DOCUMENT RESUME

ED 413 426 CE 074 988

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TITLE Forecasting Sectors, Occupational Activities and Qualifications in the Federal Republic of Germany. A Survey on Research Activities and Recent Findings.
INSTITUTION European Centre for the Development of Vocational Training, Thessaloniki (Greece).
ISBN ISBN-92-828-1172-7
PUB DATE 1997-00-00
NOTE 96p.; Paper presented at a meeting of the Circle for Research Cooperation on Trends in Occupations and Qualifications--CIRETOQ (Marseilles, France, November 20-21, 1995).
AVAILABLE FROM Bernan Associates, 4611-F Assembly Drive, Lanham, MD 20706-4391; phone: 800-274-4888 (catalogue no. HX-07-97-410-EN-C: 8 European Currency Units).
PUB TYPE Reports - Research (143) -- Speeches/Meeting Papers (150)
EDRS PRICE MF01/PC04 Plus Postage.
DESCRIPTORS Adult Education; Demand Occupations; Employment Patterns; *Employment Projections; Foreign Countries; Job Skills; *Labor Economics; Labor Market; *Labor Needs; *Labor Supply; Models; Postsecondary Education; Secondary Education; Skilled Workers; Unskilled Workers; Vocational Education
IDENTIFIERS *Germany

ABSTRACT

In view of German reunification, the 1992-94 recession, and ongoing demographic, technological, organizational, and social changes, alternative projections of labor market and employment structures provide policy makers with needed information. The Institut fur Arbeitsmarkt- und Berufsforschung (IAB) structural labor projection (1989) forecasted continued growth of the service sector and corresponding decline of primary and secondary sectors. An update in 1993 showed quite similar results. Labor market projections are also based on econometric models. The IAB System for Simulation and Forecasting takes into account many different types of interdependencies in the economy. Results show the level of employment will increase, whereas the labor force potential should expand less rapidly. The Industrial Forecasting Germany model finds that labor productivity increase will exceed economic growth until 2000 causing employment to fall consistently. A 1994 projection of the structure of labor demand closely follows IAB forecasts. Service occupations will expand; demand for unskilled people will fall in all occupations. Results of supply projections prepared by the German Joint Commission of Federation and Lander for Education Planning and the Promotion of Research (1994) indicate that the supply of unskilled workers will exceed demand, and demand for skilled workers will exceed supply. (The report contains information on statistical sources and classifications and 36 references.) (YLB)

CEDEFOP Document

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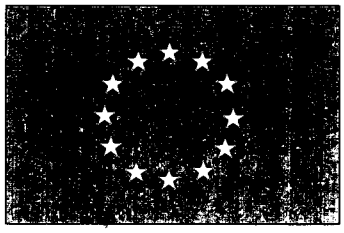
A survey on research activities and recent findings

European Centre for the Development of Vocational Training



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Forecasting sectors, occupational activities and qualifications in the Federal Republic of Germany

A survey on research activities and recent findings[1]

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Contribution to the Ciretoq meeting,
Marseilles, 20 and 21 November 1995

First edition, Thessaloniki 1997

Published by:
CEDEFOP — European Centre for the Development of Vocational Training
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The Centre was established by Regulation (EEC) No 337/75 of the Council of the European Communities, last amended by Council Regulation (EC) No 251/95 of 6 February 1995 and Council Regulation (EC) No 354/95 of 20 February 1995

[1] The manuscript was completed at the end of 1995.
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A great deal of additional information on the European Union is available on the Internet. It can be accessed through the Europa server (http://europa.eu.int)

Cataloguing data can be found at the end of this publication

Luxembourg: Office for Official Publications of the European Communities, 1997

ISBN 92-828-1172-7

Printed in Italy

CONTENTS

Summary

This paper[3] deals with topical long-term projections of the structure of the labour force in West Germany and their main results and implications.

We distinguish three different macroeconomic approaches to manpower forecasting:
- *econometric forecasts* of global manpower demand and projections of *labour force potential*
- *structural approaches to manpower demand* by sectors, qualifications, and job activities[4]
- projections of *manpower supply by levels of qualification*, including new supply and replacement demand.

Global labour market balance for Germany until 2010

The labour market balance of the Institut für Arbeitsmarkt- und Berufsforschung (IAB) compares the number of available jobs to the potential labour force.

The future *number of jobs* available is a result of the macroeconometric IAB-model 'SYSIFO' which takes into account a great number of different types of interdependencies in the economy: production potential, aggregate demand and circular flow, investment process, determination of prices and wages, interest rates and money market, international economic relations. These relationships are calculated by equations which reflect the responses of the different players in the economy; the parameters for these equations are estimated by variables which are either explained by the model itself (endogenous) or determined from outside (exogenous).

