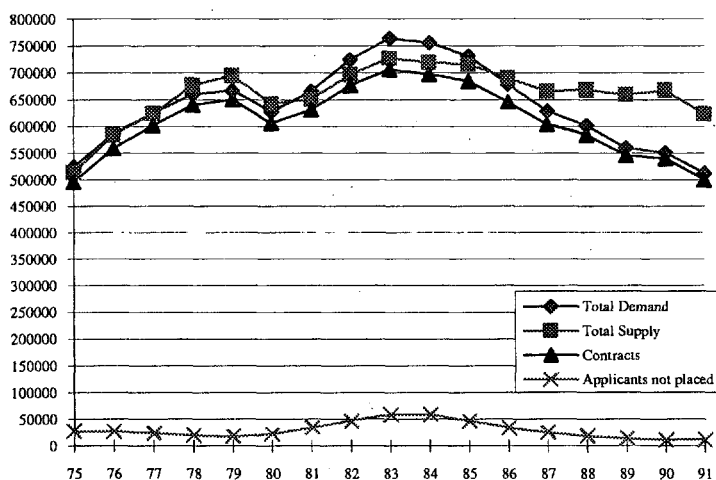
b. Suppliers

17. It can be expected that the supply of apprenticeships depends mainly on the macroeconomic production potential, corrected for changes in labour productivity in the long run. The actual supply of vocational training, defined as the number of apprenticeships offered by firms and public administration, developed roughly parallel to total demand, as can be seen from **Graph 5**. One might say that until 1984 supply was dominating over demand with respect to the development of contracts, whereas after 1984 demand seems to have been the limiting factor. Supply reacted to recession periods as is indicated by the reduction in 1980 and 1981. Demand for vocational training exceeded supply only in the period 1982–1985.

18. The obvious idle capacity for vocational training since 1986 does not reflect excess supplies across all kinds of activities. Even in 1991, when excess supply amounted to almost 20 per cent of all training places offered, there were scarce training capacities

in some sectors, e.g. in the banking sector. The ongoing reduction in potential demand suggests that there will be an overall surplus in the market for the years to come. However, Graph 5 does not include the data for the new German states. The situation in the eastern part of Germany is surely quite the opposite of the western one: The number of applicants not placed is much higher in the new states (Bundesanstalt fuer Berufsberatung, 1992); the gap is to a large extent filled by state-run workshops ("ueberbetriebliche Ausbildungsstaetten") which provide vocational training.

Graph 5 — Total Supply and Demand for Vocational Training, 1975–1991



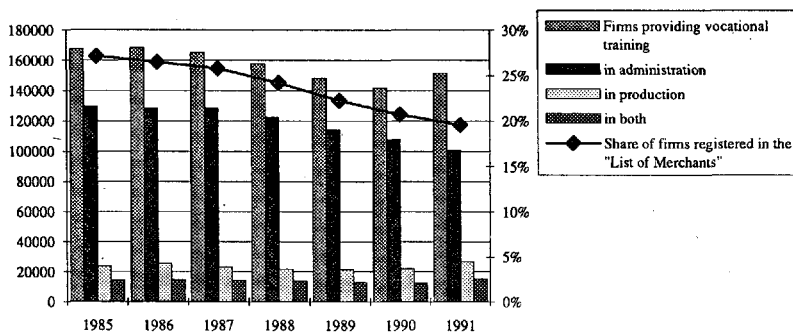
Source: Bundesanstalt fuer Arbeit, Berufsberatung (1991/1992).

19. The decision of firms to offer apprenticeships is shaped by economic and, most importantly, social considerations. One may argue that there is a substantial social and political pressure on firms to offer vocational-training contracts in excess of what the firms may need. The amount of such pressure is inversely related to the macroeconomic situation. In times of excess demand the government and the public is normally putting very intensive political pressure on the private firms, coupled with some financial aid, e.g. for training workshops. In case of excess supply the respective chambers and guilds often react by running image campaigns for their businesses.

20. Not all German firms provide vocational training. For those represented by the Chambers of Industry and Commerce (which represents the bulk of firms) the absolute

number of firms which do so had a downward tendency until 1990 (Graph 6). If measured as per cent of firms registered in the "List of Merchants"¹³ this negative trend is even more obvious. The trend is due to the reduction in training opportunities in administration, which are comparatively cheap to set up and to withdraw, compared to training in production.

Graph 6— Firms Providing Vocational Training by Number and Shares^a, 1985–1991



^a Firms belonging to the Chambers of Industry and Commerce

Source: DIHT, Berufsbildung, Weiterbildung, Bildungspolitik, various issues.

21. Disaggregating the supply of vocational training according to the size of firms as measured by the number of employees may lead to the information on which size of firm is the most relevant one for vocational training. Since small companies are said to incur less net costs of vocational training than the large ones¹⁴ they should offer relatively more apprenticeships. The argument is strengthened when including other chambers, such as the Crafts Chambers, which normally represent small firms (up to 20 employees). According to the Kiel Chamber of Industry and Commerce, and in line with Graph 6, the small firms provide the overwhelming majority of vocational-training places. In view of the many small firms engaged in vocational training, many a regulation can be considered to be a transaction-cost reducing device of macro-organisation.

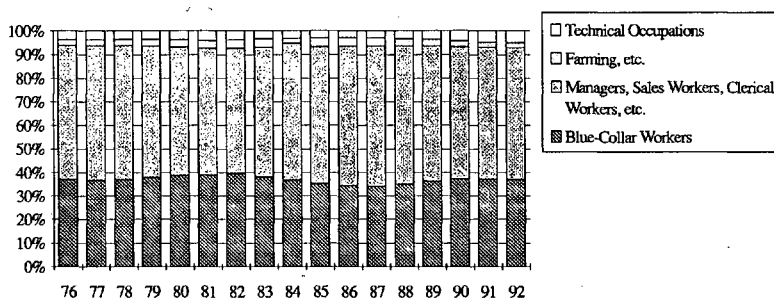
¹³ The List of Merchants includes only firms which have a minimum size (described by the term 'run in a professional manner') and thus are the only ones relevant as suppliers of vocational training. The total number of members of the Chambers of Industry and Commerce is much higher than the number of firms in the List of Merchants.

¹⁴ The Chamber mentioned a relatively cheap sales-person program as an exception.

c. Some Additional Data on Demand and Supply

22. A more detailed view of the market reveals the ups and downs of the different groups of occupation as reported by the Federal Labour Institute. The service sector has been the most popular among graduates from school in recent years. Its 50 per cent share, however, also reflects the structure of the German economy. Although there are complaints from the side of the employers that it is increasingly difficult to find applicants for vocational training in manufacturing, the data show a relatively stable share of total demand for these occupations up to date. Technical occupations such as technical drawers (tracers) or laboratory assistants increased their share in vocational training over the last decade, whereas the primary-sector occupations (agriculture, mining, gardening) are becoming less important. The rise in demand for service occupations since 1986 is mainly due to the increase of third-level school graduates wanting to take up vocational training. On the supply side, jobs in manufacturing exhibit a significantly higher vocational-training share (about 45 per cent) than on the demand side (about 35 per cent). An interesting result that can be derived from these statistics is the non-existence of a long-term trend of vocational-training contracts towards service and technical occupations which could have been derived from the increasing importance of these sectors in the economy.

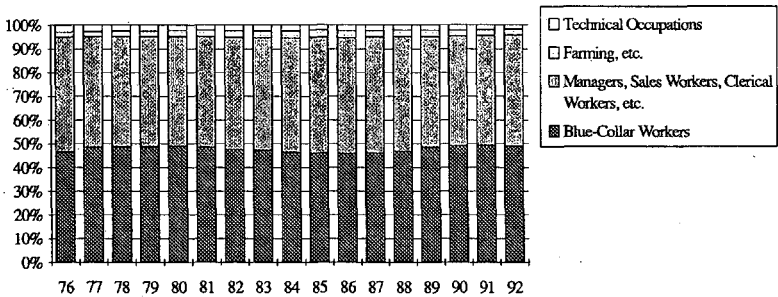
Graph 7 — Demand for Vocational Training by Occupation (per cent), 1976–1992¹⁵



Source: Bundesanstalt fuer Arbeit, Berufsberatungstatistik, various issues.

¹⁵ For definitions of occupations see Annex 1. Annual data refer to the 12 months from October to September, starting October 1975.

Graph 8 — Supply of Vocational Training by Occupation (per cent), 1976–1992

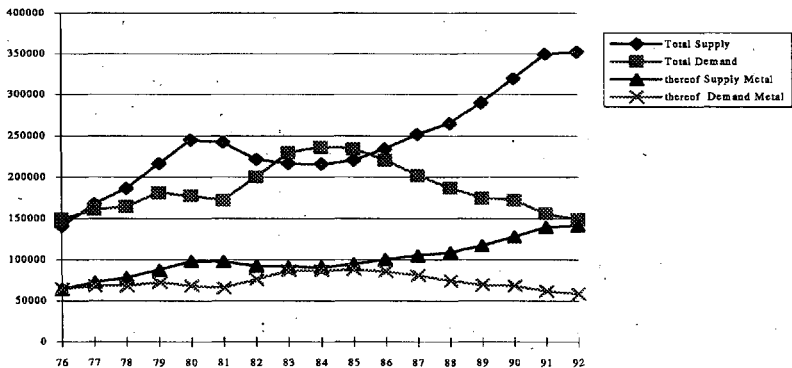


Source: Cf. Graph 7.

Graphs 9–12 contain more detailed and disaggregated information regarding absolute numbers:

- There is a more or less pronounced decline in demand for vocational training in all occupations, starting in the mid-eighties.
- The supply of vocational training has generally increased since the mid-eighties.

Graph 9 — Vocational Training in Blue-Collar Occupations: Supply and Demand, 1976–1992

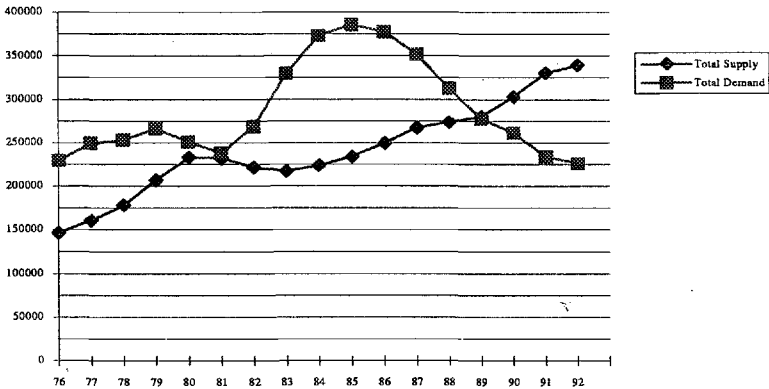


Source: Cf. Graph 7.

Depending on the initial situation of demand and supply there is a considerable amount of excess supply notably in the blue-collar occupations where we have about

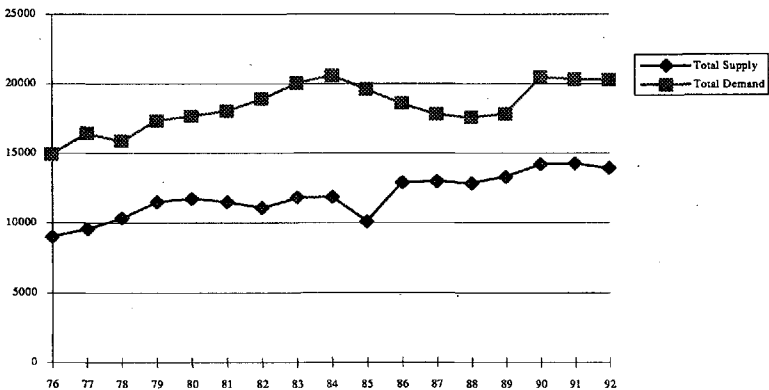
two hundred thousand vocational-training jobs offered in excess of what was asked for in 1992. Quantitatively of a minor importance but nevertheless interesting to note is the almost stationary development of demand and supply in the technical occupations, with excess demand prevailing throughout the time considered (Graph 11).

Graph 10 — Vocational Training in Clerical and Service Occupations: Supply and Demand, 1976–1992



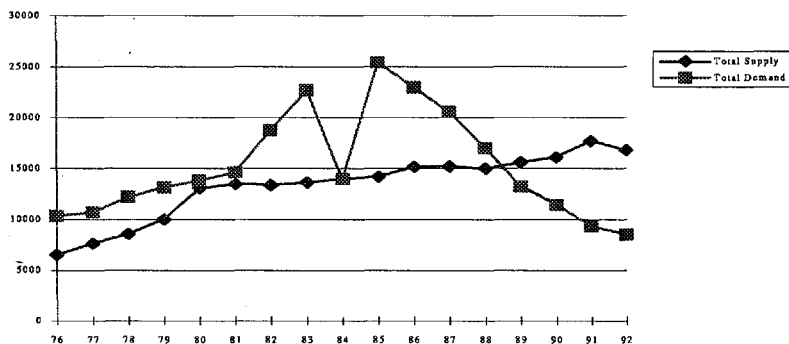
Source: Cf. Graph 7.

Graph 11 — Vocational Training in Technical Occupations: Supply and Demand, 1976–1992



Source: Cf. Graph 7.

Graph 12 — Vocational Training in Farming and other Primary-Sector Occupations: Supply and Demand, 1976–1992



Source: Cf. Graph 7.

2. Institutions

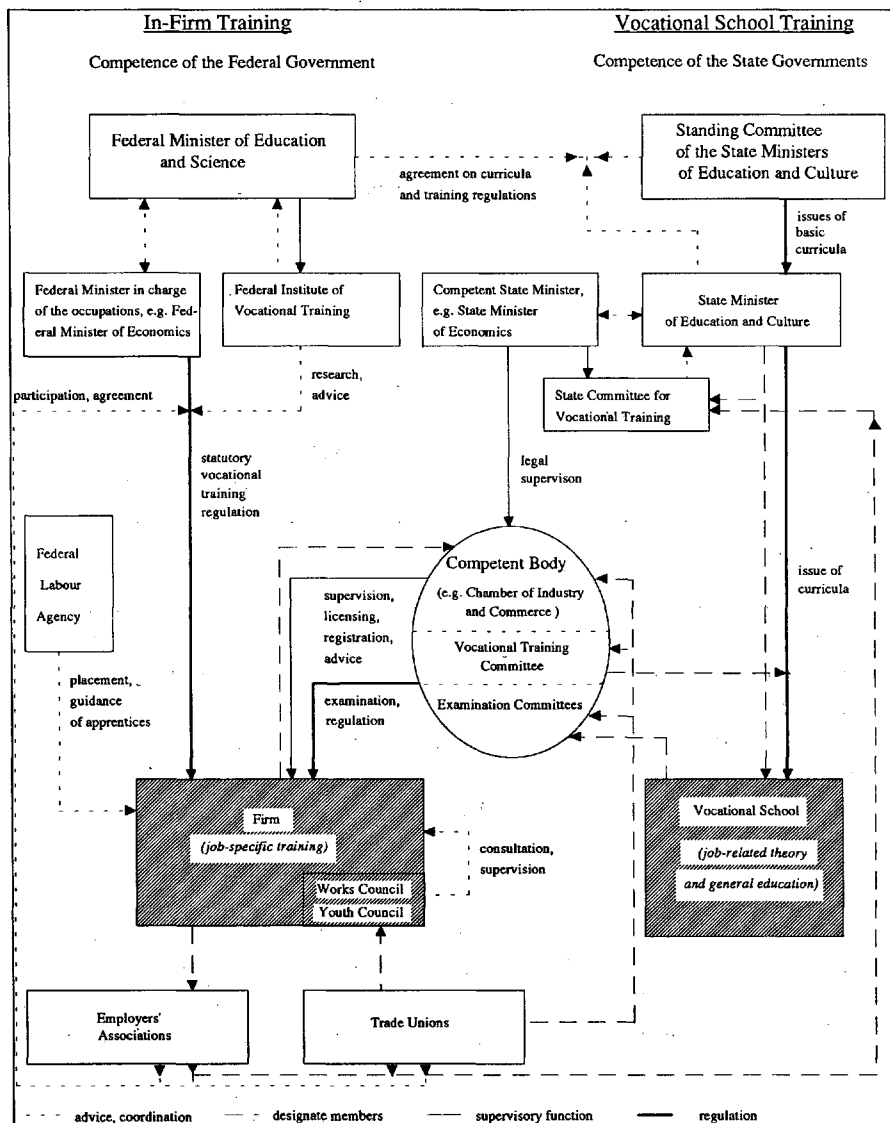
a. Regulations and the Competent Body at the Heart of the System

23. The vocational education is embedded in a network of laws, directives, recommendations, passed on and enforced by various institutions. The purpose of this chapter is to describe the link between federal regulations on in-firm vocational training and the states' (Laender-) regulations for the vocational schools¹⁶, and to show how employers' and employees' organisations work hand in hand and along with the federal and state governments in order to define goals and procedures in vocational training. The major relationships among the institutions involved are shown in **Graph 13**, a more detailed description about the formal aspects is given in the text. In the last part of this section the de facto interaction among these institutions is described for the case of the recent reorganisation of a particular occupation (industrial mechanic).

In Graph 13, the two main actors of the German dual system are the firm and the vocational school, both represented by the shaded rectangles. All other rectangles/circle are

¹⁶ The German Basic Law stipulates that training at vocational schools is in the domain of the state (just like education at large, Art. 70 I, 74, No. 11)

Graph 13 — Institutions in Vocational Training



Source: Own compilations.

symbols of the institutions that shape each side of the dual system. The following description starts with the Competent Body (the circular area) because it is in charge of the supervision of vocational training as well as responsible for examinations; after that we briefly inform on the left-hand side institutions in Graph 13 — which are in charge of in-firm training — and then on the right-hand side ones in charge of vocational-school training.

24. The structure and the goals of vocational training in Germany are shaped by several laws and directives, the most important of which are:

- Vocational Training Act (Berufsausbildungsgesetz)
- Works Constitution Act (Betriebsverfassungsgesetz)
- Crafts Code (Handwerksordnung)
- Work Promotion Law (Arbeitsförderungsgesetz)
- Youth-Work Protection Law (Jugendarbeitsschutzgesetz)
- Vocational-Training Promotion Act (Berufsbildungsförderungsgesetz)
- Regulations for the Vocational Training by Occupation (Ausbildungsverordnungen)
- Regulations on Requirements for Being a Vocational Trainer (Ausbilder-Eignungsverordnung).

The system of vocational training is quite obviously based on laws and directives which were drafted in most cases without a specific (or holistic) training content. Instead, these regulations were set up at different times, and only parts of them were directly relevant for the vocational-training system. Of these parts, Graph 13 represents an institutional summary, as these regulations also define the major institutions involved and delineate their competences. Graph 13 reproduces the duality of the system by the two shaded rectangles labelled "Firm" and "Vocational School". It also shows a certain bias towards a more than 50 per cent involvement of government institutions in the decision-making processes.

25. The *Competent Body* ("zuständige Stelle") is central to the system of vocational training. The Vocational Training Act defines the "Competent Body" for the different occupations.¹⁷ Generally these are represented by "Chambers"; the Chambers are formed by firms and established by regions — for example the Land Schleswig-Hol-

¹⁷ Cf. Berufsausbildungsgesetz of 14 August 1969 Bundesgesetzblatt 1, pp. 1112, most recent revision through Einigungsvertrag as of 31 August 1990 §§ 74f., 79, 84f., 7, 89, 91, 93, 97.

stein has three Chambers of Industry and Commerce in charge for one district each, and one Chamber of Crafts. These act as self-administered regulatory and coordinating bodies of the employers.¹⁸ The Chambers have certain official duties and powers to shape vocational training in all occupations. For most industrial and administrative occupations the Competent Body is the Chamber of Industry and Commerce, and for the crafts it is the Chamber of the Crafts.¹⁹ The Competent Body has special departments responsible for vocational training and for furthering occupational education. The Competent Body has the following tasks according to the Vocational Training Act:

- to supervise the vocational training,
- to promote vocational training through counselling of trainers and trainees,
- to determine the suitability of a firm for providing a qualified vocational training program (with respect to the qualification of the trainer and the necessary equipment),
- to establish and maintain the register of vocational training contracts,
- to extend or shorten the duration of training,
- to appoint examination boards and conduct the intermediate and final examinations,
- to admit the candidates to the final examinations,
- to publish examination regulations,
- to mediate in disputes between employers and apprentices.

In order to coordinate and fulfill these tasks the Competent Body has to set up two special committees: the Vocational-Training Committee and the Examination Committee.

26. The *Vocational-Training Committee of the Competent Body* (Berufsbildungsausschuß der zuständigen Stelle) consists of six representatives of each the employers and employees, and six representatives of teachers at vocational schools; the latter have an advisory function only. The representatives are appointed by the Competent Body (on behalf of the employers), by the trade unions (on behalf of the employees) and by the minister in charge of vocational training, usually the Minister of Economics rather than

¹⁸ All employers and firms are compulsory members of the Chambers in their trade or occupation. They act according to a one-firm-one-vote principle, whereas the fees are based on the respective turnovers.

¹⁹ Other Chambers, though of a minor importance when measured by the number of apprentices, are the Chamber of Agriculture, the Chamber of Physicians and Pharmacists for technical and administrative assistants in these occupations, and the Chamber of Lawyers and Notaries for their clerical staff.

the Minister of Education and Culture. With respect to the employers' and employees' representatives the 50 per cent parity is often found in vocational education, implying a necessity to compromise. The Vocational-Training Committee has the right to formulate and to decide upon regulations concerning vocational training, the most important being the requirements of qualifying and final examination. Regulations requiring funds in excess of the current budget (financed out of membership fees to the Chambers) have to be approved by the general assembly of the Competent Body. It has to be informed by the Competent Body and heard in all matters relating to vocational training. Examples include plans of the Competent Body regarding the organisation and expansion of vocational training, the changes in training ordinances, the weighting of individual results in final examinations. The supervision of the Competent Body itself rests with the *Competent State Ministers* (zustaendige Landesminister). These are ministers in charge of the subject the occupation belongs to, e.g. the Minister of Agriculture for the farming occupations or the Minister of Justice for the apprentices in the jurisdictional sector; for the industrial professions it usually is the Minister of Economics. Their influence on vocational training is of a more passive nature in that they have to approve the regulations issued by the Competent Body.²⁰ They appoint the government's representatives in the Vocational-Training Committee. In addition, the competent minister has the right to participate in the process of setting up the curricula for the vocational-training schools.²¹ It should be added that the *Examination Committees* (Pruefungsausschuß) are also appointed by the Competent Body. Usually they consist of three or a multiple of three members, one representing employers, one the employees, and one the teachers. All members have to be competent in the respective occupations. They decide on the admittance to and the results of the qualifying and final examinations. Often there are several Examination Committees depending on the number of apprentices.