The *potential labour force* consists of persons who are employed, unemployed or those willing to take up employment, but not registered as unemployed ('hidden labour force'). The level and development of the labour force potential depends on the employment desired by the different groups (e.g. women) and on demographic change.

An up-to-date estimation of the labour force balance for Germany until 2010 was worked out in the summer of 1995.[5] The results for West Germany (figure 1) show that the level of employment will increase in the next 16 years by about 2.7 m jobs[6], from 28.6 m in 1994 to 31.3 m in 2010. On the other hand, the labour force potential is expected to expand as well, although less rapidly.

When balancing both it becomes obvious that the growth in employment (at the highest level after World War II) will not be sufficient to compensate for the growth in the labour force potential. Global underemployment, which has been about 4.5 m in 1994 will decrease, but still remain at 2.3 m by 2010; it is estimated that two thirds of the employment gap is due to registered unemployment.

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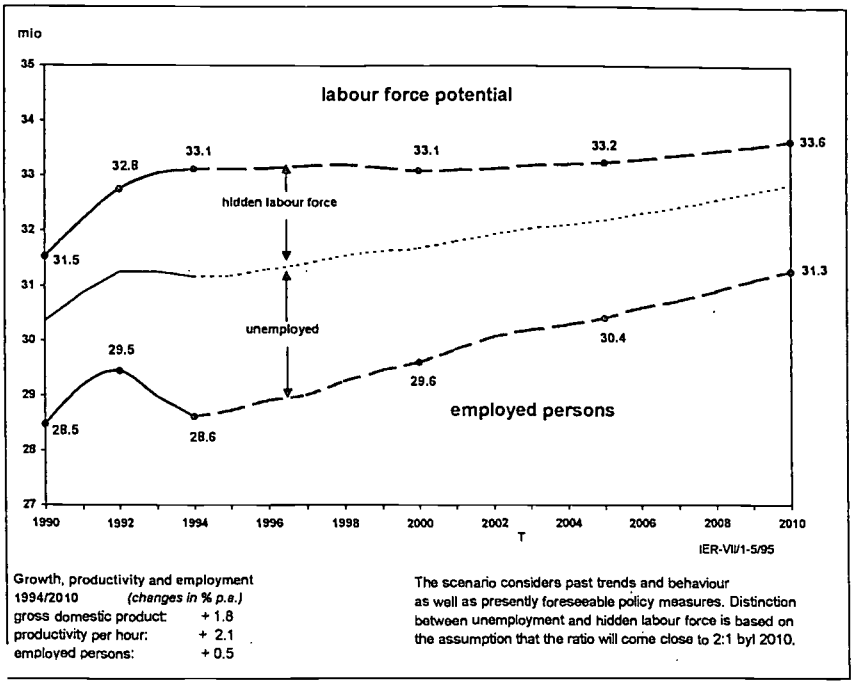
[3] Summary of a report presented to CEDEFOP in October 1995 (in German language)
[4] Job activities are defined herein as the type of work to be performed in a certain job such as typing, operating a machine etc., they are different from occupations
[5] Klauder, 1995 (unpublished, preliminary results)
[6] incl. apprentices, which are counted as workers in the employment statistics

(1) Labour Market Balance 1990 - 2010 (West Germany)

- national concept resp. place of residence concept -
preliminary results of an IAB basic scenario (in million persons)



Sectoral labour force demand

In 1993 the Prognos-Institute (Basel) published its first Report on Germany considering the changes due to Germany´s unification in 1990. A scenario considering the long-term developments of Germany´s economy and social system and the impacts on structural labour demand was presented to project global and sectoral employment. Some of the principal assumptions for West Germany were a GDP-growth of +2.1% and a productivity growth of +1.9% p.a. in the period 1991-2010. For the 1990s Prognos assumes that the decceleration of labour productivity due to German unification in the early 90s could be followed by a productivity push in the subsequent years. As a consequence, employment should stagnate until the year 2000 at a level of 29 m and should rise up to almost 30 m by 2010.[7]

Irrespective of the slow increase of employment the structural changes of *sectoral employment* in the past are expected to continue. The primary sector (agriculture, forestry, fishing) will reduce its share in overall employment from a good 3% (1991) to 2% in 2010. The employment share of the secondary sector (mining/quarrying, manufacturing, electricity, utilities, construction) will decrease as well, from 39% in 1991 to less than 34% in 2010. Correspondingly, the employment share of the tertiary sector (private and public services) will increase from 57% to more than 64% in the projection period. Within the service sector, public services are expected to increase more moderately than private services.