27. As has been mentioned above, most institutions and committees concerned with vocational training are composed of one-third proportions, namely by representatives of the state, of the employers and of the employees. The laws and regulations usually give the *employers' and employees' organisations* in the respective area the opportunity to

²⁰ As this is only legal supervision the ministers only have to approve that the regulations are made and voted for according to the legal requirements. They do not have to form a judgement on the contents of the regulations.

²¹ The state ministers play a more active role when subsidising or financing vocational-training workshops held outside of the firms, and they finance workshops for the training of trainers. In other words, they influence the supply of vocational training within their state.

appoint their own representatives. The employers' organisations, such as "Gesamtmetall" (as the federal association of employers in the metal sector), thus have the right to appoint representatives.²² The employers' organisations, together with the Chambers of Industry and Commerce, founded the *Kuratorium der deutschen Wirtschaft fuer berufliche Bildung* as their central policy-coordinating body. It is representing the employers' interests at the federal level.

The employees are organised mainly by sector; their trade unions are members of the *Deutscher Gewerkschaftsbund* (DGB, which serves as a kind of umbrella for its members). Usually only one union is in charge of a particular sector, it appoints the representatives of employees for that sector. In the case of clerical occupations there are trade unions which are not members of the DGB, such as the *Deutsche Angestellten Gewerkschaft*. Other employees' organisations, such as the association of employed managers, often do not meet the legal criteria of being a major employees' organisation and therefore are not in a position to have their own representatives.

b. The left-hand Side

28. The *Federal Minister of Education and Science* (Der Bundesminister fuer Bildung und Wissenschaft) is the leading government agency in questions of vocational training. He has to be consulted in all cases of official regulations. The minister is administering the vocational-training act, he is in charge of the fundamentals of vocational-training policy and for advanced (i.e. additional) vocational training, and for the qualification requirements for trainers (training ordinances); he is also supervising the Federal Institute of Vocational Training.

29. The *Federal Institute of Vocational Training* (Bundesinstitut fuer Berufsbildung) is the specialised advisory and research institution concerning vocational training. The institute is not headed by the Minister of Education and Science, but instead by a "central committee" which is considered to represent the relevant groups in the German society: eleven representatives of employers, employees and states respectively, plus five representatives of the Federal Government (having eleven votes). In addition, one

²² The employers are organised according to sectors and regions.

representative of the Federal Labour Agency may participate (but not vote) in the meetings.²³

The tasks of the Institute are to advise the federal government in all matters of vocational training; in particular, it analyses the effects of new regulations, monitors pilot projects in vocational training, and supports exams and organises training workshops. Important to note, the Institute decides upon whether to acknowledge supra-state institutions of vocational training. Furthermore, the Institute works on the harmonisation of training ordinances and school curricula among the states, and it deals with problems of disabled persons in vocational training and their respective legal consideration.

30. The *Federal Minister of Economics* (Der Bundesminister fuer Wirtschaft) is in charge of the statutory vocational training regulations and defines the officially recognised occupations in industry, in commerce and in the crafts.²⁴ In spite of this the minister actually rather plays a more coordinating role; today, the minister issues only those regulations that the trade unions and employers' organisations have agreed upon. In this process the Federal Institute of Vocational Training helps and mediates.

31. According to the law, the *Federal Labour Agency* (Bundesanstalt fuer Arbeit) is the main public institution dealing with the problems of the labour market; in fact, it has a government-enforced monopoly in matters of job-placement. It also has some functions in the system of vocational training, although these are not mentioned in the Vocational Training Act:²⁵

- Giving information to pupils about labour market conditions and the existing occupations, the careers possible and the paths of qualification.²⁶

²³ This particular distribution of voting rights, and the composition of members, refers to the situation before the German unification.

²⁴ Responsibility for the agricultural occupations is with the Minister of Food, Agriculture and Forestry.

²⁵ The organs are the board of executives, and the board of directors at the central, state, and local levels. All boards consist to one third of government representatives, one third of employers' representatives nominated by the major associations of employers and one third of employees' representatives nominated by the major trade unions.

²⁶ Most local and all state employment offices have an Occupation Information Center (Berufsinformationszentrum) which provides literature, short videos, leaflets and brochures about occupations.

- Placement of vocational apprenticeships. This placement function is mainly relevant for those pupils who cannot find an appropriate vocational-training job by their own efforts.
- Subsidisation of vocational training in well-defined cases of need, concerning e.g. additional costs of inter-regional placements²⁷ or lack of financial means of suppliers of vocational training, or in cases of disadvantaged groups (disabled people, drop-outs and foreigners). In addition, the Agency finances and organises pre-vocational training programs for pupils who cannot be placed (these programs last for 6 to 12 months).

c. The right-hand Side

32. The *Standing Committee of the State Ministers of Education and Culture* (Kultusministerkonferenz) is the coordinating body of the states concerning, among others, vocational education. As in all matters of education and culture, the states have the non-competing regulatory power, the committee decides on the "General Framework of Education" (Rahmenlehrplan) that a vocational-school curriculum for any occupation should orientate on. In practice, this framework contains school curricula for each subject which are amended or slightly changed according to the individual preferences of each state.²⁸ The concept of the General Framework is quite new. It was introduced in the mid seventies and is now mandatory for all major occupations. This is to provide a nation-wide comparable standard of vocational education at the school level.²⁹ The Committee consists of the Ministers of Education and Culture of the States and their representatives.

33. The *State Ministers of Education and Culture* (Landesminister fuer Bildung und Kultur) finance, operate, and supervise the vocational schools of their respective state.

²⁷ The Agency then guarantees an apprentice's income of 900 DM (as of 1993).

²⁸ Actually, in some states there are specialists appointed by the Committee to modernise this framework for a particular occupation. Schleswig-Holstein is in charge of modernising the curricula for the banking occupations. This modernised curriculum is then issued by the Committee as a guideline to all other states.

²⁹ The General Framework was deemed necessary to make the final school degrees comparable and legally accepted in all German states (some "conservative" states did not acknowledge the high-school degrees of "socialist" states, thus prohibiting the freedom to choose among universities).

Each minister defines the qualifications necessary to be a vocational-school teacher and provides the opportunity to study at the state's universities in order to become a vocational-school teacher.

A second major task of the ministers is to define vocational-school curricula for all occupations taught in the respective state.³⁰ These curricula must fit into the General Framework of Education of the Standing Committee and into the regional conditions of in-firm training. They are usually developed in cooperation, at least in consultation, with the Competent Body. There has been some discussion over the past years that too many lessons at schools are no good because too many obsolete things are taught (put forward mainly by employers' organisations), or that Germany would be in need of a more and intensified theoretical teaching at school (put forward mainly by the teachers' organisations).

Thirdly and finally, the state ministers appoint the teachers taking part in the final examinations.

34. The *State Committee for Vocational Training* (Landesausschuß fuer Berufsbildung) is the coordinating and advising organ for the state government. It is made up of representatives of employers, employees, and state representatives, one third each. Half of the state representatives are required to be experienced in matters of education at schools. The State Committee gives general advice to the state government, coordinates the contents of practical training and vocational schooling, and lobbies on behalf of vocational training in case changes in the school structure or school system are discussed.

d. A German Speciality: The Works Council and the Youths Council

35. The *Works Council* (Betriebsrat) is the directly elected board representing the employees in companies with more than 20 employees.³¹ It has the duty to promote vocational training and has to be heard in all matters of vocational training by the management. Part of its tasks is to review the proper performance of the training duties by the employer and to discuss problems and their possible solutions with him. The Works Council has therefore a considerable influence on the performance and organisation of

³⁰ In Schleswig-Holstein only about 180 out of 380 official occupations are taught.

³¹ The Works Councils, their rights and duties, are regulated in the Works Constitution Act.

in-firm training. Nevertheless, its actual influence is by persuasion rather than by direction.

36. The *Youths Council* (Jugend- und Auszubildendenvertretung) is the equivalent to the works council for apprentices and employees below the age of 18. All companies employing more than five apprentices or low-age employees have to have this council. The Youths Council has a representative in the works council and has to be informed and heard on all matters relating to their voting group. The Council has the explicit task to check for the implementation of legal and contractual regulations concerning apprentices and young employees.³² They can use this right to discuss cases of inappropriate organisation of vocational training with the management. They have the right to be heard by the management.³³ The Youths Council exerts its influence mainly through the works council and its legal power.³⁴

e. The Development of Some Typical Trails of Vocational Training

α . Industrial Mechanics

37. Technical progress and reorganisations in industry out-dated the vocational-training programs for mechanics prevalent in the 1960s and 1970s. In 1978, the Federal Minister of Education and Science, the employers' organisations, the trade unions and the states agreed to restructure vocational training, and along with it the definitions of the occupation of mechanics. In this area there were major differences in opinion as to the requirements of becoming a mechanic existing among industrial employers and between employers and employees; therefore, it took six years (i.e. until 1984) to come to an agreement.

³² These regulations are based on the youths protection law, on the labour protection law, on existing individual work contracts as well as on provisions regarding vocational training.

³³ Moreover, they can sue the management in cases of neglect of the training obligations. It should be noted that the right to bring forward vocational-training problems to the management is often sufficient as a means of mediation. Besides, the Competent Body as the legal-external supervisor of vocational training has an outright mediation function in cases of conflict. Therefore, additional legal enforcement of vocational training is uncommon.

³⁴ In practice this is very important, as most of the usual day to day life in the large firm is regulated by agreements between the works council and the management.

38. The schedule for the negotiations was set up by the coordinating committee of the federal and state ministries: In a first step each side nominated a team of specialists which developed and formulated a new training regulation and, in addition, a new school curriculum; both was done in a parallel fashion. Coordination between the school specialists and the in-firm specialists was reached by interlocking the delegates of the two groups. In the case in point it was hard to define the new occupation of a mechanic. Eventually the employers' and employees' organisations, supported by the *Federal Institute of Vocational Training*, collected all the information about the requirements for mechanics in a large number of different companies (cf. Graph 13). The Federal Institute then analysed these requirements for similarities in order to define the specific occupation of a mechanic. With the practical experience of the (unpaid) help from the labour-market organisations and the analytical work of the Federal Institute, 16 occupations of mechanics, subdivided in 5 groups, were defined. This was a significant reduction in the number of the mechanics occupations. It was deemed necessary in order to improve transparency in this field of vocational training; furthermore it was intended to make the trained worker more flexible to adopt new technologies. Important to note, differences occurred, among others, about the problems of whether a more general "three step education" or a more direct specialisation should be aimed at. The direct specialisation would have been advantageous for smaller firms. The Federal Institute of Vocational Training helped a lot to mediate between the different points of view.

Basically, the Federal Minister of Education and Science accepted the definitions of the specialists and introduced them to the Committee of the State Ministers of Education and Culture who already had received and discussed the basic vocational-school curricula for these new occupations. After acceptance of the curricula and the definitions of occupations by all participants (the states, the federal ministry, the employers' organisations and the trade unions) the new regulations on vocational training of mechanics were introduced and published in the "Bundesanzeiger" (the Federal Information Paper).

39. It should be added that the coordination system is based on the principle of unanimity. Thus, neither vocational-school curricula nor the vocational-training regulations are developed and issued by the governments' bureaucracies alone, but instead they are the result of negotiations among employers' organisations, trade unions, and states. Because all parties have to agree to the final solution, a relatively high degree of identification of the individual groups with the results is achieved. Identification seem to be

important in order to make the training firms, the trainers, and the schools comply to the rules efficiently.

40. The enforcement of the new structure is the task of the regional chambers (the "Competent Bodies", cf. Graph 13) regarding in-firm training, and of the state Ministers of Culture and Education regarding vocational schools. The chambers do this by formulating the examination requirements; furthermore, they supply information on changes in vocational-training requirements (which is an important service for small firms). The ministers transform the basic (federal) curricula into state-specific curricula.³⁵ The curricula may diverge among the states because the resources (teachers and equipment available) may differ. The state-specific curricula have also to be agreed upon by the Competent Body. Furthermore, the trade unions provide information about the new training requirements to their members and to the works councils and the youths councils of the firms, so these are able to discuss the most efficient or suitable implementation of the new training program with their management.

Taking the adoption of the new regulations as an indicator of acceptance by the market it can be said that in the case described above two thirds of the firms voluntarily applied the new regulations before the end of the transition period.

β *Teachers' Qualification*

41. It was described above that vocational training of apprentices takes place at a vocational school (for 20 per cent to 40 per cent of the time) and within the firm. The teachers at the vocational schools and in the firm have to have certain qualifications which differ between two kinds of teachers:

In-Firm Teachers

42. The appointment of teachers within the firm can be different according to firm size. In small firms, particularly in the crafts, a master is qualified and responsible to take care of the education of the apprentices. Everybody wanting to become a master must have successfully passed the examination after apprenticeship (to become a skilled

³⁵ The basic curriculum is only binding among the states' ministers. But the curriculum published by the individual minister of culture and science is legally binding for the schools of that state only.

worker)³⁶. After that he must have gathered working experience as a skilled worker for a couple of years.³⁷ The degree of a "Meister" (master) is awarded after having passed part-time or full-time courses at a master school (mostly a part-time or full-time advanced vocational school, or at an academy). These courses include lessons on basic legal aspects, social behaviour, and in particular problems on how to educate and teach apprentices. For specific details regarding "Industriemeister Metall" and "Industriemeister Elektro", see the case studies below.

43. In small non-craft firms where there is no master a firm wanting to engage in vocational training must provide qualified staff to obtain a substitute license to offer an apprenticeship. Qualification is provided under that circumstances by courses and a final examination similar to that of the master, based on the "Ausbilder-Eignungsverordnung" mentioned above. In the financial sector, the manager of a small branch or his deputy is responsible for the in-firm vocational training.³⁸

44. In contrast to the central role the master has in a small craftsmen business (where the master is responsible for planning and implementing the apprenticeship program), these tasks are taken over by the personnel department in the large firm. In other words,

³⁶ The term is different for different kinds of occupations (i.e. "Geselle" in the crafts, "Gehilfe" in the clerical jobs, "Facharbeiter" in manufacturing).

³⁷ A person who successfully finishes his three to four years apprenticeship in the German system of vocational training, in the crafts becomes a "Geselle". The term has its roots in the medieval system of handicraft guilds, where the "Geselle" was a "journey man" or, more precisely, a "Wandergeselle" (referring to the fact that "Gesellen" had to travel the country for some two or three years in order to become a master, living from occasionally applying their craft). A Wandergeselle was an "experienced reliable worker or performer esp. as distinguished from one who is brilliant and colourful" (i.e. "as distinguished from the superior master").

Incidentally, there are quite a few folk songs, operas and musicals referring to this old way of achieving mastership: ["Steh' auf, steh' auf, Du Handwerksgeßell ..."; or the Lieder-Zyklus: "Die schoene Muellerin", "Die Winterreise", "Lieder eines fahrenden Gesellen"; or "Das Wandern ist des Muellers Lust". The latter song ends up by "... laßt mich in Frieden weiterziehn", indicating, perhaps, that the pay of an occasional job was often too low relative to the work to be done for the master (or his wife and daughter, if any)].

The tradition of wandering is still upheld in Germany in the profession of carpenters (but not as a precondition for achieving a master degree). One major economic reason behind the wandering requirement may be seen in regional disequilibria of supply and demand of skilled workers. The guilds tried to solve this employment problem by artificially increasing labour mobility.

³⁸ Internal seminars of the Deutsche Bank for example are carried through either by real masters ("Bankfachwirt") or by branch managers.

there is no special training program as a precondition for becoming a trainer. Companies such as the Deutsche Bank in Hamburg leave the duties of vocational training to the managers or deputy managers of its different departments. In the large industrial firm there are different kinds of masters, each being qualified for different stages of vocational training; these masters again have passed the same kinds of exams as described above for the small firm.

Teachers at Vocational Schools

45. The teachers at vocational schools have to pass the typical German three-step education: In the first step a teacher receives — after 13 years of schooling — the third-level school degree (Abitur). In a second step the student has to study for (on average) five years at a university in a limited number of disciplines, after which he receives a diploma comparable to a Master of Arts. The diploma also requires one year of internship in a firm (an apprenticeship is accepted instead of the internship). This second part is followed by a two-year practical education which consists of training at school and preparing courses at a special teachers' college. After passing a final examination the candidate is eligible to teach at vocational schools.

As regards the trails of the teachers' education, five options can be identified:

- Teachers specialising in the field of business administration at a vocational school usually do their degree as "Handelsschullehrer" based on the study of business economics plus courses in pedagogics. In addition, all teachers in Germany have to master at least one other field of teaching. This second field can be chosen out of economics, languages, mathematics, or geography, etc.
- Teachers specialising in the field of industrial and craftsmen education do their degree as "Berufsschullehrer fuer technische und gewerbliche Berufe" (vocational trainer for technical and manufacturing occupations) which is based on an engineering program (again supplemented by courses in pedagogics and in one second field of teaching).
- Teachers at "Gymnasium" are also eligible to teach at vocational schools in their respective field. This is common practice in the fields of languages, including German, and in mathematics.
- Recently, a new trail of becoming a vocational-school teacher is, in short, the following: After having completed apprenticeship a degree in engineering or business eco-

nomics (3–4 years) at a "Fachhochschule" is achieved (BA equivalent); then a short-cut study at a university as teacher for vocational schools is added.

- Academics having worked for some years in a firm and decided to change their job and become a vocational teacher have to go to a university again, but only for a couple of courses. After successful completion of these courses the academic can apply for a job as vocational teacher.³⁹

The individual backgrounds with respect to experience on the job is different among teachers. Teachers at vocational schools usually have passed an apprenticeship program in the field they are teaching. Some teachers even worked in their field for several years before deciding to change the job and become a teacher at a vocational school. It should be added that the vocational teachers have to do internships in firms from time to time to keep in touch with developments outside. The vocational schools are thus very much down-to-earth rather than being abstract and theory-minded institutions.

³⁹ According to the IPTS (Institute for Practice and Theory of Schools), academics with a degree in subjects not well represented can enter the two-year practical program directly, without doing pedagogic courses at university. But this is an example of a temporary regulation for times of scarcity.

IV. Operation of the System

1. Structure

46. The dual system of vocational training in Germany, reaching back in German history to the turn of the century, is quite evidently still going strong. To be sure, there have been considerable changes over time, for good and for worse. Along with other, rather societal developments, the attitudes, incentives, and consequently the results of the system of vocational training have been changing. In the following we shall shortly address a few structural changes which appear to be pertinent to the present status. These are

- (1) the relative position of vocational training within the system of education;
- (2) the quality of apprentices regarding composition as well as conduct;
- (3) in-firm vs. school training;
- (4) intra-firm adjustment over time with respect to vocational training;
- (5) the contents of curricula;
- (6) the quality composition of teachers at vocational schools;
- (7) the social prestige attached to different occupations.

ad 1: There has been a considerable change in the overall system of vocational training in Germany since the end of the 1960s. Due to various reasons [supposed future shortage of academics (Picht, 1965); basic civil rights of higher education for "discriminated" groups, such as catholics, women, blue-collar workers, and rural people (Dahrendorf, 1965)], more resources were directed into university education; along with it the entrance barriers were lowered, tuitions abolished, and subsidisation of scholars increased. The shares of scholars attending the "Gymnasium" and universities in the relevant age groups has increased considerably: It has become more important than ever before for a scholar to be part of the better educated group, in spite of the inherent economic devaluation of education at large (for example in terms of relative incomes); on the other hand, those remaining "mere" vocational trainees who had completed their training at that level are on average not what they used to be before the 1960s regarding diligence, intellectual capability, or motivation. Thus, the notorious "Facharbeitermangel" (shortage of skilled labour) observed by employers' organisations has not only a quantitative but also a qualitative dimension.

All in all, one can observe that the education system has, so to speak, turned upside down over the last three decades (giving less emphasis to vocational training and more to higher education) with the structure of skills required in production not following suit.

- ad 2: With respect to the "quality" of apprentices there are trend factors as well as structural factors to be observed. The long-run changes in the attitudes have been circumscribed by firm representatives as "consumption orientation" of apprentices, or as problems of motivating apprentices to learning. Instead of apprentices striving to learn, the company is supposed to strive to make interesting offers to apprentices today. This may be regarded as a long-term trend nourished by rising incomes in the society.

Other factors are of a more structural kind. Firstly, an increasing share of apprentices does not come directly from the first-level schools as they used to, but finishes the "Realschule" or even completes the "Gymnasium"; thereby, the average age of scholars has risen, too. Secondly, the results of primary education are reported by the firms to be not sufficient and below the traditional standards. This holds for graduates from all levels of schools. Thirdly, there is a familiarity with advanced tools of data processing among apprentices. Fourthly, the share of non-German apprentices (in most cases the children of "guest-workers") has been rising.

- ad 3: There is a tendency to expand the share of theoretic and general education in vocational training at two levels. Firstly, the time of a trainee spent at a vocational school has been increasing slowly but steadily over all occupations. Secondly, the theoretical education content of in-firm training has been expanding, too.
- ad 4: For whatever reason, the duties as well as the rewards and the rights of a vocational trainee within the firm have changed. Side jobs (such as shopping for the master, or the team) which once were an important part of a trainee's working time in the first year of apprenticeship have been replaced by training. In addition, apprentices have their interests represented in the works council, or youth council respectively and they receive salaries which have been rising relative to average incomes over the past decades.
- ad 5: Not only has the share of general education in vocational schooling increased (cf. ad 3), but the subjects have changed as well. Foreign languages, notably English,

gained importance in most occupations⁴⁰; economics and other social sciences have become compulsory subjects for all occupations (it may be added in passing that the amount of wisdom regarding economics is somewhat less represented in the teachers at vocational schools than wishful thinking might have it).

- ad 6: The structure of teachers at vocational schools has been changing on account of the inclusion of general subjects into the curricula: with languages, politics and economics being taught as well, the share of teachers with no in-firm experience has increased. It should also be reminded, that — since being a teacher in Germany has the image of earning a decent salary⁴¹ coupled with a lot of spare time — some teachers at vocational schools have an explicit leisure interest when choosing their job; firms advanced the proposition that the consumption orientation of apprentices today (cf. ad 2) is in part due to the examples given by many a teacher.
- ad 7: Quite remarkably, that firms observe a major inclination of scholars to favour white-collar jobs even when these pay less and include a higher risk of displacement. Consequently, along with the overall structural change of the economy towards white-collar activities the share of apprentices in the service sector has risen as well. The social prestige attached to white-collar jobs is clearly quite high. The reasons are manifold: in-door work; more comfortable allocation of working time; more job security through greater mobility among sectors.

2. Conduct

47. The conduct of the system of vocational training depends on the incentive structure it provides for suppliers and customers. In the German system nine major strands of incentives are prevalent:

- a. Still today, vocational training can be regarded as being a basically privately organised activity: It is the firms and the chambers on which the bulk of responsibilities — financial, organisational, and otherwise — rests. The government adds to the

⁴⁰ In the framework of the European Union exchanges of vocational trainees across member countries are subsidised; this may put some pressure on vocational schools to teach foreign languages more intensively than they have done before.

⁴¹ The average teacher at a vocational school earns — in U.S. Dollars — roughly 50 000,- per year (up to 60 000,- for headmasters), and he runs no risk of job displacement.

vocational training by supplying the body of the institutional background and school facilities.

- b. Quite importantly, there are no significant negative eventualities to be considered by firms engaging in vocational training. Although considerable parts of apprentices leave their firm after receiving their degree, the firm can be quite sure to get somebody who did his vocational training in another firm, having received by and large the same amount of skills. Thus, the system rewards investors in human-capital formation in the long run.
- c. There is a lot of interaction between the private actors in vocational training and the governments; in addition, the private actors feel — and can easily be made to feel — responsible for the working of the system. In times of an excess supply of apprentices, the chambers and the firms react strongly and positively to political moral suasion, directed at creating more training opportunities than economic self-interest would suggest. In times of excess demand for apprentices governments tend to be persuaded to create additional incentives for young people to take up vocational training (e.g. relatively more financial means for vocational schools; broader acceptance of vocational-school degrees for further — general or job-specific — education).
- d. It cannot be denied, however, that the reallocation of financial resources by all state and federal governments towards higher education makes university attendance the most attractive trail of education in the Germany of today. Vocational training is in this respect in a second-best position only.
- e. Still today, a university diploma provides a person with a widely respected social status, which goes hand in hand with the fact that the incomes of the owners of such diploma are still well above average, and that the risk of job displacement has been well below average.
- f. The state and the federal governments, being the main actors in education at large, have tried to raise the attractiveness of vocational training by giving it tokens of a general education.
- g. Mention should be made that once a scholar opts for a career starting with vocational training, his relative income position will be limited. Wages and salaries in Germany do not exactly follow the (marginal) contribution of labour to output but instead are determined in a corporativistic manner: Trade unions and employers' as-

sociations negotiate and decide on these matters. Since the wage structures do not change over time according to scarcities,⁴² incentives are directed towards minimising the displeasures (and hours) of work rather than towards maximising personal incomes. This again provides the tertiary education at universities or colleges with additional attractiveness.

- h. The fact that apprentices receive considerable amounts of monthly payments from the firms may be surprising for outsiders to the system of vocational training (in the early days of training the apprentices had to pay their masters in order to be trained). These monthly payments tend to differ among occupations; as of today, firms in the service sector — insurance companies, banks — pay the most per apprentice. Consequently, there is a certain structure of apprentices' abilities by industries which may change the international competitiveness of some manufacturing industries in the long run.
- i. The system has been efficient in the sense that the incentives of firms to offer apprenticeships has been matched by equivalent incentives of young people to demand apprenticeships. The observed excess supply of firms offering vocational training in recent years indicates that the salaries offered for apprentices are too low.

3. Performance

48. It has been argued above that it is extremely difficult to evaluate the performance of any system of vocational training because of the (unknown) lags involved between inputs (i.e. training) and overall labour productivity. Therefore, the assessment of the present system of vocational training is at least in part (educated) guesswork, and it may contain elements of wishful thinking.

- 49. One may distinguish between the working of the vocational training system itself and the working of this system within the economy. As to the first, the drop-out rates of the educational system will be analysed. In order to do this there are two seemingly opposing views to be considered: On the one hand drop-outs can be interpreted as indicators of the educational quality of the system; the higher these rates are, the more elite-

⁴² Wage negotiations normally focus on average yearly changes of incomes according to income groups (across occupations) rather than being based on the success of individual firms. There was a tendency to increase the wages of low-income groups by more than the average in the past.

oriented it is. On the other hand, drop-outs can be a burden to the society. There possibly is a fragile equilibrium between creating the necessary elites and minimising the number of long-run drop-outs of the system. In that respect, Tables 4 and 5 show that the German educational system at large has a considerable amount of forgivingness: Drop-outs can enter the system again at various levels. **Table 4** gives evidence that the total number of drop-outs (gross drop-outs defined as all those scholars who do not get any degree after completion of the educational process plus all those who do not achieve the particular degree that they originally aimed at) was some 91 800, that is 13.6 per cent of all scholars. In absolute as well as in relative terms most of the gross drop-outs can be found at "Hauptschule" and "Gymnasium". Net drop-outs (defined as all those scholars who do not get any degree after completion of the educational process) are some 53 600, or 8.0 per cent of all scholars. Quite remarkably, only 5.6 per cent thus achieve a school degree below the one they originally aspired.

50. The relevance of the "second chance" for drop-outs and for those who want to improve their educational level is indicated in **Table 5**. Quite evidently, some 84 100 people attended the adult education system. Cum grano salis — i.e. not considering that Tables 4 and 5 refer to different samples of the population — one might argue that only some 8 000 of total drop-outs did not rejoin the system of education. If this is correct, only a very small share of scholars ultimately drops out of the system (some 1 per cent). In addition, the vocational schools contributed to the second-chance education by educating some 16 200 scholars, that is 20 per cent of the market for adult education. It is noteworthy, too, that the vocational schools also provide degrees typical for the general education system.

51. Whether the inherent forgivingness of the German system of education also holds for the vocational-training part of this system cannot be seen from Tables 4 and 5. **Table 6** indicates that there is a considerable number of drop-outs in vocational training: At least (because it is unclear what becomes of those 9.1 per cent who cancelled their apprenticeships) some 11.8 per cent fail in the final exams. What can be said is that the second-chance system is also open for these scholars since there are no barriers to entry.

52. The second major feature of the German system of education and vocational training besides forgivingness is the continuous attempt to integrate, reintegrate or keep integrated the young people. In fact, there is not a significant argument among political parties, or institutions, or employers' and employees' organisations about whether to promote education. In this respect the performance of the system seems to be unique (**Table 7**): The level of youth unemployment is low by international standards. The

Table 4 — Drop-Outs^a and Final Degrees of Scholars Leaving School in Germany (West), 1989/90

School type	First-Level School (Hauptschule ^c)		Lower Secondary School ('Realschule')		Upper Secondary School ('Gymnasium')		Comprehensive School ^b ('Gesamt- schule')		Others ^c		Total	
Degree	students in 1000	as % of school type	students in 1000	as % of school type	students in 1000	as % of school type	students in 1000	as % of school type	students in 1000	as % of school type	students in 1000	in %
Without de- gree	25.8	11.4	2.3	1.4	1.2	0.6	1.8	5.7	22.4	50.8	53.6	8.0
Hauptschul- abschluß	170.0	75.0	7.8	4.6	2.8	1.4	8.7	26.8	10.6	24.1	200.0	29.7
Realschul- abschluß	31.1	13.7	160.6	94.0	24.0	12.2	15.0	46.1	3.4	7.7	234.3	34.8
Fachhoch- schulreife					3.7	1.9	0.5	1.5	1.1	2.6	5.4	0.8
Abitur					166.1	84.0	6.5	19.9	6.5	14.8	179.1	26.6
Total	226.9	100.0	170.8	100.0	197.8	100.0	32.6	100.0	44.1	100.0	672.3	100.0
Share of school type		33.8		25.4		29.4		4.8		6.6		100.0

^aStudents leaving school without passing the final exam of the respective school type; bold-type figures. — ^bGesamtschule has no particular final exam as it integrates all three types of schools. Abitur rate is low because some Comprehensive Schools do not offer it. — ^cIncludes primarily "Sonderschulen" (e.g. for the disabled) of all types, and to a lesser extent Evening Schools.

Source: Statistisches Bundesamt, Fachserie 11: Bildung und Kultur, Reihe 1: Allgemeinbildende Schulen, various issues. — Own calculations.

Table 5 — Degrees in the "Adult Education System"^a

School types	Degree	Hauptschulabschluß	Realschulabschluß or Fachschulreife ^b	Abitur and Fachhochschulreife
Evening schools		362	2131	6287
Vocational schools providing				
- Occupation preparation year (Berufsvorbereitungsjahr)	6004 ^c		114	
- Basic occupation education year (Berufsgrundbildungs- jahr)	2750		1564	
- Preparation for 'Fachschule' (Berufsaufbauschulen)			5791	
Senior high school for students who passed vocational training successfully (Fachoberschule)				41743
Senior high school for students with a degree of the lower secondary school (Fach- gymnasium)			30	17366
Total		9112	9630	65396

^a"Zweiter Bildungsweg". It offers a "second chance" for all those who did not – for whatever reason – go the routine way of education. — ^bBoth are regarded as being equivalent. The latter is more practice oriented. — ^c20 000 students without the basic degree "Hauptschulabschluß" participate in this program. It enables them to join vocational training after that. The "Hauptschulabschluß" received in this program is thus of minor importance.

Source: Statistisches Bundesamt, Fachserie 11: Bildung und Kultur, Reihe 1: Allgemeinbildende Schulen und Reihe 3: Berufliche Schulen, various issues. — Own calculations.

stick and carrot rationale of the system — with the carrot being the monthly payment for apprentices, and the stick being the compulsory attendance at vocational schools plus examination by the Chambers — in combination with the fact that on the firms' side there are (almost) no negatives externalities involved in the system of vocational training, keeps youth unemployment low.

53. Of course, there are other indicators than drop-out rates which refer to the performance of the system. One describes the share of scholars who stay in the firm after having completed their vocational education, and the other describes the same phenomenon with respect to staying in the same line of business, or industry:

Table 6 — Indicators of Success and Failure in Vocational Training as of 1990

	All apprentices		Cancelled contracts	Failure rate in	
				Final examination of v.t.	Advanced vocational training ^a
	in 1000	%	as % of total contracts	as % of total participation	
All occupations	1476	100.0	9.1	11.8	
of which					
Locksmiths, metal workers (Schlosser)	97.6	6.6	6.7	11.0	9.1 ^b
Electricians (Elektriker)	144.4	9.8	5.7	13.6	8.5 ^c
Bank and insurance clerks (Bank- und Versicherungskaufleute)	71.9	4.9	1.4	4.0	8.9

^aRefers to final exams of Technical Schools and 'Berufsakademien'. Participants aim at higher qualified jobs. — ^bRefers to 'Metallmeister' (includes Locksmiths). — ^cRefers to Industrial Electricians.

Source: Statistisches Bundesamt, Fachserie 11: Bildung und Kultur, Reihe 3: Berufliche Bildung, various issues. — Own calculations.

Table 7: Youth Unemployment by Countries, 1992

Country	Rate of unemployment ^a
Germany (West)	5
Japan	7
Sweden	12
Netherlands	15
United Kingdom	16
Norway	17
United States	20
France	23
Finland	26
Spain	39
Italy	41

^aYouths between 15 and 19 unemployed as per cent of their age group.

Source: OECD. — Bundesanstalt fuer Arbeit, Nuernberg.

Table 8a indicates that loyalty is different among occupations — possibly for a number of reasons: The main underlying causes are, firstly, the relative job security in the public sector (and the corresponding insecurity in agriculture) and, secondly, the range of alternative job opportunities; the latter can be supposed to be greater in the case of crafts than in any other occupation. It has to be added that there has been an old tradition in agriculture and in the crafts to send young members of the family away so they could achieve their vocational training outside the home; after completion of the training the major part of the then skilled workers returns home to take up the family's business in due time.

Table 8a: Loyalties after Completion of Vocational Training in Germany: I (as of 1992)

Industry	Share of skilled labour remaining in the firm of their apprenticeship ^a (per cent)
1. Civil service	57
2. Manufacturing/construction	44
3. Wholesale/retail trade	32
4. Crafts	32
5. Agriculture	29
^a Criterion: still in the firm 5 years after completion of vocational training.	

Source: Bundesinstitut fuer Berufsbildung. — Institut fuer Arbeitsmarkt- und Berufsforschung.

Table 8b is to indicate loyalties referring to the occupation learned instead of loyalties to the firm. When correcting for the compulsory military services the only major difference between male and female skilled young workers is that the former have a stronger inclination to extend their education: The share of males striving at more degrees is by three times higher than that of females.

54. As regards the role of vocational training within the economy it can be said that the returns on higher education, e.g. at universities, has been declining; unemployment of academics is spreading. At the same time the perceived value of practical experience and vocational training has been rising as can be deduced from the development in the number of Fachhochschulen and of students attending Fachhochschulen; Fachhochschulen teach practice-orientated knowledge in contrast to the universities which rather aim at theory and methods. In addition, it has become more and more

Table 8b: Loyalties after Completion of Vocational Training in Germany: II (as of 1992)

Field of Activity	Share of skilled labour ^a (per cent)	
	Males	Females
1. Remaining in the occupation learned	42	66
2. Working in a different occupation	15	15
3. Engaged in further education	18	6
4. Part-time work or unemployed	14	13
5. Military service or substitutes	11	—

^aRefers to the situation three years after completion of vocational training.

Source: Bundesinstitut fuer Berufsbildung.

customary to complete vocational training before attending a tertiary education. Thus, although the quantitative importance of vocational training has been declining since the mid-1980s, it is ranking higher in importance than before with respect to tertiary education. It may well be that in the course of increasingly abstract processes of production there will be a change in the composition of skilled labour away from the "skilled" worker towards the "skilled-plus" worker.

55. The German system of vocational training has produced a class of skilled workers which is said to be the very reason for the international competitiveness of the economy. Until recently (i.e. well into the 1990s), the shares of unskilled labour as well as of academics were equally low; the bulk of the labour force was at the levels of "Facharbeiter" (and the like) and of "Meister". Today, it seems that the German economy is moving towards the situation of the United States: The share of academics is increasing rapidly, and the share of the traditionally skilled workers is declining. However, two tendencies are different: Firstly, the share of unskilled labour in total employment is not rising and will possibly never reach U.S. standards; secondly, the share of academics having completed vocational training is partly compensating for the losses in the traditional middleclass of workers.

56. Finally, the flexibility of the vocational-training system to adjust to ongoing change in production technologies is provided by the formal structure of the system:

Firstly, two thirds of the training is under supervision of the individual firms. Secondly, the dominance of firms in the examining boards of the Competent Body leads to feedbacks in the regulations as depicted in Graph 13. The impact of actual developments on the rules and regulations governing vocational training may not be very fast, but they are significant.

V. Case Studies

57. The purpose of this section is to give detailed information on the requirements and the contents of vocational training and advanced training regarding three occupations:

- *Industrial mechanic specialised in production techniques* (Industriemechaniker, Produktionstechnik);
- *Industrial electrician specialised in instruments* (Industrieelektroniker, Geraetetechnik)
- *Bank clerk* (Bankkaufmann)

Before doing so, the common features of apprenticeship will shortly be summarised.

1. The General Organisation of Apprenticeship

58. Vocational training lasts 3 to 3.5 years. Apprenticeship programs are based on the assumption that participants completed "Hauptschule" successfully. Nonetheless it has turned out that the specific composition of classes of trainees also influences the contents and progress of training. The composition of classes depends on the particular kind of occupation to be learned. For example, "bank clerk" is an occupation typical for graduates from lower secondary schools ("Realschule") and "Gymnasium". Moreover, there is the possibility for the apprentice to shorten the time of apprenticeship in agreement with his company. Graduates from "Gymnasium" often get a half-year reduction, especially in theory-oriented programs such as "bank clerk". In Hamburg, for example, there are different classes for graduates from "Gymnasium" (with a two year program) and for graduates from lower secondary schools (with a 2.5 year program), implying that graduates from "Gymnasium" can go through the material much faster. The shortest possible duration of apprenticeship is 18 months.⁴³

59. The contents of vocational training are formulated by the "competent bodies" (cf. Graph 13), and the examination requirements are standardised nation-wide. These contents as well as the number and the definitions of the official occupations in vocational training are up-dated from time to time [for the list of today's 395 (1991) official occupations cf. Annex 1]. The objective of the up-dates is to provide the vocational-training program of each occupation with a general training in the first year, and with a rapidly

⁴³ This short-cut, though very rarely taken, is mainly for apprentices who plan to go to a university afterwards.

increasing specialisation in the following years (cf. **Graph 14**). The up-dates are prepared by a joined committee of unions and employers' organisations. The contents of each training program is also an integral part of the contract between apprentice and company. The directives for the education at vocational schools are nation-wide, and are provided within the framework of a "Rahmenlehrplan" by the standing committee of the Ministers of Culture and Education (cf. para 32).

60. According to a decision of the standing committee of the Ministers of Culture and Education (in agreement with the Chambers of Commerce and Industry) two days per week should be made available for vocational schooling. In practice, however, the schooling part varies between one and two days per week. In some states vocational school is held in blocks of six to eight weeks per year in certain fields of occupations. Schooling is divided in occupation-oriented subjects and others such as social sciences and business administration. These general subjects are the same for all vocational schools, though taught in greater detail and more intensively in courses of commercial apprenticeships than in the crafts or in courses of industrial apprenticeships. (These subjects are not reported in following tables). Together they are the basis for the written examination in "Economics and Social Sciences". The relative importance can be measured by the ratio of (on average) 3:1 between specific and general subjects.

2. Industrial Mechanic Specialised in Production

61. The duration of vocational training lasts 3.5 years. In the following the trails and contents of vocational training will be described for one out of the 17 occupations in the field of mechanics (in Graph 14 the first one on the left side) for each year of training.

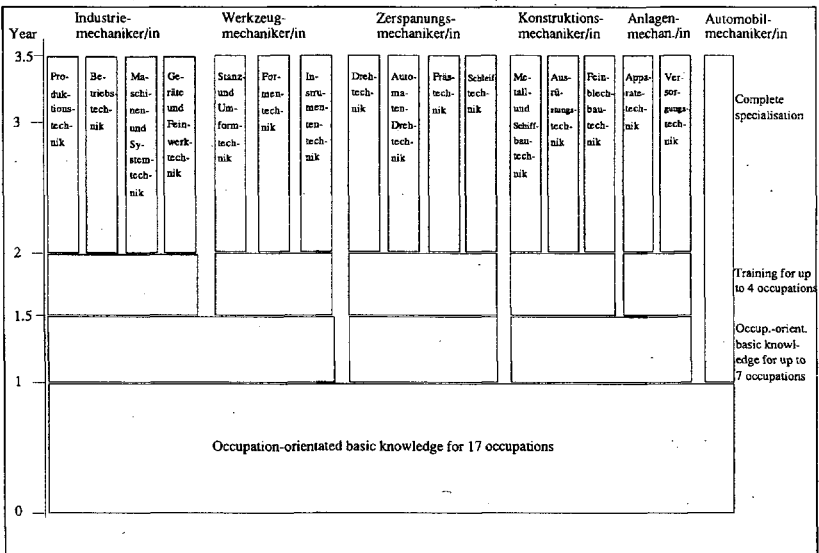
a. Contents of In-Firm Training⁴⁴

62. *1st year: Basic knowledge (cf. Graph 14)*

1. Duties and rights based on the apprenticeship contract.
2. Structure and organisation of the company.
3. Industrial law, labour protection law, and other regulations.

⁴⁴ According to para 4 of the "Provision on Vocational Training in Metal-Working Occupations" (Verordnung über die Berufsausbildung in den industriellen Metallberufen) of 15 January 1987 the importance of a position is indicated by the time required to learn a specified subject.

Graph 14 — The Specialisation of Mechanics in the Course of Vocational Training



Source: Industriegewerkschaft Metall, Frankfurt/Duesseldorf.

4. Personal protection and behaviour in case of accidents.
5. Reading, applying and producing technical information (e.g. lists of parts).
6. Knowledge of main and auxiliary materials used in production.
7. Planning and controlling simple production processes and evaluating results.
8. Maintenance of tools and machines, corrosion protection, replacement of lubricators.
9. Measuring and marking with the help of different tools, e.g. measuring roundness, planes and marking the focal points for drilling.
10. Fixing materials and tools with special reference to the hardness of the surface of materials and their stability.
11. Doing the cuttings manually (iron and non-iron metals). Choice of tools appropriate for the individual materials. Techniques: filing with a tolerance of 0.2 mm and sur-

face structure of Rz^3 6.3 to 40 μm ; sawing of tubes and profiles with a handsaw; chisel; thread cutting and tapping (including the handling of cooling lubricators of the drill); rubbing of drill holes to roundness (according to norm IT 7) and with surface structure of Rz between 4 and 10 μm .