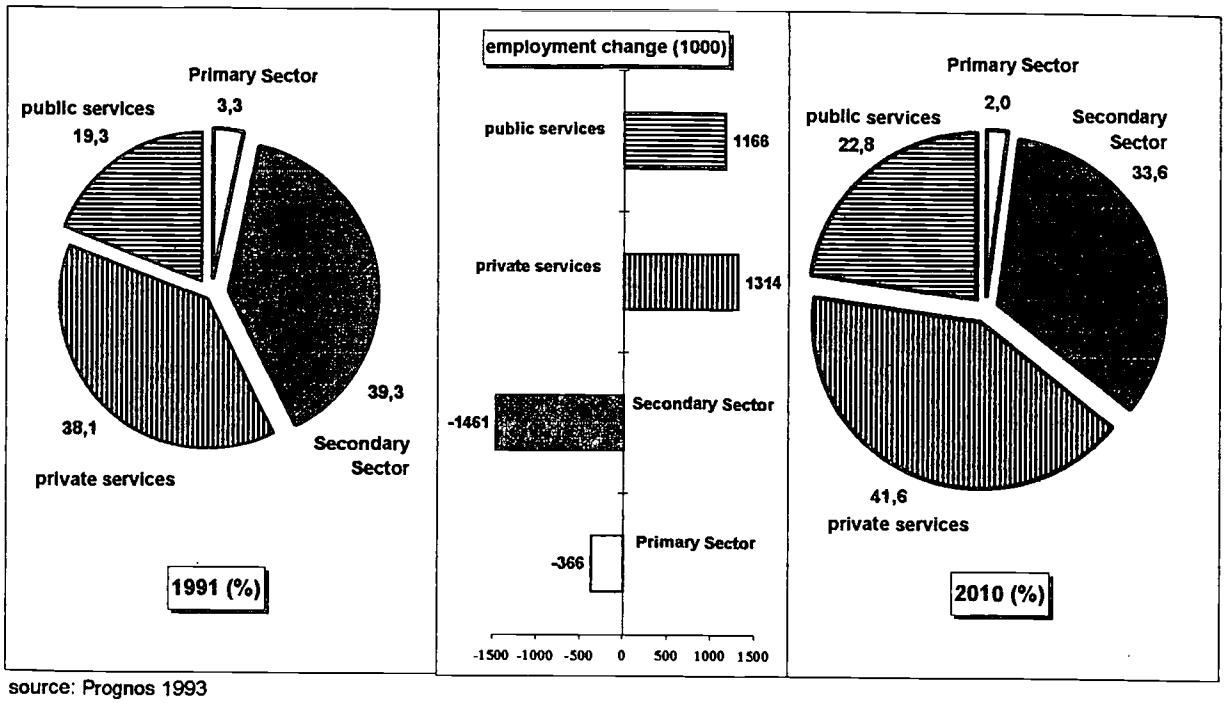
In absolute figures, the loss of jobs in the primary and secondary sectors of more than 1.8 m could be outweighed by an employment gain of 2.5 m in the service sectors. It remains unknown to what extent these employment shifts are feasibble in view of current education and training structures and to what extent this transition process should

[7] The difference in the results of global labour force projections by IER mentioned above to the Prognos results are due to different assumptions concerning growth and productivity rates and to different methods.

be promoted by active labour market policies (e.g. further training, retraining, recruitment subsidies or mobility allowances). These measures strongly depend on the future financial constraints of public budgets.

Figure 2 provides a survey of the sectoral labour demand forecast by Prognos.