12. Doing the cuttings with machines: choosing and adjusting the appropriate machines (e.g. rounds per minute and cutting depth). Drilling with a tolerance of 0.2 mm and handling the cooling lubricators. Rubbing holes with a drill to the same accurate roundness as manually. Mill-cutting (drehen und fraesen) of metals using different techniques with a tolerance of 0.1 mm and Rz of 10 to 40 μm .
 13. Cutting and forming: different techniques for different materials and differing thickness of the metal sheet.
 14. Connecting pieces: with pin and bolts, soldering and welding by different techniques for sheet metals, tubes and surfaces. Gluing with appropriate materials.
63. *2nd year: Increasingly occupation-oriented education*
1. Reading, applying and producing technical information (e.g. technical drawings).
 2. Planning and controlling complex production processes according to technical plans.
 3. Maintenance of tools and machines.
 4. Measuring and drawing with the help of specific instruments (with a tolerance of 0.1 mm).
 5. Doing cuttings manually: drilling with a surface structure Rz of 4 to 10 μm , fine thread cutting and tapping, producing parts with drill, file, grind paper and hand machines.
 6. Doing cuttings with machines: additional variations, e.g. mill-cutting of cones. Tolerances for mill-cuttings are less than 0.05 mm. Sharpening of tools.
 7. Cutting and forming: cutting profiles, cold forming of metal.
 8. Connecting pieces: screwing with the right torque, connecting by pressure.

9. Setting-up of pneumatic switches: reading and making plans, measurement and adjustment of pressure, connecting and testing pneumatic switches.
10. Installation of parts and subsystems: preparation, storing, testing of parts before installation. Preparation of surfaces for perfect fit. Installation according to plans, and tests of tolerances after installation with different instruments.
11. Testing and adjusting tolerances.

64. *3rd and 4th year: Complete specialisation*

1. Reading, applying and producing technical information (e.g. maintenance plans and data).
2. Maintenance of tools and machines, especially pneumatic and hydraulic systems.
3. Thermic separation of steel metal sheets using oxyacetylene cutter.
4. Installation and testing of hydraulic switches and systems.
5. Checking and repairing errors and breaks in production equipment.
6. Detecting and repairing errors and breaks in production equipment.
7. Operation of production equipment, taking into account lubricators and energy requirements, and checking operation data.
8. Adjustment of machines and equipment, taking into account safety requirements, the supply of lubricators and auxiliary material and handling of waste.
9. Handling and programming of machines in operation. Quality checks of output.

b. Contents of Vocational Schooling

α. Occupation-Oriented Schooling

Table 9 — Lessons per Subject and Year: Industrial Mechanic^a

Subjects	1st year	2nd year	3rd year	4th year
Production technology (Fertigungs- und Prueftechnik)	120	105	88	88
Material technology (Werkstofftechnik)	40	50	36	36
Machines and tools (Maschinen- und Geraetetechnik)	40	50	112	112
Control technology (Steuerungstechnik)	60	50	60	60
Electrical engineering (Elektrotechnik)	20	30	—	—
Technical Communication (Technische Kommunikation)	80	75	64	64
Total	360	360	360	360

^aEach lesson lasts 45 minutes.

Source: Die Ministerin fuer Bildung, Wissenschaft, Jugend und Kultur des Landes Schleswig-Holstein. Lehrplan fuer Industriemechaniker/in, XL 130-3243.110.2—2.1, Kiel, June 1989.

65. 1st year:

Production Technology: measures used in the industry, tolerances, measurement techniques, tools and impact of production method (laboratory work), characteristics of materials and production techniques (forming, doing cuttings, drillings, etc.).

Material Technology: categories of materials, physical characteristics, chemical characteristics (esp. corrosion), technical characteristics. Analysis of metal (crystal structure, alloys and blends). Costs, availabilities, impact on health, recycling.

Machines and Tools: understanding of the "system" in which the machines operates. Energy flows, material flows, information flows; functional groups and subsystems of machines. Knowledge of safety devices and handling of different machine types.

Control Technology: history of control technology from mechanic to electronic control systems. Description of control devices of different kinds (text, tables, equations,

drawings). Functional architecture of computers and components (RAM, EPROM), simple programming.

Electrical Engineering: basic electric concepts (conductor, semi-conductor, voltage, Ohm's law etc.). Effects and characteristics of electric components (heat, magnetism, accumulator, relay). Measuring electricity. Safety and accident prevention rules.

Technical Communication: understanding and use of technical plans. Multi-dimensional imagination ability. Two-dimensional views of solids from different angles. Symbols, organisation and rules for technical drawings and construction plans.

66. 2nd year:

Production Technology: German industrial norms (DIN, Deutsche Industrie-Normen) for tolerances of form, surface, and place. Function, use and evaluation of mechanic, optical, pneumatic and electric measurement systems. Production methods: turning, milling, grinding. Production planning with respect to required amount and qualities. CNC-Machines: characteristics, information flows, alternatives of control, co-ordinates used according to DIN, program structure, active programming.

Material Technology: analysis of alloys: Pb-Sn; Fe-Fe₃C up to 2.06 per cent C. Technical characteristics of non-alloyed steel, aluminium and copper alloys. Methods to change the characteristics (different heating, alloying). System of metals, common material numbers and traded materials. Corrosion: understanding the chemical process and methods to avoid it. Methods to test materials.

Machines and Tools: analysis of specific functional systems with regard to sub-systems, energy flow and the physical basics of their operation. Prop and carrying systems (axes, frames), energy transmission systems (clutches, gearshifts, transmissions), linkage systems (screws, solder).

Control Technology: setting up of controls for specific technical problems. Use of pneumatic, electro-pneumatic and electronic methods. Sequential control systems. Emergency and safety tasks.

Electrical Technology: characteristics of AC and DC. Frequency, periods, magnetic fields of conductors and spools. Applications (generator, transformation). Protection of the body. Function of fuses and other electric safety switches. ↗

Technical Communication: reading and preparation of partial and group drawings and plans. Realising the true length and areas from perspective drawings of different solids. Information about linkages, tolerances and materials in plans, e.g. plans of clutches, milling systems, mechanic and pneumatic regulation devices.

67. 3rd and 4th year:

Production Technology: description of computer-supported production methods. Planning of production according to given norms of original and final pieces. External programming of NC-machines by different methods. Data of tools, reference points. Active NC-programming and optimising of programs, using subroutines, teach-in-programming, etc. Quality control with NC-machines. CAD/CAM systems. Social impact and cost-benefit analyses of computer-controlled machines. Methods of forming such as welding and thermal cutting methods.

Material Technology: characteristics, production and categories of plastics. Tests of characteristics. Characteristics and production of sinter materials (density, form, measuring accuracy, etc.). Relationships between friction, lubrication, and abrasion. Analysis of material fatigue, causes and avoidance.

Machines and Tools: mounting and demounting, supervision of production, search for and repair of defects. Electrical parts, switches, torque and frequency. Description of technologies and use of transformers. Requirements regarding reliability and maintenance of specific machines. Methods to calculate effectiveness of and stress on specific parts. Planning of mounting and demounting of machines, analysis, plan and tools. Combination of flexible sub-systems of one production line. Safety rules. Evaluation of production control data. Systematic search for defects. Maintenance procedures. Economic and legal impact of mistakes in mounting and maintenance.

Control Technology: simple control programs, programming. Sub-systems in a hydraulic-regulation system. Use of parts: pumps, motors, valves (in all their variations). Characterising data. Maintenance procedures. Safety requirements regarding control devices.

Technical Communication: use of plans of a machine, making rough drafts of typical machines and sub-systems. Implementing changes and improvements in plans. Reading and explanation of system plans, control plans, linkage plans etc. Possibilities and advantages of CAD/CAM systems. Presentation and evaluation of technical data. Professional communication: explaining the use and dangers of a machine to others; taking working orders.

β. *General Schooling: Economic and Social Sciences*

68. *1st year:*

Historic development of society, their structures and their rules, application to actual problems. Social processes within groups and among groups. The family and its importance. Adolescents in the company and at school. Regulations (e.g. work contract) and motivations. Minorities with respect to religion and citizenship; problems of addiction. The principles of democracy. The philosophical background of the German Basic Law. The fundamental rights granted by the constitution. Development and structure of the legal system. Political opinions and the political decision process, function of parties, lobbies, spontaneous civil initiatives. The democratic institutions in Germany. Freedom of the press; influence of the media.

69. *2nd year:*

Development, chances and problems of an industrial society: German historic development from the agricultural to the industrial state in the 19th century. Technical progress and economic goals. Ecological problems, use of exhaustable natural resources, environmental protection. Economic and social policy in Germany: The "magic" quadrangle, as defined by the law. The economic institutions and their function. Means and goals of different organisations (unions, employers, government, central bank). Instruments and institutions of social policy (the churches, redistribution of incomes, etc.).

70. *3rd year:*

The development of Germany after World War I; the Treaty of Versailles and its impact. The rise of national socialism and its causes. The democratic state vs. the NS-state. The crimes of the regime and the ideology behind it. The development of today's Germany and her institutions.

Business: this subject will be presented in the section of "bank clerk".

c. Examination Requirements

71. The apprentice has to pass three kinds of examinations. At the vocational school two exams per subject have to be performed in writing each semester. After 1.5 years a mid-term exam is taken: practical and theoretical abilities are tested. At the end of the apprenticeship there are four exams in writing where the scholar has to prove the theoretical knowledge taught. The second part of the final exam is a test of the occupational abilities. The weights of the two parts depend on the individual occupation; the weight of the "theory" is between 80 per cent in banking and 50 per cent in the crafts. An example of the structure of a final exam after vocational training is the following:

Theoretic part:

- Technology 120 min.
- Work Organisation 120 min.
- Technical Mathematics 60 min.
- Economic- and Social Sciences 60 min.

Practical part:

Duration: max. 14 hours, including

- 4 work examples: testing and installation of machines, eliminating defects, adjustment of machines.
- Production of 4 exam pieces: production of machine parts, fitting of machine parts using different techniques, installation of pneumatic and hydraulic control systems, programming of NC-machines.

Example of exam piece: Annex 2.

3. Industrial Electrician Specialised in Instruments and Gadgets (Industrieelektroniker, Geräatetechnik)

72. The duration of vocational training lasts 3.5 years. In the following the trails and contents of vocational training will be described for one of the occupations in the field of electronics.

a. **Contents of In-Firm Training⁴⁵**

73. *1st year: Basic knowledge*

1. Duties and rights based on the apprenticeship contract.
2. Structure and organisation of the company.
3. Industrial law, labour protection law, and other regulations.
4. Personal protection, data security and behaviour in case of accidents. Economic use of energy.
5. Production of mechanical parts: Reading and applying drawings, measuring angles etc., maintenance of tools, marking work points and lines, fixing material considering hardness of the surface, filing of metals and plastics with a degree of accuracy laid down in DIN 7168 and a surface structure according to Rz 25, sawing of metals and plastics, drilling, thread cutting and tapping, cutting of metal sheets, cold forming of metal sheets and tubes.
6. Connecting: with bolts and screws, soft soldering, mechanically and electrically connecting of parts, gluing etc.
7. Fitting electrical and mechanical parts together: Reading of plans, selection of tools and materials, planning of work steps, fitting of plugs, cables etc., fitting protected cables by different techniques, preparation of electrical parts for installation (e.g. insulating, bowing, etc., assembling parts such as spools or capacitors to electronic groups, fitting mechanic parts, profiles and metal sheets together, etc.
8. Preparing, laying and connecting cables: Reading plans according to DIN 40719. Selection of tools and appropriate cables. Laying cables according to local necessities.
9. Measurement of electrical parts: Instruments and estimation measurement errors. Adjusting circuits to expected measures.

⁴⁵ According to para 6 of the "Provision on Vocational Training in Industrial Electrician Occupations (Verordnung über die Berufsausbildung in den industriellen Elektroberufen und zum Kommunikationselektroniker/zur Kommunikationselektronikerin im Bereich der Deutschen Bundespost) of 15 January 1987.

74. 2nd year: Increasingly occupation-orientated education

1. Connection of mechanical and electric components and subsystems: Reading technical drawings and making sketches, preparation of materials by taking into account electrostatic and temperature problems, fitting and soldering into circuit boards, selecting cables with respect to signal colour, electric capacity etc., connecting parts and systems in different variations. Checking and correcting work results or plans. Connection of mechanical parts with pit and bolts, installation of moving parts.
2. Installation of functionally separated systems: Carrying out a complete work process from the planning of the work to connecting mechanic and electronic components up to the final checks and corrections.
3. Checking and measurement of parts and gadgets. Installation of measurement instruments and circuits. Measuring phases, amplitudes, function of digital circuits, discrete semi-conductors, characteristic lines of spools and transformers. Documentation of results in tables and graphs. Measurement of efficiency in different variations.
4. Setting into operation of gadgets and functionally separated systems: Effectiveness of protection devices, checking of insulation, checking automatic security switches. Checking and adjusting operation characteristics according to planned data. Handling of numerical machines and instruments.

75. 3rd and 4th year: Complete specialisation

1. Production of mechanic parts by machines: Tolerance of 0.1 mm and surface structure of Rz of 10 to 63 μm ; mill-cutting, drilling and tapping.
2. Production of electronic parts: Wiring resistors and forming cables within specified tolerances; coiling spools by hand and with coiling machine. Connecting spools and iron bars.
3. Production of circuit boards: Planning boards according to switch plans and "Euroformat" size, taking into account the regulations for handling dangerous materials in the production of boards. Producing circuit boards and connecting parts in "laboratory" quality.
4. Installation and fitting together the energy and communication gadgets. Considering side effects as feed-back noises, and cooling requirements for semi-conductors.

5. Checking and adjusting of subsystems and gadgets: Testing booster effects, voltage, frequency of booster, filter or oscillographs. Using test programs for numerically controlled devices. Methods for testing rounds per minute, temperature, pressure, installation of measurement devices.
6. Setting into operation of gadgets and systems: Doing tests of partial and total functions, test operations, explanation of use to customer.
7. Maintenance: Detecting errors by systematic search and repairing; documentation of maintenance and repair procedures.

b. Contents of Vocational Schooling

α. Occupation-Orientated Schooling

Table 10 — Total Number of Lessons per Year: Industrial Electrician ⁴⁶

1st year	360
2nd year	360
3rd/4th year	540

Source: Die Ministerin fuer Bildung, Wissenschaft, Jugend und Kultur des Landes Schleswig-Holstein. Lehrplan fuer Industrieelektroniker/in, X 580-32343-110.2-1, Kiel, June 1989.

76. *1st year:*

Electrical engineering (80 h): effects of electricity: heat, light, magnetism etc. Perils of electricity. Methods to produce electric voltage. Measurement and particular diagrams, Ohm's law. Appropriate diameters of cables. Codes and Norms (DIN). Fuses and their peculiarities. Different resistor parts. Costs and prices of electricity. Different kinds of electrical circuits, switches and the respective physical laws. Electrical circuits under different loads.

Control and digital technology (40 h): simple logic control devices. Continuous and binary status. Basics of logic. Connection symbols.

⁴⁶ The subjects differ from year to year in such a way as to make presentation in a table ineffective. The number of lessons per subject are given directly behind the sub-headings.

Electronics (70 h): materials, characteristics, influence of temperature and light. Characteristic lines of semi-conductors; diodes and their applications. Transistors: boosting characteristics and lines. Stabilisation of work point.

Protection arrangements (20 h): maximum currents for human beings and animals. Rules and regulations regarding accident insurance⁴⁷. Behaviour in case of accidents. Protection arrangements according to DIN.

Measurement technology (30 h): measurements, instruments and their application for voltage, resistance, labour, defect searching. Use of oscillograph.

Technical drawings (30 h): drawing of simple tools. Norms for lines, letters and measures according to DIN. Reading and understanding of different electrical construction plans.

Material knowledge (20 h): characteristics and application of different materials in electrical engineering: Insulations, conductor, and resistor materials. Cutting, transforming and connecting techniques for these materials.

Capacitor and spools in DC-circles (30 h): capacity, marking, circuits with capacitors. Technical implications of electrical fields. Use and characteristics of spools.

AC-circles (40 h): AC versus DC and impulse tension. Characteristic measures as period, frequency, moment values in numbers and diagrams. Effective values of AC as the equivalent of the power of DC at a resistance. Characteristics of parts: phase shifting, blind and effective measures. Diagrams for resistors, spools and capacitors.

77. 2nd year:

AC-circles (80 h): interaction of electrical values in parallel and series connections, phase angles, voltage, resistance, power, compensation, resonance. Construction and use of one-phase transformations.

⁴⁷ Accident insurance by special insurance co-operations (Berufsgenossenschaft) is compulsory for all companies. For each occupation the insurance co-operatives publish protection and safety rules that *must* be known by all employees.

Mains-operated connections (20 h): construction and operation of mains connections, multi-phase rectifying, smoothing, sieving, characteristic measures. Stabilisation of voltage under changes in power.

Digital circuits (100 h): transistors as switches, static and dynamic data of TT1- and MOS circuit families, pull-up and pull-down resistors, monostable, bistable and astable "Kippstufen" (sweep steps/switches). Identifying characteristics of parts from the data leaves. Analysing and planning of electrical circuits. Basic counting and time-measuring circuits. Function of A/D and D/A transformers (speed, linearity, accuracy).

Three-phase AC (30 h): principal construction and operating mechanisms of three-phase tensions. Possible connections: star and triangle circuits, characteristics. Structure and effects of synchronised machines and asynchronised motors. Characteristics of three-phase machines: rounds per minute, slippage.

Protection arrangements (50 h): insulations against direct and indirect connections. Safety circuits and mechanisms for electrical machines (over-power, short-circuit). Safety of electrical tools. Criteria for safe installation: interference-free, minimum distances.

Sifter-connections (30 h): RL and RC sifter circuits, high and low passes. Marginal frequency, phases. Application of sifter-connections. Logarithmic transmission values: smoothing and levelling.

Control technology (50 h): names and measures in control technology. Description of applications: electro-mechanic, pneumatical and digital electronic realisations.

78. 3rd year:

Power electronics (60 h): characteristics and data of Thyristor, Triac, Diac and GTO. Safety devices. Thyristor and GTO rectifier. Starter, one- and multi-impulse circuits. IC and MC technology. Four-quadrant rectifier, frequency transformer, wave parcel controlling, feed back to mains connection.

DC-connections (40 h): fixed voltage circuits, characteristics. Effectiveness and impulse measures for flow controller and transformer.

Electric motor (40 h): structure, effectiveness and characteristics of all kinds of electrical motors, e.g. capacitor motor, Dahlander motor. Regulating small electrical motors.

Switches and cables (15 h): systematising switches according to their abilities: cutting-load and power switches, analogue and sensor switches. Characteristic data of switching devices. Build-up and characteristics data of cables in energy and communication applications, installation rules of high-frequency cables. Norms and measurements of cables according to VDE and TAB norms.

Booster circuits (100 h): basic boosting circuits for DC, setting and stabilisation of work point. Description and reasoning for the use of uni- and bipolar transistors. Build-up of multi-step low-signal boosters. Integrated boosters, data, circuit plans, examples. Basic structure of operative boosters, differences boosters, Integrators, comparators, Schmitt-Triggers.

Regulation technology (60 h): construction, understanding and use of frequency-generator circuits and connections. Sinus oscillators, non-sinus wave generation.

Measurement of electrical and non-electrical characteristics (25 h): principles of measurement set-ups (sensor, transformer, amplifier). Different tools and applications, active and passive sensory.

Computer technology (170 h): basic computer parts, CPU, RAM, Bus system, input-output parts. Functional structure of a micro-processor. Use and architecture of memory. Bus systems: tri-state-technology, logic. Serial and parallel transfers, time-adjustment, level and potential adjustment. Different command groups. Simple programming in assembler and machine code.

β. *General Schooling: Economic and Social Sciences*
(cf. Industrial Mechanic)

c. **Examination Requirements**

79. *Theoretic part:*

- Technology 120 min.
- Analysis of Switch and Control Systems ... 120 min.
- Technical Mathematics..... 60 min.
- Economic- and Social Sciences 60 min.

Practical part:

Duration: max. 14 hours, including

- Work examples: eliminating defects of control and steering systems, controlling safety and control devices, changing work characteristics of a machine through manipulation of sensorial pieces, changing control programs according to plans and performing program checks.
- Exam pieces: producing a control group using different techniques according to a plan.

Example of exam piece: Annex 2.

4. Bank Clerk (Bankkaufmann)

80. Bank clerks' vocational training is different from industrial apprenticeships in several ways: Firstly, vocational training lasts only 2.5 to 3 years. Secondly, nearly all of the apprentices come from a secondary school. Thirdly, more than 50 per cent of the apprentices are female.

a. Contents of In-Firm Training

81. As opposed to industrial mechanics and industrial electrician there is no increase in specialisation during the apprenticeship. Specialisation takes place after vocational training, e.g. in the fields "counselling of private customers", "loans", "securities" and "foreign transactions".

1. In general: structure and organisation of the bank; banker's duty regarding secrecy requirements; office organisation.
2. Basic transactions: opening and closing of accounts; fees and (per day) interest charges; foreigner's accounts; trustees' accounts. Internal provisions. Organisation of cash and non-cash transactions; advising customers. Handling of cheques and guaranteed cheques, credit cards, safety regulations. Handling of returned cheques, bills of exchange and direct debits. Foreign transactions; documented and non-documented transactions, SWIFT, wire, avis, codes of banks; checking letters of credit.

3. Deposits and investment: kinds of deposits and their relevance and importance for the bank, with special emphasis on the liquidity requirements of the Bundesbank. Opening savings accounts according to legal requirements; advising customers about capital investments, especially savings vs. certificates of deposit. The particularities of home-building saving accounts and their subsidisation. Securities: handling of orders; interpreting price notations; over-the-counter business; back office handling of securities (e.g. regulation of stock exchange deals, tax repayments for foreign securities under double-taxation agreements).
4. Finance: relevance of the different kinds of loans. Loans: regulations, criteria of credit worthiness; evaluating the value of collaterals; handling; controlling; contractual obligations; private customer loans and overdrafts; mortgages and the ways of handling them.
5. Internal organisation: controlling and accountancy; account structure, legal duties of information; statistics of the company; organisation of work processes regarding payments and securities; automated information processing. Regulations in cases of accident and robbery; corporate auditing; aiming of auditing and assistance of auditors.

b. Contents of Vocational Schooling

Table 11 — Lessons per Subject and Year: Bank Clerk

	1st year	2nd year	3rd year
Banking (Bankbetriebslehre)	120	80	80
Accounting/Mathematics (Rechnungswesen/Mathematik)	120	120	120
Economics (Allgemeine Wirtschaftslehre)	120	80	80
English	40	40	40
Total	400	320	320

Source: Der Kultusminister des Landes Schleswig-Holstein (June 1989). Lehrplan Bankkaufmann, Akt.Z.Nr. XL 130-3243-110.1-7.

82. 1st year:

Banking: the law of bank services; definition of a bank. The types of accounts, their goals and structures, with special emphasis on savings and checking accounts; au-

thorised persons. Money transfers: instruments of non-cash payments; direct debiting; bills of exchange. Rationalisation. Equity financing vs. other financial tools. Creditors' accounts: transformation of maturities; motives to save; legal requirements of and public subsidies for saving plans. Money markets; refinancing at the Bundesbank; issuing of obligations and bonds. Loans: characteristics and economic importance; loan contracts; checking of creditworthiness. Securities, cessions, pledges, mortgages, kinds of credits and their characteristics.

Accounting: the statement, legal requirements, accounting systems, categories of accounts, debtor-creditor accounts, mixed accounts. Combined booking of taxes. Depreciation methods.

Mathematics: interest calculation for saving accounts and current accounts. Calculation of annuities and "effective" interest rates according to the law. Basics in computer programming, programs for interest rates and annuities.

Economics: the legal environment of the business (30 h): structure of laws, legal status of persons, contracts, cooperations. Basics of economics (15 h): Needs, commodities, the economic principle, demand, supply, elements of production, diversification of work. Human work (35 h): working conditions and intra-company relations, hierarchy, work contracts and collective work contracts; work protection requirements, social security, participation in management, leadership methods. Production process (20): fixed and variable costs, prices and pricing policies, organisation of production.

English: repetition of basic grammar; tenses and if-clauses; active-passive voice. Situations: opening an account, transferring money, vocabulary and oral exercises. How to open an account in the United Kingdom. Borrowing money.

83. *2nd year:*

Banking: legal limits to banks. Principles of the Bundesbank about liquidity and equity. Required reserves. Voluntary deposit securing by the banks. The securities business of banks: kinds and characteristics of securities. Shares, bonds investment certificates, options and futures, the stock and bond exchange. Brokerage business. Emission of securities for third parties. Safe-custody accounts. Advising private customers on investing their money: Targets of the customer, comparing different forms of investments, tax aspects of investments and speculations. Foreign trade: foreign exchange, futures, means of international money transfer, encashments and

letters of credit, INCO terms, control function of the bank, credit aspects of the L/C.

Accounting: accounting of securities and safe-custody accounts and their legal requirements, fees, partial interests, taxes. Cost calculations and methods of ascribing costs to product, departments, etc. End-of-year accounting, deferrals and accruals.

Mathematics: interest calculation for securities, "Bezugsrecht" (subscription rights) calculation. Chart analysis of security prices.

Economics: the market and the price mechanism (20): functioning markets, perfect and imperfect markets. Cooperation and concentration in economics. Government policies, goals and instruments, consumer protection. Taxes (10): kinds of taxes, distribution of taxes among local state and federal governments. Basics of the tax laws. Economic systems (15): the models of market and centralised economies. Social market economy in the Federal Republic of Germany. Economic policies (60): economic flows in the national accounts statistics. Targets and conflicts of targets, growth, price stability, balanced current account, full employment. Monetary and real measures in economics. Demand and supply-caused inflation. Business cycle and public policy: monetary, fiscal and tax policies. Foreign exchange policies and current account components. International liquidity, IMF.

English: writing a business letter in English, different forms of style and headings. Typical phrases in foreign trade and cross-border banking. The security market in England, gilts, bonds, "big bang".

c. Examination Requirements

84. Theoretic part:

- Theory of Banking 180 min.
- Accounting..... 90 min.
- Economics.....90 min.
- Social Sciences.....90 min.

Practical part:

Duration: 30 minutes

- Oral examination of practical skills in advising and preparing personal and business loans, advice on private investment/securities, preparation and controlling of foreign

transfers (e.g. letter of credits) and dealing with specific administrative problems, such as optimal transfer methods or techniques used to transfer money.

5. Advanced Vocational Training

a. Goals and Motivation

85. The main motivation for the employee to qualify as "industrial master" is the chance to earn a higher income. The wages for "Industriemeister" start at about 3 000 DM today (1993) which is about the second highest income group for "Facharbeiter" and goes up to 5 700 DM. The second motivation is the social status achieved. As a "master" one is usually the foreman of a work group or even of several groups. Without the master degree it is very hard to advance to any higher position in a company.⁴⁸ These pay-offs require a considerable amount of inputs to become an Industriemeister, as it is usually a three-time-a-week evening-school program (in rural areas schooling is over the weekends). Thus, the candidates for a master degree have to give up most of their spare time for two to three years, when only 75 per cent of those who survived over the whole period and went into the final examinations are successful (Statistisches Bundesamt, Fachserie 11). Some programs for the Meister are one year full-time programs. Thus, the participants have to give up their income, if not their job for one year and live on their savings.

86. The motivation to become a bank manager (Bankfachwirt) is fuelled more by career potentials and incomes expected as the title itself has no special reputation. Nevertheless, a branch manager or a department manager has either a university degree or the degree of a bank manager. The human resource manager of a bank normally takes the will to go through this program as an indicator for the ability to lead and to organise branches and departments. The major banks usually pay back the education fees in cases of successful participation. The savings and loan banks even grant a half-year fully paid leave to join the full-time program; this leave is made dependent on an entrance examination, whereas in the evening school there exist only formal entrance requirements, such as the apprenticeship.

⁴⁸ The alternative of a master degree is to become a specialist for a specific production method or machine (which also requires intensive further training). The social position of specialists is about the same as that of the Meister, but lacks the leadership function. Both "master" and "specialist" often work together hand in hand with engineers in research and development.

87. For the industrial master and the bank manager there is no practical final examination (it is only in crafts that practical examinations are required to achieve the master degree). Only written exams in the subjects described in the following.

b. Industrial Master

88. The theoretic program for the industrial master is based on the contents of vocational training. Besides a fresh-up of theoretic knowledge the focus is on a more thorough understanding. Moreover, special weight is put on the leadership functions. The minimum of a three years work experience after the apprenticeship is a pre-condition for the final exam.⁴⁹ As the subjects are similar to that of the apprenticeship programs the contents are presented in the following in a condensed form. The ultimate aim of the program is to educate team leaders (as opposed to the technician program which is focused rather on educating specialists).

Number of Lessons per Subject⁵⁰

<i>Total</i>	966
<i>General part</i>	296
1. Basics of being cost efficient.....	130
2. Basics of the legal framework	66
3. Social relations and team work.....	100
<i>Specific part for industrial master in mechanics</i>	580
1. Basics in mathematics, physics, etc.	100
2. Technical communication.....	64
3. Knowledge of materials.....	68
4. Operation technology	118
5. Production technology.....	154

⁴⁹ A work experience of 8 years (6 years in banking) is considered to be a substitute for apprenticeship.

⁵⁰ This section is based on IHK-Weiterbildung "Industriemeister Elektrotechnik", May 1992 and "Industriemeister Metall", October 1989.

Specific part for industrial master in electronics580

1. Basics in mathematics, physics, etc.100
2. General operation technology140
3. Special operation technology: telecommunication⁵¹.....184
4. Production technology.....76
5. Safety requirements and environmental issues.....52
6. Practical examples.....28

Vocational training contracts.....120

1. The principles of apprenticeship12
2. Planning and implementation60
3. The adolescent and the apprentice30
4. Legal environment of vocational training18

Contents89. *General part* (identical for mechanics and electricians)

1. Basics of being cost efficient: economics: motivations, prices and markets, company structures, business organisation. Business: nature of production, planning, controlling, information flows, cost calculation.
2. Basics of the legal framework: the constitution, purpose of laws, passing of bills, courts and their decisions. Work contracts, worker protection, environmental laws, workers' participation, collective wage bargaining, strikes and unions, social security.
3. Social relations and team work: development of the personality, group behaviour, rules and problems when dealing with other employees, especially females, elderly people and foreigners. Labour organisation: analysis of the place of work, the role of motivation of employees. Principles of team work. Role of the industrial master: Supervisory function, responsibilities, mediation between management and workers, cooperation and communication among working groups. Management methods.

⁵¹ There is also the possibility to specialise in energy technology measurement as well as control technology.

90. *Specific part for industrial master in mechanics*

1. Basics in mathematics, physics, etc.: mathematics: numerical systems, linear equations, geometric functions, geometric calculations; chemistry: definitions, oxidation and reduction, bonding of atoms and molecules; base, acids, electrolysis, corrosion. physics: definitions of movements, power, combination of different powers, power performed by machines, temperature technology, calculating heat equivalent energy, electric energy circuits, statistics: descriptive and analytical statistics, samples, classes, distributions, probability intervals.
2. Technical communication: reading and analysis of technical drawings, drawing of sketches in order to explain problems; integration and separation of parts in technical drawings; construction of parts and tools; usage and drawing of simple statistics and tables.
3. Knowledge of materials: structure of metals and of crystals; melting characteristics; C-concentrations; effects of alloys on the characteristics of metals; molecular structures of plastics and their synthesis; industrial norms for plastics, their characteristics and practical application; lubricators and auxiliary materials, their main characteristics and industrial norms; methods to test materials.
4. Operation technology: power units and vehicles: construction, efficiency, characteristics of parts and subsystems, e.g. breaks, differentials, service and maintenance; energy supply and distribution: supply facilities, maintenance, avoidance of losses, safety rules; control and steering devices: theory, measurement techniques, construction, application of different regulation techniques (pneumatic, hydraulic, numerical).
5. Production technology: production techniques: warm and cold transformation, separation, etc.; methods to change the characteristics of materials, automation concepts and systems, their components; safety: official work protection norms, possibilities of personal safety, handling of dangerous materials, protection against fire and explosions, transportation safety; environmental protection: waste disposal and its management, avoidance of waste and recycling; quality: methods to test for quality, consequences of non-testing, measurement errors, economic and technical efficiency of quality tests, quality tests and acceptance of supplied materials.

91. *Specific part for industrial master in electronics*

1. Basics of mathematics, physics, etc.: same as for industrial master in mechanics, plus basics in electrical engineering: sources of electricity, electrical fields, magnetic fields, AC-technology, three-phase current technology.
2. General operation technology: supply and distribution of electrical energy: power stations, demand curves (daily, weekly, yearly), efficiency of energy transformation, distribution, frequencies, voltage, phases, systems, accumulators and their characteristics; electronics: active and passive components, circuits and switches using these components, operation booster; digital signal systems: logical circuits, algebraic expression of circuits, codes (Hexa, 7-bit, ASCII), A/D and D/A transformer, memory components (SRAM, DRAM, ROM, EPROM, EEPROM, EAPROM), structure of a micro computer, light wave transmitters: transmitter components, connection methods of transmitters, measures for light wave transmitters, application; measurement technology: appropriate measures and instruments in electronics; control and steering devices: SPS vs. VPS technology, regulators, electrical networks and control systems, sensors and actors, process control systems.
3. Special operation technology: telecommunication: legal aspects of telecommunication: basic telecommunication law, public network regulations, regulations for radio communication, information technology: terms, definitions, applications and common characteristics, components, cables, aerials, filters, boosters, and their characteristics, frequency modulation methods, impulse modulation, parallel usage of transmitter components; measurement technology: low frequency and high frequency techniques, error detection, industrial communication technology analogue vs. digital transfer of data, structures of networks, information processing systems, components, documentation, components and techniques for wireless transmission, e.g. mobile telephone, frequency plans, satellite technology, memory systems for sound, pictures and data.
4. Production technology: materials: steel and non-iron metals, industrial norms, corrosion characteristics, characteristics of alloys, insulator materials, auxiliary materials and lubricators; applied techniques: soldering, shrinking, multilayer technology, surface protection, fitting and usage of endangered components (electromagnetic influences), techniques of installation of cables and wires; quality: basic terms and methods, statistical analysis of data, samples and interpretation; technical drawings:

deriving work instructions for employees from plans, DIN-norms, kind and purpose of plans, drawing of sketches to explain specific problems.

5. Safety requirements and environmental issues: specific safety regulations: official norms for networks, rooms, etc., international standards, checks and official acceptance of electrical equipment; work protection: general rules and regulations, personal protection using power-driven and electrical equipment, special problems, e.g. laser rays, fire protection and fighting; environmental protection: Noise and vibration protection, heat and radiation protection, gas and dust protection, waste management.

92. *Vocational Training Contracts* (identical for mechanics and electricians)

1. Principles of apprenticeship: position in the education system, places of vocational education, position, duties and responsibilities of the trainer, rules and regulations.
2. Planning and implementation: contents and goals of vocational education, selection of appropriate working places, expected performance, providing qualified personnel and considering time requirements for education; cost aspects: cooperation and communication with other places of training within and outside the company; didactic organisation: preparation of materials, methods of teaching, use of media, evaluating performance.
3. The adolescent and the apprentice: typical behaviour according to the stages of the individual's development; what is expected from trainers: problems caused by unsatisfied demand, detecting and promoting personal qualities.
4. Legal environment of vocational training: work contracts and the duties and rights implied, limitation of the freedom to contract by federal and state law. institutions and their functions for vocational training, regulations by laws regarding the labour market, social minimum standards, and youth protection.

c. **Bank Manager**

93. The bank manager is the equivalent to the industrial master in the banking sector. Again, the table of contents is very much like the one of apprenticeship. Some subjects, such as law, are taught by professors from university, others by senior bank managers. In order to receive permission to educate apprentices the bank manager has to pass a

special exam, the contents of which are identical with that part of the program for industrial masters which was described above ("Vocational Training Contracts").

Number of Lessons per Subject

Total470

1. General banking	80
2. Business administration (incl. human resource management)	100
3. Economics.....	75
4. Bank laws.....	75
5. Deposits	20

1. General banking: structure of the banking sector, bank laws, financing of banks, function and structure of (international) money and capital markets, internal accounting, statistics, cost calculations, revisions, interest spreads, external accounting statements, tax regulations, bank policies regarding liquidity, collaterals, risk management.
2. Business administration (incl. human resource management): organisation of a company, legal forms of firms, accounting, cost factors and calculation, statements of balance, legal duties. consolidation of trusts, tax statements, definitions and discrepancies between tax statements and commercial statements, instruments of finance, various forms of equity, loans, subsidies, leasing; human resources: the law, leadership aspects and management techniques, recruiting, planning, promotion, administration and vocational training.
3. Economics: definitions, mainstream theories, economic systems, circular flows, factors of production, process of income creation, prices and markets, national accounting, money and credit, definitions and systems, monetary policy, foreign exchange policies, foreign trade and the balance of current accounts, relevant statistics (on national incomes, labour, prices, trade, growth), business cycles, economic indicators and policies, general economic policies.
4. Bank laws: basics, contracts and their requirements, duties and rights; possession vs. ownership: property rights and mortgages; family law; law of inheritance; commercial laws; banking contracts: standardised contracts and conditions, law of collaterals and guarantee, right of lien, trust deed, mortgages; bankruptcy regulations: legal collection of debts, writ of execution.

5. Deposits: transfers of money (national), trade and safe-custody of securities, international business, short- and medium-term loans, long-term loans, saving and loans for housing.

6. Questionnaire Results⁵²

94. Three companies were visited in order to get information on each company's human-resource management. All these companies are stock corporations⁵³; one is mainly owned by the founder's family: its shares are traded at German stock exchanges (company A); the shares of C are internationally traded, and the shares of B are neither traded nationally nor internationally because it is owned solely by a holding company. Two companies, A and B, are medium-sized (about 5 000 employees each), one (C) is a very large company (about 450 000 employees). Two companies are multinational corporations (A and C) with subsidiaries in the United States, Japan and elsewhere.

95. The three firms differ mainly with respect to the high-technology contents of their products, and with respect to their share of military productions: companies A and C are typical high-tech firms — one concerned with electronic products, the other with various systems for storing, mixing and transporting gases. Company B on the other hand has been engaged in producing sea-going vessels as well as in repair and maintenance of ships; it should be added that company B has been relying heavily on government procurement and subsidisation; the latter also holds for company C.

96. Only one of the companies considered has a major share of military products (company B with about 45 per cent in 1990). The other two companies sell a very small share of their production to the military (about 2 per cent). Nonetheless, due to the differing size of the companies, firm C sells more than twice as much to the military than firm B.

97. The details of the answers to the questionnaire are presented in the following. Since the representatives of each firm often had important things to add, these are given

⁵² Of the 18 questions asked some refer to a project focussing on "The German Market for Advanced Vocational Training". The results may be interesting in the context of this study as well and are therefore reported but not commented on.

⁵³ The three companies are not representative with respect to vocational training in general. Most of the training is carried through in small and medium firms.

in italics below the respective question. We shall only point out the main common denominators and the most obvious divergencies.

98. The quality of apprentices according to the education received before taking up the apprenticeship is highly similar in the two high-tech firms, with the median being the degree of a lower secondary school (question 1); company B has the median at the level of the elementary school. The same company structure holds also when looking at the share of non-German apprentices (which is relatively low in the high-tech firms; question 2b).

99. All three companies do the bulk of vocational training in-house (question 4). The time of an apprentice devoted to production is highest in the two high-tech companies (question 5). The large company considers its internal schooling a substitute for public vocational schooling.

100. The financial incentive for skilled workers to achieve mastership or a comparable qualification through additional training is between 21 per cent and 33 per cent of the respective lower-level income (question 6); it can be assumed that the information given by company B holds for the other companies as well, namely that the "image" provided by the superior job is more important than the financial compensation.

101. Question 7 indicates the criteria for promoting employees from the firm's point of view: "job competence" is considered to be more important than formal qualification. All three companies handle the promotions mainly in the framework of personnel planning (question 8).

102. Masters, or their equivalents, have in common that they are not engaged in own practical production work (question 9); instead, their time is devoted to surveillance — high-tech firms A and C — and to receiving and giving directives.

103. The degree of substitutability of labour between military and civilian lines of production is low in the high-tech firms, even zero in company C, and very high in company B (question 9). Quite obviously, the dual-use potential of the final products decreases with sophistication.

104. The returns on advanced vocational training are such that an employee has to take rather long-term bets in case he is aiming at additional income (question 11). This is unanimous among the firms, and it stresses the above made observation that intangibles,

such as "image" are possibly more important; in addition to this, job security and long-run career perspectives seem to provide incentives to engage in further training, too.

105. It can be argued that every employee in the firms considered participates in advanced vocational training some time in his life. In company A: 63 per cent take part in advanced training each year, and an even higher share in firm B (assuming that the 50 per cent of 12.b are double counts in the case of company B). Most of this training is in-house, in company C even 100 per cent (question 12).

Questionnaire

(answers are written in *italics*)

Company A

<p>1. Can you indicate the structure of your apprentices according to their level of school education?</p> <p>a. no graduation at all b. special schooling (very low level) c. elementary school ("Hauptschulabschluß") d. lower secondary school ("Realschulabschluß") e. upper secondary school ("Gymnasium") f. university</p> <p>In general: <i>The share of apprentices with an upper-secondary-school degree was 80 per cent in administration in the 1980s. Quotas of graduates each type of school are fixed in advance by the management.</i></p>	<p>Production</p> <p>a. — b. — c. 40 % d. 55 % e. 5 % f. —</p>	<p>Administration</p> <p>— — 10 % 60 % 30 % —</p>
<p>2. Can you give information on sex and nationality of your vocational trainees?</p> <p>a. male b. German</p> <p>In general: <i>The share of females in production has been declining.</i></p>	<p>a. 80 % b. 93 %</p>	<p>40 % 93 %</p>
<p>3. What vocational trainees will actually have to learn is decided by</p> <p>a. external committees</p> <p>b. the company's top management c. the company's top management plus the firm's works council d. the firm's works council</p> <p>In general: <i>The details of inhouse training have been delegated to special "training managers".</i></p>	<p>a. <i>No; they do not have the know-how to decide on in-firm training.</i></p> <p>b. <i>No.</i> c. <i>No.</i> d. <i>No.</i></p>	

<p>4. What is the share of</p> <p>a. in-house b. external vocational training?</p>	<p>a. 70 % b. 30 %</p>	
<p>5. What is the share of a vocational trainee devoted to</p> <p>a. in-house-training workshops? b. external schooling? c. production?</p> <p>In general: <i>The firm tries to have as much training directly on the job as possible.</i></p>	<p>a. 11 % b. 30 % c. 59 %</p>	<p>2.5 % 30.0 % 67.5 %</p>
<p>6. Please describe the income structure of your employees</p> <p>a. without master qualification b. with master qualification c. specialist, technician</p> <p>In general: <i>Payment is strictly according to the general wage constructs, i.e. according to function. Extra payments (depending on individual performance) are possible.</i></p>	<p>a. DM 3000.-- min. b. DM 4000.-- min. c. —</p>	
<p>7. The authority of an employee</p> <p>a. without master qualification? b. with master qualification? c. specialist, technician?</p> <p>to give directives refers to how many employees?</p> <p>In general: <i>The authority to give directives depends on position (and on "job competence"), not on formal qualification attained by vocational training and past education.</i></p>	<p>a. — b. — c. —</p>	
<p>8. How do you handle your promotions:</p> <p>a. from above, in the framework of a complete planning of the structure of employees? b. by advertising certain positions in the public?</p>	<p>a. Yes. b. No.</p>	

<p>9. What are the typical fields of activities of a master? (as per cent of total working time)</p> <ul style="list-style-type: none"> a. giving directives (distribution of jobs) b. surveillance c. receiving directives (from higher positioned people) d. own practical work e. other jobs <p>In general: <i>The traditional foreman job does no longer exist. Group and department managers are supposed to have the competence regarding methods and leadership. (The distribution refers to group manager.)</i></p>	<ul style="list-style-type: none"> a. 20 % b. 35 % c. 25 % d. 0 % e. 20 %
<p>10. Can skilled workers or masters change between the production of civil goods and military goods? I.e., does their vocational training account for both?</p> <ul style="list-style-type: none"> a. without additional training b. only after additional training 	<ul style="list-style-type: none"> a. To some extent. b. Yes.
<p>11. Can you estimate the impact of additional vocational training (of fully trained people) in terms of money?</p> <p>(0=no impact; 10=income differential of DM 2000.-- per month)</p> <p>In general: <i>Not measurable (although chances of promotion increase considerably). The personnel department rather aims at demonstrating paths of long-term careers.</i></p>	
<p>12. What is the share of employees participating in advanced vocational training?</p> <ul style="list-style-type: none"> a. with respect to in-house seminars and workshops? b. training by specialised firms outside your company? 	<ul style="list-style-type: none"> a. 48 % b. 15 %