(2) Employment by sectors in West-Germany 1991-2010



source: Prognos 1993

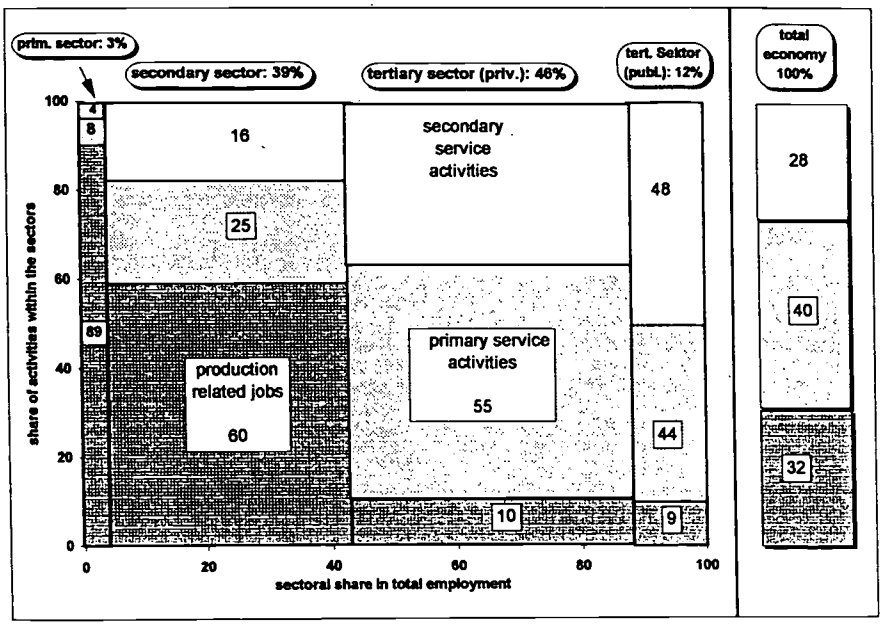
Sectoral change and fields of job activities

The shift in sectoral employment structures does not account for the fact that within the sectors - including in the secondary sector - jobs are becoming increasingly service-related. Manual work is decreasing, whereas services, both close to or distant from production, are going up. A decreasing number of material goods is produced in Germany today. In particular, production-related service jobs such as system engineering, controlling, logistics, machine operating, project management or strategic planning as well as marketing, technical and organization services, advisory, information and communication services are gaining importance. Personal services however are rather elastic with relation to prices and incomes of consumers.

The sectoral figures shown above do not give a full account of the shift in job content, though. Therefore figure 3 shows some of the *distribution of job activities* within the different sectors.[8] In 1993 almost 70% of the labour force was engaged in service jobs. Among these, 40% are defined as primary service jobs which are closer to production (office work, trade, transport etc.) or more consumer-related (maintenance, cleaning, catering, nursing etc.). Another 28% - with upward tendency - are secondary services which are generally more human capital intensive. Included are research&development, planning, law, management, organization, teaching, advising, medical care and information jobs.

[8] The figures are based on the microcensus which uses a sectoral definition different from the national accounting concept used by Prognos 1993. For this reason sectoral shares are not fully comparable.

(3) Structure of job activities within industrial sectors 1993 (%)



source: own calculations based on the 1993 microcensus

A look at the job activities within the sectors reveals how strongly service jobs are represented even in production industries. In 1993 about 40% of all jobs in the secondary sector were service jobs, in manufacturing alone they accounted for almost 44%. In the past 17 years it was only the increase in service jobs - and primarily in secondary service activities - within the secondary sector that prevented a decline in overall employment in this sector.

Forecasting job activities and qualifications

Structural forecasts of the labour force demand by job activities and qualifications have been carried out by the IAB and Prognos since the mid-1980s. Up to now they could not consider German unification and its consequences, however. The projections are broken down by sectors, job activities ("Tätigkeiten" - not identical with occupations) and levels of qualification.

The IAB/Prognos-projection (1989) forecasts the structural manpower demand until the year 2010. The projection was carried out in three steps:
The *first step* consists of the projection by economic sectors. It is based on the national accounts and calculates different scenarios of international and national economic development. Since national accounts, other than the microcensus, do not include information by activities or qualifications, the results of the sectoral forecast had to be merged with data from the microcensuses. This merging of different statistical approaches[9] requires a transformation of the sectoral projection results based on the national accounts into the functional concept of the microcensus.

In a *second step* the results of the sectoral forecast were broken down by job activities. In order to consider the future impacts of technological and socio-economic changes upon job activities an

[9] National accounts follow an institutional concept of sectoral classification, whereas the microcensus defines sectors by a functional concept. As a consequence, public and private service sectors cannot be distinguished properly in the microcensus.

expert rating served to identify those effects and their implications for employment change. In this rating arguments and specific analyses of technical and socio-economic factors were weighted in order to quantify positive and negative employment impacts on specific activities. After transforming the results of the rating into quantitative employment figures the future structure of job activities within the different sectors was estimated.

The *third step* was a further breakdown of the activity forecast by qualification levels within each activity. The qualification structure was projected with the qualification proportions' exponential trends assuming that the future development of each qualification within each job activity will approach a limiting value.