13. How did the share of employees participating in external training change since 1988?	<i>Increasing, but data are not available.</i>
14. Is there any financial or other support of advanced vocational training by your company? (maximum amounts in DM/month per trainee) In general: <i>If the training is necessary for the job the additional training is fully paid by the company. In addition, one freely chosen course at an evening school is paid per employee and year (worth about DM 50-100 per month).</i>	
15. What are your estimated costs for a. in-house vocational training? b. advanced vocational training (in-house)? c. external training?	a. <i>DM 8.5 Mio.</i> b. <i>Not measured.</i> c. <i>DM 3.5 Mio.</i>
16. a. Does your company offer its training facilities also to external people? b. How did the number of participants and the turnover develop in recent years?	a. <i>Yes, since 1993.</i> b. <i>Data not available.</i>
17. What is your estimate of the per-cent share of your advanced vocational training that could be used in other companies as well?	<i>100 %</i>
18. How many suppliers potentially relevant for your company exist on the market for advanced vocational training?	<i>A very large number.</i>

Questionnaire

(answers are written in *italics*)

Company B

<p>1. Can you indicate the structure of your apprentices according to their level of school education?</p> <p>a. no graduation at all b. special schooling (very low level) c. elementary school ("Hauptschulabschluß") d. lower secondary school ("Realschulabschluß") e. upper secondary school ("Gymnasium") f. university: <i>these would be too old</i></p> <p>In general:</p> <ul style="list-style-type: none"> - <i>The status of "Facharbeiter" is seriously endangered.</i> - <i>Education received is generally bad today. This holds for all kinds of schooling.</i> - <i>Apprentices with secondary school degrees often perform relatively badly in the long-run (under-utilization of intellectual capacities).</i> - <i>"Attitudes" are increasingly deteriorating ("consumers' mentality").</i> - <i>V. T.-schools have miserable teachers (leisure maximisers). Teachers do not enforce discipline.</i> - <i>V. T. is subject to "Mitbestimmung", i.e. employees and (often) trade unions also determine the contents and ways of V.T.</i> - <i>In case of a problem society looks for the easy way out: "Let's do some schooling".</i> 	<p>a. } 4.0 % b. } c. 53.4 % d. 31.6 % e. 11.0 % f. 0.0 %</p>
<p>2. Can you give information on sex and nationality of your vocational trainees?</p> <p>a. male (<i>share is increasing</i>) b. German (<i>share is decreasing</i>)</p>	<p>a. 78.1 % b. 85.1 %</p>
<p>3. What vocational trainees will actually have to learn is decided by</p> <p>a. external committees b. the company's top management c. the company's top management plus the firm's works council d. the firm's works council</p>	<p>a. 100 % (<i>rules and regulations</i>) b. 0 % c. 0 % d. 0 %</p>

<p>4. What is the share of</p> <ul style="list-style-type: none"> a. in-house b. external vocational training? 	<ul style="list-style-type: none"> a. 60 % b. 40 %
<p>5. What is the share of a vocational trainee devoted to</p> <ul style="list-style-type: none"> a. in-house-training workshops? b. external schooling? c. production? <p>In general: <i>V.Ts. go into production starting as early as the 2nd year of vocational training.</i></p>	<ul style="list-style-type: none"> a. 20 % b. 40 % c. 40 %
<p>6. Please describe the income structure of your employees</p> <ul style="list-style-type: none"> a. without master qualification b. with master qualification c. specialist, technician <p>In general:</p> <ul style="list-style-type: none"> - <i>There is a general wage contract ("tarif for metal workers") in Germany. On the basis of that contract there exists an "In-house tariff", with extra payments.</i> - <i>"Image" is more important than pay.</i> 	<ul style="list-style-type: none"> a. DM 4500.-- max. b. DM 5470.-- max. c. DM 6150.-- max.
<p>7. The authority to give directives refers to how many employees?</p> <ul style="list-style-type: none"> a. without master qualification? <i>"Vorarbeiter" (foreman) can have the same authority as "Meister" (cf. note).</i> b. with master qualification? c. specialist, technician? <p>In general: <i>The authority to give directives depends on position (and on "job competence"), not on formal qualification attained by vocational training and past education.</i></p>	<ul style="list-style-type: none"> a. b. max. 300 c.
<p>8. How do you handle your promotions:</p> <ul style="list-style-type: none"> a. from above, in the framework of a complete planning of the structure of employees? b. by advertising certain positions in the public? 	<ul style="list-style-type: none"> a. 75 % b. 25 %

<p>9. What are the typical fields of activities of a master? (as per cent of total working time)?</p> <ul style="list-style-type: none"> a. giving directives (distribution of jobs) b. surveillance c. receiving directives (from higher positioned people) d. own practical work e. other jobs, <i>mainly administrative.</i> <p>In general: <i>"Other jobs" refers to administration mainly.</i></p>	<ul style="list-style-type: none"> a. 25 % b. 15 % c. 30 % d. 0 % e. 30 %
<p>10. Can skilled workers or masters change between the production of civil goods and military goods? I.e., does their vocational training account for both?</p> <ul style="list-style-type: none"> a. without additional training b. only after additional training <p>In general: <i>There has never been a distinction of capabilities between both activities in this firm. V.T. is very general.</i></p>	<ul style="list-style-type: none"> a. Yes. b. No.
<p>11. Can you estimate the impact of additional vocational training (of fully trained people) in terms of money?</p> <p>(0=no impact; 10=income differential of DM 2000.-- per month)</p> <p>In general: <i>"Job competence" is required. Many take courses secretly, without talking about it. The probability of extra pay is low. The rewards can rather be seen in higher chances of promotion, and in increased job security.</i></p>	
<p>12. What is the share of employees participating in advanced vocational training?</p> <ul style="list-style-type: none"> a. with respect to in-house seminars and workshops? <i>Every 2nd employee is the normal rate. But 1992/93 was an exception: 4500 courses for 4200 employees, of which "conduct training" (for quality improvements) was a major part.</i> b. training by specialised firms outside your company? <i>Includes double counts. The ratio between internal and external training is roughly 1:1 (courses taken secretly not included). EDV seminars and welding courses are mainly external.</i> 	<ul style="list-style-type: none"> a. 50 % b. 50 %

13. How did the share of employees participating in external training change since 1988?	<i>No data available.</i>
<p>14. Is there any financial or other support of <i>advanced</i> vocational training by your company? (maximum amounts in DM/month per trainee)</p> <p>In general: <i>Refers to firm-promoted courses only. The maximum amount was due in cases of training in Japan, etc.</i></p>	<i>Yes. Up to DM 3500.-- per course, plus wages foregone.</i>
<p>15. What are your estimated costs for</p> <p>a. in-house vocational training? b. advanced vocational training (in-house)? c. external training?</p>	
<p>16.</p> <p>a. Does your company offer its training facilities also to external people? b. How did the number of participants and the turnover develop in recent years?</p>	
17. What is your estimate of the per-cent share of your advanced vocational training that could be used in other companies as well?	
18. How many suppliers on the market for advanced vocational training?	

Questionnaire

(answers are written in *italics*)

Company C

<p>1. Can you indicate the structure of your apprentices according to their level of school education?</p> <p>a. no graduation at all b. special schooling (very low level) c. elementary school ("Hauptschulabschluß") d. lower secondary school ("Realschulabschluß") e. upper secondary school ("Gymnasium") f. university</p> <p>In general: <i>Graduates from universities get training-on-the-job, not vocational training.</i></p>	<p>a. 0 b. 0.4 % c. 20 % d. 60 % e. 20 % f. 0 %</p>
<p>2. Can you give information on sex and nationality of your vocational trainees?</p> <p>a. male b. German</p>	<p>a. 82 % b. 94 %</p>
<p>3. What vocational trainees will actually have to learn is decided by</p> <p>a. external committees b. the company's top management c. the company's top management plus the firm's works council d. the firm's works council</p> <p>In general: <i>The framework of vocational training is provided externally (regulations).</i></p>	<p>a. 0 % b. 1 % c. 99 % d. 0 %</p>

<p>4. What is the share of</p> <p>a. in-house</p> <p>b. external vocational training?</p>	<p>a. 70 %</p> <p>b. 30 %</p>
<p>5. What is the share of a vocational trainee devoted to</p> <p>a. in-house-training workshops/<i>own training centers</i>?</p> <p>b. external schooling?</p> <p>c. production/<i>administration</i>?</p> <p>In general: <i>Own training centers constitute alternatives for vocational schools.</i></p>	<p>a. 35 %</p> <p>b. 30 %</p> <p>c. 35 %</p>
<p>6. Please describe the income structure of your employees</p> <p>a. without master qualification</p> <p>b. with master qualification</p> <p>c. specialist, technician</p> <p>In general: <i>There is no in-house agreement on salaries. Salaries are orientated on general wage contracts. The company has subsidiaries throughout Germany; income structures are diverging on account of diverging regional wage contracts.</i></p>	<p>a. .</p> <p>b. .</p> <p>c. .</p>
<p>7. The authority to give directives refers to how many employees?</p> <p>a. without master qualification?</p> <p>b. with master qualification?</p> <p>c. specialist, technician?</p> <p>In general: <i>The authority to give directives depends on position (and on "job competence"), not on formal qualification attained by vocational training and past education.</i></p>	<p>a. .</p> <p>b. .</p> <p>c. .</p>
<p>8. How do you handle your promotions:</p> <p>a. from above, in the framework of a complete planning of the structure of employees?</p> <p>b. by advertising certain positions in the public?</p>	<p>a. Yes.</p> <p>b. No.</p>

<p>9. What are the typical fields of activities of a master? (as per cent of total working time)</p> <p>a. giving directives (distribution of jobs) b. surveillance c. receiving directives (from higher positioned people) d. own practical work e. other jobs</p>	<p>a. 20 % b. 60 % c. 20 % d. 0 % e. 0 %</p>
<p>10. Can skilled workers or masters change between the production of civil goods and military goods? I.e., does their vocational training account for both?</p> <p>a. without additional training b. only after additional training</p>	<p>a. No. b. Yes.</p>
<p>11. Can you estimate the impact of additional vocational training (of fully trained people) in terms of money?</p> <p>(0=no impact; 10=income differential of DM 2000.-- per month)</p> <p>In general: <i>Advanced vocational training has no immediate impact on salaries. Effects may occur later through promotion into higher ranks.</i></p>	
<p>12. What is the share of employees participating in advanced vocational training?</p> <p>a. with respect to in-house seminars and workshops? b. training by specialised firms outside your company?</p> <p>In general: <i>All employees taking part in advanced vocational training get this in-house.</i></p>	<p>a. . b. .</p>

13. How did the share of employees participating in external training change since 1988?	<i>Not registered.</i>
14. Is there any financial or other support of <i>advanced</i> vocational training by your company? (maximum amounts in DM/month per trainee)	<i>The support per employee is per month DM 2460.-- (not considering wages).</i>
15. What are your estimated costs for a. in-house vocational training? b. advanced vocational training (in-house)? c. external training?	a. <i>DM 400 Mio.</i> b. <i>DM 50 Mio.</i> c. <i>0</i>
16. a. Does your company offer its training facilities also to external people? b. How did the number of participants and the turnover develop in recent years?	a. <i>No.</i> b. <i>0</i>
17. What is your estimate of the per-cent share of your advanced vocational training that could be used in other companies as well? In general: <i>In-house advanced vocational training can be used in other companies as well.</i>	<i>No information on percentages available.</i>
18. How many suppliers exist on the market for advanced vocational training? In general: <i>Company C does not rely on external supplies of advanced vocational training.</i>	<i>Negligible.</i>

VI. Effectiveness Analysis

1. Measuring Effectiveness

a. Introductory Remark

106. In analysing the efficiency of a country's policies too often inputs are taken as an indicator of results. This can be observed particularly in the fields of R&D efficiency, technology transfers, and human capital formation. For example, it is argued that a certain country was, is, or will be in a technologically superior position because it spent more money on R&D or on university education; in reality, things may be quite the opposite: the country may have a system of relative prices where R&D, or education, is more costly because these sectors are less competitive by international standards. In any firm the argument of high costs incurred would not lead to the conclusion that this indicates a competitive edge of such a firm.

107. A country's competitiveness depends, no doubt, among others on how well it trains, or educates, its people and how it minimises the costs of the trails of education. From an economic point of view the difference between the results (the additional incomes) of vocational training and the costs incurred should be a maximum; the traditional analysis would suggest that marginal revenues in training be equal to the marginal costs. Training beyond this point would decrease net outcomes.

108. Whether the macroeconomic efficiency of the German system of education and vocational training is any greater than that of other countries, such as the United States, is hard to evaluate. The many variables determining per-capita income and its growth make the insulation of a single variable too difficult for standard analysis, not to mention the intrinsic problems of quantitatively assessing the qualities of different educational systems.

109. What can be said is that the levels of per-capita income are not very divergent between the two countries. Thus, it is surprising that the role of vocational training is very important in the one country and relatively negligible in the other. Quite obviously, there are factors other than vocational training making up for the lack of training in the United States, and/or there are such other factors in Germany which compensate for the formation of skilled labour.

110. With the singular effects of systems of vocational training not being measurable, there is nonetheless an interesting problem at hand: Why do so many young people look

for and receive vocational training offered by the firms and the states in Germany and why do so few American young people do the same? The answer, in economic terms, can only be: In Germany it pays to demand and offer vocational training, and in the United States it does not. Whether this is true will be the concern of the following.

b. Concepts

111. The measurement of effectiveness will rely on a microeconomic calculus. On this level one may differentiate among the individual actors in the system of vocational training, namely the employees, the firms, and the government(s). Assuming that the calculus of each actor is independent from the others' calculus, each additional DM spent for vocational training must be matched by an additional DM of revenue (after taxes).

112. Thus, the decision to become a skilled worker instead of remaining unskilled depends on whether the expected additional income of a skilled worker (weighted by what remains after taxes) is greater or equal to the costs of training, id est

$$(1) \quad |(1-MTR) \cdot \text{Inc. Gains}|^{40} \geq |(1-MTR) \cdot \text{Inc. Losses} + \text{Schooling Costs}|^3$$

with	MTR	≡	Marginal Tax Rates
	Inc. Gains	≡	average yearly income of a skilled worker minus that of an unskilled worker
	Inc. Losses	≡	Average income of an unskilled worker minus the average payment to the apprentice
	40	≡	refers to the present value of 40 years of a working life
	3	≡	refers to the present value of three years of vocational training.

113. The second actor — the firm — has the same basic calculus, but with slightly differing variables, such as:

$$(2) \quad |(1-MTR) \cdot MR|^3 + |\text{Ext.}|^n \geq |\text{Training Costs} + \text{Appr. Inc.}|^3$$

with	MR	≡	Marginal revenue
	Appr.Inc.	≡	Income of apprentices
	Ext.	≡	Externalities
	n	≡	1, 2, 3, n years considered relevant by the entrepreneur.

This equation formulates the condition under which the firm supplies vocational training. It says that apprenticeship must pay. The fact that skilled labour receives higher incomes (cf. equation 1) does not enter equation (2) because of the alternative of buying skilled workers from the market; in addition, the higher income of skilled workers will be matched by higher revenues of the firm. It is important to know that countries may differ with respect to defining MR: In countries such as Germany positive externalities of the system of vocational training accruing to the individual firm have to be considered as well. As has been shown above (cf. chapter III, B) the externality can be circumscribed by the availability of skilled labour irrespective of a firm's own endeavours to train the unskilled. In particular, the general capability of labour to produce a broad range of products provides a firm with the flexibility to adjust the lines of production to changes in the (international) markets. The weight attached to the externalities differs among firms; the same holds for the years when externalities are expected.

114. The government is assumed to have its economic calculus as well. It should be interested in raising enough tax revenues needed to finance the production of public goods and services. In short, one can reduce this to a simple tax-revenue maximisation behaviour. Under that circumstance the government invests as much money in vocational schools, teachers, etc. as it takes to equate the marginal tax with the marginal costs:

$$(3) \quad \Delta PVT = \Delta PVC$$

with	PV	≡ Present value
	T	≡ Tax revenue
	C	≡ Costs of public vocational training

Since the tax revenues are identical with the taxes paid by firms and employees. ΔT depends, among others, also on the income changes, and profit changes, mentioned above.

2. Ball-Park Estimates

a. Apprentices in Germany

115. With respect to equation (1) the left-hand side can be assessed as follows. The income gains — at prices and wages of 1991 — are roughly 14 000 DM per year (Statistisches Bundesamt, Jahrbuch 1993), expected for an average of 40 years starting immediately after apprenticeship. Of these income gains some 60 per cent are demanded by the tax state to finance the production of public goods, such as the system

of external security⁵⁴. The present value of future net income gains is then about 66 000 DM, calculated at an interest rate of 6.5 per cent.

116. The gross costs to the apprentice are the incomes of an unskilled worker for the three years of apprenticeship minus the salaries received in the three years (cf. footnote 55 for the details). The present value of the differential income losses for the three years of apprenticeship amounts to 29 000 DM, again calculated at a rate of interest of 6.5 per cent.

117. Comparing marginal financial revenue with marginal financial costs leads to the conclusion that vocational training in Germany is highly rewarding for the average apprentice: The net receipts are worth about **37 000 DM**.⁵⁵ To be sure, the results of the calculation of present values of vocational training depend heavily on the rate of interest chosen. A slightly different calculus shows that the "internal" rate of interest — where the costs of vocational training are equal to the rewards — is some 25 per cent. In other words: When deciding on whether to take up vocational training or remain an unskilled worker, anybody who values present consumption to be worth more than 1.25 times of next year's consumption will remain unskilled; he considers the income loss over the three years of apprenticeship to be more important than the income gains of the years thereafter. In Germany — as surely in all other industrial countries — people actually are used to calculate with interest rates much below 25 per cent.

b. The German Firms

118. The costs of vocational training which are borne by the firms have been calculated according to a marginal accounting procedure (total costs are shown in Annex 3). This means that only those costs are included which are relevant for the decision of the

⁵⁴ Including income taxes, VAT and consumption taxes.

⁵⁵ These are rough estimates. The basic assumptions are:

- a. Single, no kids.
- b. Average income of unskilled labour: 36 000 DM per year.
- c. Average income of skilled labour: 50 000 DM per year.
- d. Marginal tax rates on incomes between 36 000 DM and 50 000 DM: 37 per cent of 28 000 DM (8 000 DM is income-tax free) plus 12 per cent value-added tax (= 49 per cent) on 36 000 DM; the marginal tax rate at 50 000 DM is 60 per cent.
- e. Average income of an apprentice: 12 000 DM per year with an average tax rate = marginal tax rate: 12 per cent.

firm to engage in vocational training; general overheads are thus not apportioned to training activities. What actually is included are apprentices' salaries, social security payments for trainees, salaries of trainers and similar personnel, costs of training workshops and devices, and examination dues.

119. An equilibrium situation would require equation (2) to be fulfilled, i.e. the above costs per trainee to be matched by resources accruing from the productive work of an apprentice over the three/four years of training plus the "externalities". As regards the firms' costs and the revenues, these have been estimated by experts (Bardeleben, 1993) and will be repeated here:

The productive work of an apprentice in the average firm was 11 711 DM per year in 1991. The marginal costs of training an apprentice was on average 18 051 DM. Calculating the net present value of costs and revenues at an interest rate of 6.5 per cent leads to a **loss of 16 800 DM**. Quite evidently it does not pay for the individual firm to engage in vocational training. As a matter of fact, a negative result also holds when disaggregating the above totals according to the sectors (such as crafts and industry) or according to firm size.

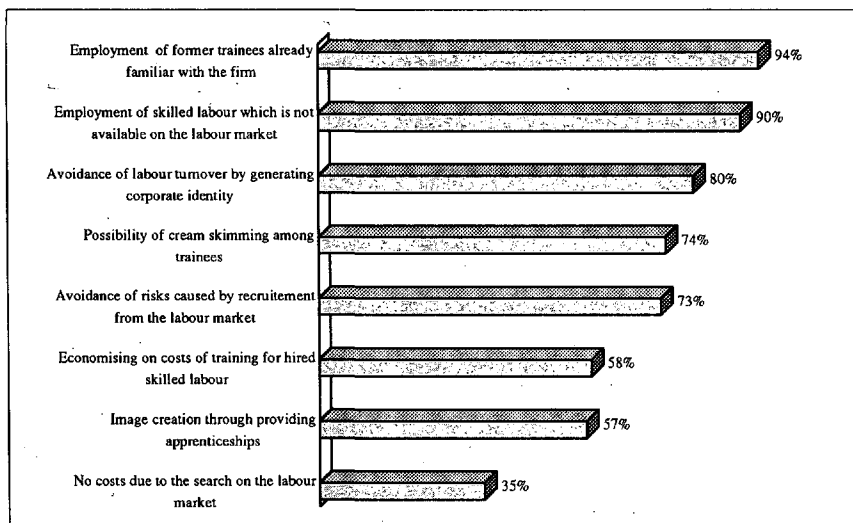
120. Since German firms nonetheless are heavily involved in offering apprenticeships the "externalities" accruing to each firm must compensate for the direct financial losses, at least when the proposition is maintained that firms behave rational. Questionnaire actions (Bardeleben, 1993) lead to the profile of "externalities" presented in **Graph 15**. To be sure, many of the issues covered do not refer to real externalities but simply to non-financial intangibles which entrepreneurs feel compensate for financial losses of the average firm engaged in vocational training.

There are estimates of only few of these intangibles. For example, the costs of training required to adapt a hired skilled worker to the firm-specific processes are assessed to be in the range of 50 per cent of a skilled worker's yearly income for an average of 9 months. Together with the 58 per cent of relevance as shown in Graph 15 we conclude that there is some 11 000 DM to pay once for hiring skilled labour from the market. Search costs on the labour market correspondingly can be estimated to amount to 500 DM per hired worker. Considering that both these costs occur after the third year of vocational training the present values of these once-and-for-all costs is 9 500 DM.

121. Thus, there remain net costs of vocational training of 7 300 DM which have to be covered by the other intangibles. It should be added that intangibles only exist in the

mind of the entrepreneur. In other words, these intangibles may be more or less important depending on the entrepreneur's state of mind. The latter again depends on the overall conditions in the economy and, of course, on the firm's individual economic condition. It is no great surprise, therefore, that today — by the end of 1993 — many firms (such as firm A of chapter V) have changed their apprenticeship policy and reduced their offers to do vocational training by some 50 per cent of last year's offer.

Graph 15 — Firm-Specific Positive "Externalities" of Vocational Training in Germany 1991 – Questionnaire Results (Number of firms as per cent of all firms)



Source: Bardeleben (1993).

c. The Treasury (including social security)

122. The tax receipts necessary to quantify the treasury's equilibrium equation (3) come from apprentices, skilled labour and the firms. They can be derived from the calculations under a and b: The apprentices will receive additional incomes once they are skilled workers of 14 000 DM per year for a total of 40 years; from this the treasury will collect 8 400 DM to finance the budget and the system of social security. On the other hand, the income loss of apprentices involves a financial loss to the treasury of 13 200 DM per year for three years. The present value of benefits and costs to the treasury amounts to (again at a discount rate of 6.5 per cent) 63 300 DM. The same calculation on behalf of the firms results in a present value of 4 700 DM net losses per ap-

prentice (net costs of training, cf. para ..., being 16 800 DM, and net gains due to externalities: 9 500 DM; the total loss was weighted by a tax rate of 64 per cent⁵⁶).

In toto, treasury's income increases — measured as present value — by 58 600 DM per apprentice due to the system of vocational training.

123. The costs of public vocational training consist mainly of salaries for teachers at vocational schools, plus operating costs, plus acquisition and maintenance of school buildings. In 1991, these costs amounted to 7 969 mill. DM. Since the number of apprentices was almost 2 millions in the same year,⁵⁷ treasury's costs per student were 4 000 DM per year, which makes up for a present value of costs per apprentice financed by the treasury of 10 600 DM.

124. All in all, the treasury reaps in considerable profits from financing vocational training. The gains are **48 000 DM** per apprentice (present value at an interest rate of 6.5 per cent). Expressed in a different way, each DM put into vocational schools remunerates the treasury with interest payments of roughly 21 per cent per year.

d. Summary

125. The economic calculus presented here is a sketchy one. However, even when allowing for possible corrections the message should come out very clearly: Vocational training in Germany is highly rewarding for two of the three main actors, for the apprentices and for the treasury; the benefits accruing to the firms that take part in vocational training are non-existent in financial terms and are supposed to come in from intangibles rather than in monetary units.

For the average apprentice as well as for the treasury it would pay to put more resources into vocational training, in fact until the return on each DM is equal to the interest paid on the capital market. One way to do this would be to compensate firms for (some of) the financial losses incurred by supplying vocational training.

⁵⁶ The average tax on undistributed profits is 64.2 per cent in Germany. The effective tax on distributed profits depends on the individual income tax rate of the shareholder.

⁵⁷ These figures are taken from publications of the German Federal Statistical Office. The costs include — besides vocational schools — other facilities of job-related education (such as "Fachgymnasium" and "Berufsfachschulen", cf. Graph 1). As regards apprentices, they represent the major share of students (76.8 per cent).

VII. Synthesis of Results

1. Summary

126. The above analysis had the following main results:

- (1) The system of vocational training, and of education at large, is highly forgiving in Germany in the sense that failures of people and of scholars to perform do not lead to exclusion, but instead a new start or a repetition of courses is possible at any time, and welcome.
- (2) The system at large produces very few drop-outs among youths when compared to other industrial countries. In addition, youth unemployment is low by international standards.
- (3) The trails of education are characterised by a high degree of permeability.
- (4) The dual system of vocational training provides for a mixture of job specialisation (with the degree of specialisation increasing over time) and of a general education, thereby producing skilled labour which can easily adapt — within certain limits of course — to new production techniques and to different occupations, and which is capable to engage in additional training at a higher level.
- (5) The institutions in charge of the trails, contents, and exams in vocational training provide for a multitude of feedbacks among governments, firms, chambers, trainees and trainers, thereby ensuring continuous adaptation of the contents of vocational training to technological and other changes.
- (6) It is highly rewarding both for the apprentices (where the return on vocational-training investments is over 25 per cent) and for the governments (who realise a return on vocational-training investments of almost 21 per cent) to engage in and to promote vocational training.
- (7) Of the three actors in vocational training — the firm, the apprentice and the government — the firm is the only one losing money in vocational training. However, the firms themselves come up with a number of non-pecuniary rewards, id est: some sort of intangibles, which go hand in hand with supplying vocational-training jobs and which they feel (more than) compensate for the financial losses.

2. Some Additional Observations

127. As regards the economic calculus of apprentices and the government the high returns on investing in human capital look like a non-sustainable situation, because high returns tend to come down to normal levels by market forces. Thus, an outsider to the German system would suggest that there are too few financial means allocated to vocational training in Germany and that if more money would be invested, the returns would go down. However, the "disequilibrium" has been existing for a couple of decades. A closer look reveals, that it may have some properties of a true equilibrium. The distribution of returns may not have been so uneven after all:

- In the case of the calculated government's incomes from vocational training the main problem seems to be that incomes do not exactly accrue to that part of the treasury that originally had paid, namely the Laender governments: (1) of the income taxes underlying the calculations in chapter VI, only 42.5 per cent go to the Laender which provide vocational schooling, (2) of the value-added tax receipts 37 per cent go to the Laender (63 per cent go to the German Federal Government and to Brussels' European Community), (3) social security payments go exclusively into social security. In view of the relatively small shares going to the Laender treasuries one may conclude that the Laenders' rationale underlying the allocation of money to vocational schools may just be appropriate (at the rate of interest on capital markets) in terms of neoclassic economic theory.
- In the case of apprentices the high marginal benefits of vocational training cannot be reduced through expanding quantitatively the demand for such trails because almost everybody who does not continue general schooling, but instead chooses to enter a firm, demands vocational training. An outlet for equilibrating marginal returns and marginal costs on the apprentices' side would be to decrease salaries or to pay firms for doing vocational training.
- The latter would make the firms' supply of apprenticeship more rewarding in financial terms. The fact that the above cited intangibles do not really compensate the firms for the very tangible losses incurred is revealed in times of economic slowdowns: the present recession, for example, has already led firms in high-cost vocational-training sectors to reduce their vocational-training offers by half. Many a firm would be inclined, under such circumstances, to continue vocational training if apprentices' salaries were reduced.

This equilibrium, however, is highly fragile. It depends on the particularities of the German dual system as it is, and on the peculiarities of the German labour markets; should any country try and duplicate the German dual system of training, its main actors' calculus would most probably lead to entirely different results, which again would make the duplicate system not workable.

128. There are three major reasons why the German system can only perform as it obviously does in Germany:

- (1) The main presupposition of the described equilibrium of the German dual system is the highly regulated labour markets. Regulations and collectively bargained work contracts provide both for wage differentials between unskilled and skilled labour and for uniform relative changes of these wages over time. There is (almost) no influence of scarcities or of abundancies of skilled versus unskilled labour on expected incomes.
- (2) As regards the responsibilities of the actors in vocational training as well as the number of occupations taught and their changes over time, the institutions and the legal background have been developing over the past century to a status of interactions which is almost impossible to explain, let alone to copy (cf. Graph 13).
- (3) On the side of the entrepreneurs we find a feeling of "holistic responsibility" which seems to be a peculiarity especially of the larger firms. This responsibility covers macro-economic goals as well as a deeply felt obligation to engage in vocational training, even if costly; representatives of the larger firms and organisations can also be considered to support the German system of monopolistic wage bargaining (which is costly to many a firm), and to try hard to be of help to the government in many other matters.

Thus, the fragility of the system of vocational training has two sources; one is the financial losses incurred by firms offering apprenticeships, the other is the dependency on a specific German system of wage bargaining. Both seem to make vocational training in Germany something for the good rather than for the lean years.

129. If, as it seems to be, the financial rewards of the German dual system of vocational training would have to be allocated differently in other countries the incentives to demand and to offer training would be different as well. It might therefore pay to look into the systems of education in other economically successful countries, such as Japan, France, Switzerland, or South Korea.

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Annex 1: Official Occupations Requiring Vocational Training (as of 1991)¹

Occupation area
Occupation group
Occupation

Chamber²

I. Pflanzenbauer, Tierzuechter, Fischereiberufe (Agriculture and Fishing)

Landwirt(in)	Agr.
Winzer(in)	Agr.
Tierwirt(in)	Agr.
Fischwirt(in)	Agr.
Tierpfleger(in)	Ind.
Gaertner(in)	Agr.
Florist(in)	Ind.
Revierjaeger(in)	Agr.
Forstwirt(in)	Agr.

II. Bergleute, Mineralgewinner (Mining)

Berg- und Maschinenmann	Ind.
Bergmechaniker	Ind.
Aufbereiter im Bergbau	Ind.

III. Fertigungsberufe (Production)

Steinbearbeiter	
Steinmetz(in) und Steinbildhauer(in)	Cr.
Steinmetz(in)	Ind.
Natursteinschleifer(in)	Ind.
Farbsteinschleifer(in), Achatschlei- fer(in) und Schmucksteingraveur(in)	Cr.
Achatschleifer(in)	Ind.
Diamantschleifer(in)	Ind.

Edelsteinschleifer(in)	Ind.
Diamantziehsteinmacher(in)	Ind.
Edelsteingraveur(in)	Ind.
Baustoffhersteller	
Betonfertigteilebauer(in)	Ind.
Betonstein- und Terrazzohersteller(in)	Cr.
Keramiker	
Figurenkeramformer(in)	Ind.
Industriekeramiker(in)	Ind.
Keramiker(in)	Cr.
Kerammodelleinrichter(in)	Ind.
Kerammodelleur(in)	Ind.
Glasmacher	
Industrieglasfertiger(in)	Ind.
Glasmacher(in)	Ind.
Glasapparatebauer(in)	Cr.
Glasapparatebauer(in)	Ind.
Thermometermacher(in)	Ind.
Thermometermacher(in)	Cr.
Leuchtrohrglasblaser(in)	Ind.
Flachglasmechaniker(in)	Ind.
Glasschleifer(in) und Glasaetzer(in)	Cr.
Glasveredler(in)	Ind.
Brillenoptikschleifer(in)	Ind.
Feinoptiker(in)	Cr.
Feinoptiker(in)	Ind.
Chemiearbeiter	
Chemiebetriebsjungwerker(in)	Ind.
Chemikant(in)	Ind.
Pharmakant(in)	Ind.
Wachszieher(in)	Ind.
Wachszieher(in)	Cr.
Chemielaborjungwerker(in)	Ind.
Vulkaniseur(in)	Cr.
Kunststoffverarbeiter	
Kunststoff-Formgeber(in)	Ind.
Gummi- und Kunststoffauskleider(in)	Ind.
Papierhersteller und -verarbeiter	
Papiermacher(in)	Ind.
Verpackungsmittelmechaniker(in)	Ind.
Buchbinder(in)	Cr.
Buchbinder(in)	Ind.
Stahlstichpraeger(in)	Ind.
Drucker	
Schriftsetzer(in)	Cr.
Schriftsetzer(in)	Ind.
Druckvorlagenhersteller(in)	Ind.
Galvanoplastiker(in)	Cr.
Stereotypur(in)	Cr.
Chemigraf(in)	Cr.
Druckformhersteller(in)	Ind.
Flexograf(in)	Cr.
Formstecher(in)	Ind.
Notenstecher(in)	Ind.
Stahlrollenstecher(in)	Ind.

¹ Source: Statistisches Bundesamt, Fachserie 11: Bildung und Kultur, Reihe 3: Berufliche Bildung

² Definitions are: Agr.: Chamber of Agriculture; Ind.: Chamber of Industry and Commerce; Cr.: Chamber of Crafts; Civ.: Civil Service (the respective ministry); FP: Free Professions, i.e. their respective chambers.

Stempelmacher(in)	Ind.	Flachgraveur(in)	Ind.
Drucker(in)	Cr.	Graveur(in)	Cr.
Drucker(in)	Ind.	Ziseleur(in)	Cr.
Steindrucker(in)	Cr.	Ziseleur(in)	Ind.
Textilveredler(in) / Druckerei	Ind.	Universalhaerter(in)	Ind.
Tapetendrucker(in)	Ind.	Galvaniseur(in) und Metallschleifer(in)	Cr.
Siebdrucker(in)	Cr.	Galvaniseur(in)	Ind.
Siebdrucker(in)	Ind.	Emailschriftenmalter(in)	Ind.
Reprograf(in)	Ind.	Metallverbinder	
Holzaufbereiter		Schmelzschweißer(in)	Ind.
Holzbearbeitungsmechaniker(in)	Ind.	Schmiede	
Drechsler(in)/Elfenbeinschnitzer(in)	Cr.	Federmacher(in)	Ind.
Holzbildhauer(in)	Cr.	Schneidwerkzeugmechaniker(in)	Cr.
Holzbildhauer(in)	Ind.	Anlagenmechaniker(in) / Apparate- technik	Ind.
Buersten- und Pinselmacher(in)	Cr.	Kupferschmied(in)	Cr.
Buersten- und Pinselmacher(in)	Ind.	Feinblechner, Installateur	
Schirmmacher(in)	Cr.	Klempner(in)	Cr.
Korbmacher(in)	Cr.	Konstruktionsmechaniker(in) / Feinblechbautechnik	Ind.
Korbmacher(in)	Ind.	Karosserie- und Fahrzeugbauer(in)	Cr.
Metallerzeuger, Walzer		Fluggeratbauer(in)	Ind.
Verfahrensmechaniker(in) in der Huerten- u. Halbzeugindustrie	Ind.	Gas- und Wasserinstallateur(in)	Cr.
Drahtzieher(in)	Ind.	Zentralheizungs- und Lueftungs- bauer(in)	Cr.
Former		Anlagenmechaniker(in) / Versorgungstechnik	Ind.
Gießereimechaniker	Ind.	Rohrleitungsbauer(in)	Ind.
Glockengießer(in)	Cr.	Schlosser	
Metallformer und Metallgießer(in)	Cr.	Metallbauer(in)	Cr.
Zinngießer(in)	Cr.	Konstruktionsmechaniker(in) / Ausrüstungstechnik	Ind.
Schriftgießer(in)	Ind.	Modellschlosser(in)	Ind.
Metallverformer (spanlos)		Kunststoffschlosser(in)	Ind.
Drahtwarenmacher(in)	Ind.	Industriemechaniker(in) / Maschinen- und Systemtechnik	Ind.
Kabeljungwerker(in)	Ind.	Maschinenbaumechaniker(in)	Cr.
Metallverformer (spanend)		Industriemechaniker(in) / Betriebstechnik	Ind.
Dreher(in)	Cr.	Konstruktionsmechaniker(in) / Metall- und Schiffbautechnik	Ind.
Zerspanungsmechaniker(in) / Drehtechnik	Ind.	Mechaniker	
Revolverdrehler(in)	Ind.	Automobilmechaniker(in)	Ind.
Zerspanungsmechaniker(in) / Automaten-Drehtechnik	Ind.	Kraftfahrzeugmechaniker(in)	Cr.
Walzendrehler(in)	Ind.	Landmaschinenmechaniker(in)	Cr.
Fraeser(in)	Ind.	Fluggeratmechaniker(in)	Ind.
Zerspanungsmechaniker(in) / Fraestechnik	Ind.	Flugtriebwerkmechaniker(in)	Ind.
Hobler(in)	Ind.	Feinmechaniker(in)	Cr.
Bohrer(in)	Ind.	Industriemechaniker(in) / Geraete- und Feinwerktechnik	Ind.
Bohrwerkdreher(in)	Ind.	Chirurgiemechaniker(in)	Cr.
Metallschleifer(in)	Ind.	Werkzeugmechaniker(in) / Instrumententechnik	Ind.
Zerspanungsmechaniker(in) / Schleiftechnik	Ind.	Buechsenmacher(in)	Cr.
Schleiftechnik		Orthopaediemechaniker(in)	Cr.
Schleifer(in)	Ind.		
Metalloberflaechen- bearbeiter			
Vorpolierer(in) (Schmuck- und Kleingeraetetherstellung)	Ind.		
Feinpolierer(in)	Ind.		

Industriemechaniker(in) / Produktionstechnik	Ind.	Kommunikationselektroniker(in) / Telekommunikationstechnik	Ind./ Civ.
Kaltanlagenbauer(in)	Cr.	Elektromaschinenbauer(in)	Cr.
Zweiradmechaniker(in)	Cr.	Elektromaschinenmonteur(in)	Ind.
Geraetezusammensetzer(in)	Ind.	Elektromechaniker(in)	Cr.
Maschinenzusammensetzer(in)	Ind.	Bueroinformationselektroniker(in)	Cr.
Teilezurichter(in)	Ind.	Industrieelektroniker(in) /	Ind.
Uhrmacher(in)	Cr.	Geraetetechnik	
Uhrmacher(in)	Ind.	Kommunikationselektroniker(in) /	Ind./
Werkzeugmacher		Informationstechnik	Civ.
Werkzeugmacher(in)	Cr.	Nachrichtengeratemechaniker(in)	Ind.
Werkzeugmechaniker(in) /	Ind.	Radio- und Fernsehtechniker(in)	Cr.
Stanz- und Umformtechnik		Kommunikationselektroniker(in) /	Ind./
Werkzeugmechaniker(in) /	Ind.	Funktechnik	Civ.
Formentechnik		Hoergeraeteeakustiker(in)	Cr.
Pragewalzengraveur(in)	Ind.	Spinnberufe	
Stahlgraveur(in)	Ind.	Textilmaschinenfuehrer(in) / Spinnerei	Ind.
Metallfeinbauer und		Textilmechaniker(in) / Spinnerei	Ind.
zugeordnete Berufe		Seiler(in)	Cr.
Guertler(in)	Ind.	Textilhersteller	
Guertler(in) und Metalldrucker(in)	Cr.	Musterprogrammierer(in) / Weberei	Ind.
Goldschmied(in)	Cr.	Textilmaschinenfuehrer(in) / Weberei	Ind.
Goldschmied(in)	Ind.	Textilmechaniker(in) / Bandweberei	Ind.
Juwelengoldschmied(in)	Ind.	Weber(in)	Cr.
Silberschmied(in)	Cr.	Textilstopfer(in)	Ind.
Silberschmied(in)	Ind.	Textilmechaniker(in) / Weberei	Ind.
Schmucksteinfasser(in)	Ind.	Textilmaschinenfuehrer(in) / Tufting	Ind.
Gold-, Silber- und Aluminium- schlaeger(in)	Cr.	Textilmechaniker(in) / Tufting	Ind.
Zahntechniker(in)	Cr.	Textilmaschinenfuehrer(in) /	Ind.
Augenoptiker(in)	Cr.	Maschenindustrie	
Klavier- und Cembalobauer(in)	Cr.	Gummistrumpfstricker(in)	Ind.
Klavier- und Cembalobauer(in)	Ind.	Stricker(in)	Cr.
Orgel- und Harmoniumbauer(in)	Ind.	Textilmechaniker(in) / Ketten- und Raschelwirkerei	Ind.
Orgel- und Harmoniumbauer(in)	Cr.	Textilmechaniker(in) / Strickerei	Ind.
Metallblasinstrumenten- und	Cr.	und Wirkerei	
Schlagzeugmacher(in)		Textilmechaniker(in) / Strumpf- und Feinstrumpfundstrickerei	Ind.
Metallblasinstrumentenmacher(in)	Ind.	Textilmaschinenfuehrer(in) / Vliesstoff	Ind.
Geigenbauer(in)	Cr.	Textilmechaniker(in) / Vliesstoff	Ind.
Zupfinstrumentenmacher(in)	Cr.	Schmucktextilienhersteller(in)	Ind.
Holzblasinstrumentenmacher(in)	Cr.	Textilverarbeiter	
Holzblasinstrumentenmacher(in)	Ind.	Bekleidungsschneider(in)	Ind.
Handzuginstrumentenmacher(in)	Cr.	Herrenschneider(in)	Cr.
Biologiemodellmacher(in)	Ind.	Damenschneider(in)	Cr.
Elektriker		Bekleidungsfertiger(in)	Ind.
Elektroinstallateur(in)	Cr.	Bekleidungsnaecher(in)	Ind.
Energieelektroniker(in) / Anlagen- technik	Ind.	Waescheschneider(in)	Cr.
Kraftfahrzeugelektriker(in)	Cr./Ind.	Sticker(in)	Cr.
Energieelektroniker(in) /	Ind.	Tapisserist(in)	Ind.
Betriebstechnik		Modist(in)	Cr.
Industrieelektroniker(in) /	Ind.	Modist(in)	Ind.
Produktionstechnik		Hut- und Muetzenmacher(in)	Cr.
Fernmeldeanlagenelektroniker(in)	Cr.	Muetzenmacher(in)	Ind.
		Muetzennacher(in)	Ind.

Muetzennacher(in)	Cr.	Fachkraft fuer Sueßwarentechnik	Ind.
Krawattennacher(in)	Ind.	Maurer und Betonbauer	
Kunststoff- und Schwergewebe- konfektionär(in)	Ind.	Hochbaufacharbeiter	Ind.
Segelmacher(in)	Cr.	Maurer	Cr.
Schirmmacher(in)	Cr.	Maurer	Ind.
Textilveredler		Backofenbauer(in)	Cr.
Textilveredler(in) / Faerberei	Ind.	Feuerungs- und Schornsteinbauer	Cr.
Textilmaschinenfuhrer(in) /	Ind.	Feuerungs- und Schornsteinbauer	Ind.
Veredelung		Beton- und Stahlbetonbauer	Cr.
Textilveredler(in) / Appretur	Ind.	Beton- und Stahlbetonbauer	Ind.
Textilveredler(in) / Beschichtung	Ind.	Zimmerer, Dachdecker und	
Plisseebrenner(in)	Cr.	Geruestbauer	
Lederhersteller- und verarbeiter		Ausbaufacharbeiter(in)	Ind.
Gerber(in)	Cr.	Zimmerer	Cr.
Gerber(in)	Ind.	Zimmerer	Ind.
Schuhmacher(in)	Cr.	Schiffszimmerer(in)	Ind.
Orthopaedieschuhmacher(in)	Cr.	Dachdecker	Cr.
Schuhfertiger(in)	Ind.	Geruestbauer(in)	Cr./Ind.
Schuh- und Lederwarenstepper(in)	Ind.	Straßen- und Tiefbauer	
Sattler(in)	Cr.	Straßenbauer	Cr.
Sattler(in)	Ind.	Straßenbauer	Ind.
Feinsattler(in)	Ind.	Tiefbaufacharbeiter	Ind.
Bandagist(in)	Cr.	Gleisbauer	Ind.
Feintaschner(in)	Cr.	Wasserbauer	Civ.
Taeschner(in)	Ind.	Brunnenbauer	Cr.
Handschuhmacher(in)	Cr.	Brunnenbauer	Ind.
Handschuhmacher(in)	Ind.	Kanalbauer	Ind.
Pelzveredler(in)	Ind.	Bauausstatter	
Kuerschner(in)	Cr.	Stukkateur(in)	Cr.
Pelzwerker(in)	Ind.	Stukkateur(in)	Ind.
Back- und Konditoreiwaren- hersteller		Isolierer(in)	Ind.
Baecker(in)	Cr.	Isoliermonteur	Ind.
Baecker(in)	Ind.	Klebeabdichter(in)	Ind.
Konditor(in)	Cr.	Warme-, Kaelte- und Schallschutz- solierer(in), (Isoliermonteur(in))	Cr.
Fleischverarbeiter		Asphaltbauer	Ind.
Fleischer(in)	Cr.	Trockenbaumonteur(in)	Ind.
Fleischer(in)	Ind.	Fliesen-, Platten- und Mosaikleger(in)	Cr.
Speisebereiter		Fliesen-, Platten- und Mosaikleger(in)	Ind.
Koch (Kochin)	Ind.	Kachelofen- und Luftheizungsbauer(in)	Cr.
Getraenke- und Genußmittel- hersteller		Glaser(in)	Cr.
Weinkuefer(in)	Ind.	Estrichleger(in)	Cr.
Weinkuefer(in)	Cr.	Estrichleger(in)	Ind.
Brauer(in) und Malzer(in)	Cr.	Raumausstatter, Polsterer	
Brauer(in) und Malzer(in)	Ind.	Raumausstatter(in)	Cr.
Brenner(in)	Ind./Agr.	Parkettleger(in)	Cr.
Destillateur(in)	Ind.	Polsterer (Polsterin)	Ind.
Fachkraft fuer Fruchtsafttechnik	Ind.	Fahrzeuggpolsterer(-polsterin)	Ind.
Uebrige Ernaehrungsberufe		Polster- und Dekorationsmaecher(in)	Cr.
Molkereifachmann(-fachfrau)	Agr.	Tischler, Modellbauer	
Mueller(in)	Cr.	Holzmechaniker(in)	Ind.
Mueller(in)	Ind.	Tischler(in)	Cr.
Fachkraft fuer Lebensmitteltechnik	Ind.	Modellbauer(in)	Cr.
		Modelltischler(in)	Ind.
		Fahrzeugstellmacher(in)	Ind.

Wagner(in)	Cr.
Böttcher(in)	Cr.
Bootsbauer(in)	Cr.
Bootsbauer(in)	Ind.
Schiffbauer(in)	Cr.
Leichtflugzeugbauer(in)	Ind.
Rolladen- und Jalousiebauer(in)	Cr.

Maler, Lackierer und verwandte Berufe

Maler(in) und Lackierer(in)	Cr.
Lackierer(in) (Holz und Metall)	Ind.
Vergolder(in)	Cr.
Glas- und Keramalmaler(in)	Ind.
Glas- und Porzellanmaler(in)	Cr.

Warenpuffer und

Versandfertigmacher	
Handelsfachpacker(in)	Ind.

IV. Technische Berufe (Technical Occupations)

Techniker

Kulturbautechniker(in)	Civ.
Straßenbautechniker(in)	Civ.
Bautechniker(in) in der	Civ.
Wasserwirtschaftsverwaltung	
Bergvermessungstechniker(in)	Ind.
Vermessungstechniker(in)	Civ./FP

Technische Sonderfachkrafte

Biologielaborant(in)	Ind.
Pflanzenschutzlaborant(in)	Civ.
Milchwirtschaftliche(-r) Laborant(in)	Agr.
Landwirtschaftl.-techn. Laborant,	Agr.
Landwirtschaftl. Laborant(in)	
Physiklaborant(in)	Ind.
Werkstoffprüfer(in) (Physik)	Ind.
Mess- und Regelmechaniker(in)	Ind.
Mathematisch-technische(r)	Ind.
Assistent(in)	
Wärmestellengehilfe(-gehilfin)	Ind.
Chemielaborant(in)	Ind.
Baustoffprüfer(in)	Ind.
Edelmetallprüfer(in)	Ind.
Stoffprüfer(in) (Chemie) (Glas-,	Ind.
Keramische Industrie sowie Steine,	
Erden)	

Textillaborant(in) (chemisch-technisch)	Ind.
Textillaborant(in) (physikalisch-technisch)	Ind.
Lacklaborant(in)	Ind.
Fotolaborant(in)	Ind.
Film- und Videolaborant(in)	Ind.
Technische(r) Zeichner(in)	Ind.
Bauzeichner(in)	Ind.
Teilzeichner(in)	Ind.

Kartograph(in)	Ind./Civ.
Planungstechniker(in)	Civ.
Zeichner(in) in der Wasserwirtschafts-	Civ.
verwaltung	

V. Dienstleistungsberufe (Service Occupations)

Warenkaufleute

Kaufmann(Kauffrau) im Groß- und Außenhandel	Ind.
Kaufmann(Kauffrau) im Einzelhandel	Ind.
Verkaeuer(in)	Ind.
Fachverkauer(in) im Nahrungs- mittelhandwerk	Cr.
Verlagskaufmann(-kauffrau)	Ind.
Buchhaendler(in)	Ind.
Musikalienhaendler(in)	Ind.
Drogist(in)	Ind.
Apothekenhelfer(in)	FP
Tankwart(in)	Ind.

Bank- und Versicherungs-

kaufleute

Bankkaufmann(-kauffrau)	Ind.
Sparkassenkaufmann(-kauffrau)	Civ.
Versicherungskaufmann(-kauffrau)	Ind.

Andere Dienstleistungs- kaufleute

Speditionskaufmann(-kauffrau)	Ind.
Schiffahrtskaufmann(-kauffrau)	Ind.
Luftverkehrskaufmann(-kauffrau)	Ind.
Seegüterkontrollleur(in)	Ind.
Reiseverkehrskaufmann(-kauffrau)	Ind.
Werbekaufmann(-kauffrau)	Ind.
Kaufmann(Kauffrau) im Eisenbahn- und Straßenverkehr	Ind.

Berufe des Landverkehrs

Berufskraftfahrer(in)	Ind.
Straßenwaerter(in)	Civ.

Berufe des Wasser- und Luftverkehrs

Binnenschiffer(in)	Ind.
Ewerfuehrer(in)	Ind.
Hafenschiffer(in)	Ind.

Berufe des Nachrichtenverkehrs

Dienstleistungsfachkraft im Postbetrieb	Civ.
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Berufe der Lagerwirtschaft

Fachkraft fuer Lagerwirtschaft	Ind.
Zahnlagerist(in)	Ind.
(Zahnlagerverwalter(in))	

Unternehmer, Organisatoren, Wirtschaftspruefer

Fachgehilfe(-gehilfin) in steuer- und wirtschaftsberatenden Berufen	FP
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**Rechnungskaufleute, Datenver-
arbeitungsfachleute**Datenverarbeitungskaufmann Ind.
(-kauffrau)**Buerofach- und Hilfskrafte**

Buerokaufmann(-kauffrau) Ind.

Kaufmann(Kauffrau) fuer Buero- Ind.
kommunikationFachangestellte(r) fuer Arbeits- Civ.
foerderung

Justizangestellte(r) Civ.

Sozialversicherungsfachangestellte(r) Civ.

Verwaltungsfachangestellte(r) Civ.

Industriekaufmann(-kauffrau) Ind.

Notargehilfe(-gehilfin) FP

Patentanwaltsgehilfe(-gehilfin) FP

Rechtsanwalts- und Notargehilfe FP
(-gehilfin)

Rechtsanwaltsgehilfe(-gehilfin) FP

Kaufmann(Kauffrau) in der Grund- Ind.

stuecks- und Wohnungswirtschaft

Werkgehilfe(-gehilfin) (Schmuckwaren- Ind.

industrie, Taschen- und Armbanduhren)

Stenoskretaer(in); Bueroassistent(in) Civ.

Sicherheitswahrer

Schornsteinfeger(in) Cr.

Publizisten und Bibliothekare

Assistent(in) an Bibliotheken Civ.

Kuenstler und zugeordnete**Berufe**

Textilmustergestalter(in) Ind.

Fotogravurzeichner(in) Ind.

Schilder- und Lichtreklamehersteller(in) Cr.

Schauwerbegestalter(in) Ind.

Fotograf(in) Cr.

Lichtdruckretuscheur(in) Ind.

Pferdewirt(in) Agr.

**Uebrigé Gesundheitsdienst-
berufe**

Arzthelfer(in) FP

Zahnarzthelfer(in) FP

Tierarzthelfer(in) FP

Veterinaermedizinische(r) Laborant(in) Agr.

Schwimmeistergehilfe

Schwimmeistergehilfe(-gehilfin) Civ.

Koerperpfleger

Friseur(in) Cr.

Gaestebetreuer

Hotelfachmann(-fachfrau) Ind.

Kaufmannsgehilfe(-gehilfin) im Ind.

Hotel- und Gaststaetengewerbe

Restaurantfachmann(-fachfrau) Ind.

Fachgehilfe(-gehilfin) im Gastgewerbe Ind.

Hauswirtschaftliche BerufeHauswirtschaftler(in) im laendlichen Agr.
BereichHauswirtschaftler(in) im staetischen other
Bereich**Reinigungsberufe**

Textilreiniger(in) Ind.

Textilreiniger(in) Cr.

Gebaeudereiniger(in) Cr.

Ver- und Entsorger(in) Civ./Ind.

Annex 2: Examples of Practical Examinations

At the end of the apprenticeship the apprentice has to pass an exam which consists of a theoretic and practical part. As to the latter, the apprentice has to perform selected elements of work processes and to produce work pieces (cf. chapter V, 2c, 3c). Reproduction of the technical drawings of work pieces — which apprentices have to take for a reference for the production of work pieces as requested by the examination committee — is prohibited.

Annex 3: Firms' Costs of Vocational Training

The vocational training law, issued in 1969, did not dwell on the question of how vocational training should be financed. Its enforcement triggered a debate about the costs and the financing of the new system of vocational training. In the end, a group of experts (Sachverständigenkommission, Kosten und Finanzierung der beruflichen Bildung, 1971/72) was commissioned to prepare a study on the gross and net costs of vocational training. An update of this study was made by the Federal Institute for Vocational Training in 1980 and 1991¹.

The following will mainly draw on these studies (Noll et al., Nettokosten der betrieblichen Berufsausbildung, 1983; Bardeleben et al., 1993), and, additionally, on studies prepared by the Institute of the German Industry (Institut der Deutschen Wirtschaft) in 1980. The latter study aims at an assessment of the total costs of vocational training. In all studies costs are divided in direct costs (wages of apprentices and material costs) and indirect costs. Regarding the latter the studies allow for costs actually caused by supervising, explaining and training through supervisors and other staff members. The benefits of apprenticeship accruing to the firms are calculated according to the value of goods produced by the apprentices.² The salient features of these studies are compiled in **Synopsis A1**. In order to be able to do intertemporal comparisons the figures are (as opposed to the text, paras 118 sqq.) based on total-costs calculations.

The estimated average return per apprentice amounted to 11 711 DM (1980: 6 754) in 1993, the net costs being 17 862 DM (1980: 10 289). A breakdown of costs by sector, occupation and firm size resulted in considerable differences. For the actual amounts of costs of vocational training in different sectors, occupations and firm sizes see **Tables A1 and A2**.

The costs of training in the public sector are higher than in other sectors. This may be explained by the fact that the public sector faces virtually no competition and can afford higher costs. In contrast, agriculture evidences the lowest costs of training and gets the highest returns whereas the public sector receives the lowest returns. The 1991 data show a very similar structure for the analysed sectors crafts and industry and commerce.

¹ The data for 1991 are not yet available.

² The accounting systems do not include the costs of vocational and advanced vocational education. Thus, the studies available had to do some pioneering work in this field, especially as far as the methods of measurement are concerned.

Synopsis A1— Studies on the Costs of In-Firm Vocational Training

Study	Expert Commission 'Cost and Financing of Vocational Training'		Federal Institute for Vocational Training		Institute of the German Industry		Federal Institute for Vocational Training	
Reference year	1971/72		1980		1980		1993	
Number of firms analysed	1261		2141		302		1370	
Number of occupations analysed	148 (1-1648 observations per occupation)		45 (44-1646 observations per occupation)		(no differentiation with respect to occupations)		not available	
Field of research	Non-school vocational training; firms in industry and commerce, crafts, agriculture, public service, independent professions and workshops in the FRG.		In-firm vocational training; firms in industry and commerce, crafts, public service, agriculture, and independent professions in the FRG.		In-firm vocational and further training; private owned firms in industry and commerce and crafts in the FRG.		In-firm vocational training; firms in industry and commerce, crafts, public service agriculture and independent professions in the FRG.	
Cost model	Direct costs (wages and materials) and indirect costs (of trainers and assisting processes) → gross costs; gross costs - returns by the trainee = net costs.		Direct costs (wages and materials) and indirect costs (of trainers and assisting processes, administration) → gross costs; gross costs - returns by the trainee = net costs.		Wages of apprentices; wages of trainer; other costs → gross costs; gross costs - returns by the trainee = net costs.		Direct costs and indirect costs according to full absorption and marginal costing → gross costs; gross costs - returns by the trainee = net costs.	
Method of research	Interviews using standardised, detailed questionnaires; additional case studies; direct data generation for calculation of gross costs and returns.		Combined techniques of interview and written questionnaires, using standardised and detailed questions; direct data generation for calculation of gross costs and returns.		Written questionnaires with direct questions for costs, kind of costs and returns.		No information, similar to the 1980 project and case studies for the new states.	
Results (per apprentice)	Gross costs	Net costs	Gross costs	Net costs	Gross costs	Net costs	Gross costs	Net costs
— Total	—	5050 DM	17043 DM	10289 DM	15758 DM	11014 DM	29573 DM	17862 DM
— Industry and Commerce	7633 DM	2582 DM	19442 DM	12447 DM	16204 DM	13513 DM	31824 DM	20509 DM
— Crafts	5241 DM	380 DM	14512 DM	7949 DM	15258 DM	8214 DM	24889 DM	12352 DM
— Agriculture	5347 DM	—	13825 DM	3644 DM	—	—	—	—
Estimated total costs for the FRG	Gross costs: 8.0 bill. DM Net costs: 5.3 bill. DM		no estimation		Gross costs: 27.9 bill. DM Net costs: 20.2 bill. DM		not yet published	

Source: Bardeleben et. al., 1993.

Table A1 — Gross Costs, Net Costs and Returns of Vocational Training by Sector, 1980

Sector of Training	Gross costs	Returns		Net costs		Wages of trainees	
	in DM	in DM	in % of gross costs	in DM	in % of gross costs	in DM	in % of gross costs
All occupations	17043	6754	40	10289	60	5954	35
Industry and commerce	19442	6995	36	12447	64	6782	35
- Bank clerk	22563	6117	27	16447	73	8824	39
- Energy electrician ^a	19924	6150	31	13773	69	6260	31
- Mechanics ^a	22536	4836	21	17700	79	6456	29
Crafts	14513	6561	45	7949	55	5107	35
- Food salesperson	13693	7410	54	6348	46	5091	37
- Carpenter	20058	7527	38	12532	62	9892	49
Independent professions	17512	6236	36	11276	64	53802	33
Public sector	23689	3733	16	19956	84	7333	31
Agriculture	13825	10181	74	3644	26	6125	44

^a These are the old occupations that had been revised in 1984; cf. Annex 1.

Source: Noll et al., 1983, p. III, Tables I and II.

The 1991 study investigated into the costs of firms by size and industry. It turned out that the gross and net costs increase with the size of the firm. As to the net costs the difference between the smallest firms and the largest ones amount to 10 000 DM (see Table A2). The reasons for this difference are twofold: returns of the apprentices are higher in smaller firms and training costs are lower; larger firms perform more expensive workshop training, where almost no production takes place.

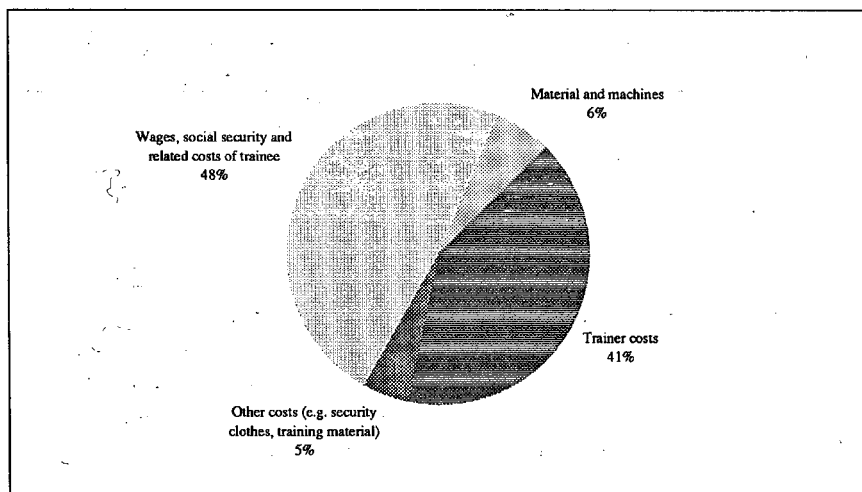
Table A2 — Costs of Vocational Training According to Firm Size, 1991

	Gross Costs in DM	Returns in DM	Net Costs in DM
Total	29573	11711	17862
1 to 9 employees	27473	12221	15252
10 to 49 employees	28176	11465	16711
50 to 499 employees	30344	12100	18245
500 and more employees	35692	10311	25381

Source: Bardeleben et al., 1993, p. 8

Graph A1 exhibits the cost structure of vocational training. The costs of vocational training consist mainly of wages for the apprentices (48 per cent of total costs) and of wages of the trainer (41 per cent). It is noteworthy that the cost structure is almost the same in all industries (agriculture being the exception) and is almost unrelated to the capital intensity of an industry. The cost structure changes during the 2 to 3½ years of apprenticeship. The wage component increases from 40 per cent in the first year to 57 per cent in the third year and the trainer costs decrease from 50 per cent to 26 per cent during the respective periods. This change in the cost structure is accompanied by an overall reduction of net costs of training of about 30 per cent from the first to the second and of about 35 per cent from the second to the third year of training, due to increased returns and reduced trainer costs.

Graph A1 — Cost Structure of Vocational Training, (1980, Average of Industries)



Source: Noll et al., 1983, p. VII, Graph II.

Concerning the development of training costs over time the studies of 1972, 1980, and 1991 deliver reliable information because they are rather similar in method and content. **Table A3** presents the comparison of costs by sector (see also Noll et al., 1983). The following trends seem to have been in force:

- The (gross and net) cost gap between industry and commerce on the one side and crafts on the other has narrowed.

- In the independent professions and in agriculture net costs have risen relatively fast while the gross costs increased similar to the other sectors.
- The wages of the trainees increased less than gross and net costs -except agriculture-; the share of trainees' wages in total cost decreased from 43 per cent in 1972 to 35 per cent in 1980.
- In all occupations the cost of the staff involved in vocational training increased significantly. The share of staff costs in gross costs increased from 10 per cent-25 per cent in 1972 to 35 per cent-45 per cent in 1980 and didn't change much by 1991.
- one skilled worker demands on average a net investment expense of 62 512 DM in case of a 3½ year apprenticeship in 1991 comparing to 36 011 DM in 1980.

Table A3 — Gross Costs, Returns, Net Cost and Wages of Trainees in Different Sectors, 1972, 1980 and 1991

Sector of training	Gross costs			Returns			Net costs			Wages of the trainees	
	1972 in DM (Index)	1980 in DM (Index)	1991 in DM (Index)	1972 in DM (Index)	1980 in DM (Index)	1991 in DM (Index)	1972 in DM (Index)	1980 in DM (Index)	1991 in DM (Index)	1972 in DM (Index)	1980 in DM (Index)
Total	6948 ^a	17043	29573	2561	6753	11711	4387	10289	17862	2981	5954
Industry and commerce 1972 = 100	7902 (100)	19442 (246)	31824 (403)	2507 (100)	6996 (279)	11315 (451)	5395 (100)	12447 (231)	20509 (380)	3121 (100)	6782 (217)
Crafts 1972 = 100	5241 (100)	14513 (277)	24889 (475)	2659 (100)	6564 (247)	12536 (471)	2582 (100)	7949 (308)	12352 (478)	2275 (100)	5107 (224)
Independent professions											
- Health 1972 = 100	5296 (100)	17769 (336)	—	5210 (100)	6655 (128)		86 (100)	11113 (12922)		3089 (100)	6136 (199)
- Advisory professions 1972 = 100	6616 (100)	16960 (256)	—	5027 (100)	5332 (106)		1589 (100)	11628 (732)		2830 (100)	5081 (180)
Agriculture 1972 = 100	5347 (100)	13825 (257)	—	4966 (100)	10181 (205)		381 (100)	3644 (956)		2310 (100)	6125 (265)

^a refers only to industry, commerce, and crafts.

Source: Noll et. al. 1983, p. 10, Table IV, Bardeleben et al., 1993, p. 11, own calculations.