The results of the 1989 IAB/Prognos structural projection indicated continued growth of the service sectors and a corresponding decline of primary and secondary sectors. Similarly, service activities within each sector, in the secondary and primary sectors as well, were expected to increase further. These shifts in the pattern of employment are accompanied by rising qualification requirements within all activities, resulting in a dramatic decline in the overall demand for unskilled labour and an above-average growth in the demand for workers with more sophisticated qualifications. The demand for skilled workers with apprenticeship training is expected to increase on average, resulting in a roughly stagnating proportion of the whole labour force. This is due to contradictory effects of the changes affecting the activities on the one hand and those regarding the qualifications required for it on the other.

The IAB *updated the activity and qualification forecast* in 1994. The update covers the period 1976 to 1991[10] and thus the first effects of German unification. The trends of activity and qualification structures are extrapolated in several variants with non-linear trend functions using limiting values, as well.

On the whole, results are quite similar to those of the former projection. They indicate that the trends of manpower demand by job activities and qualifications seem to be rather stable even in times of severe economic and social disruptions.

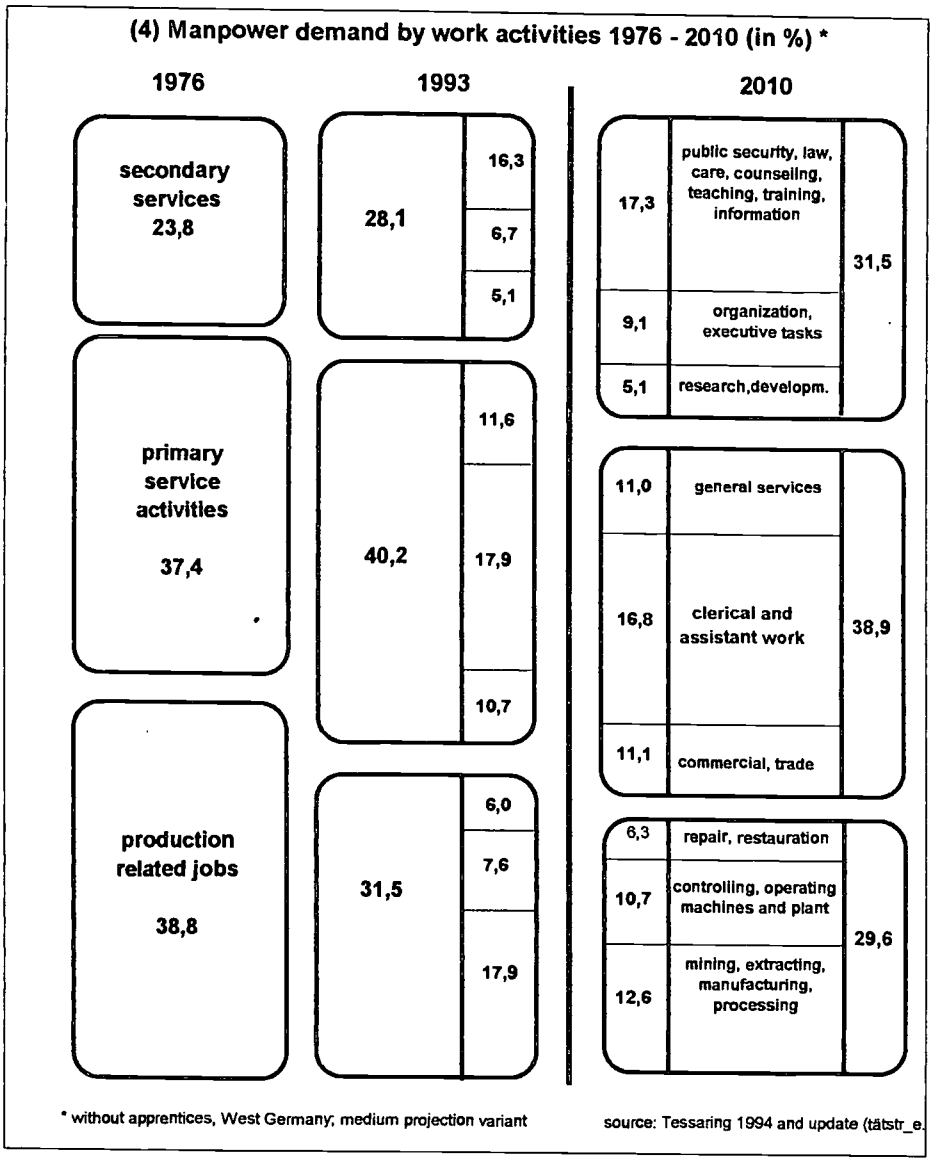
The projection of *job activities* until 2010[11] confirms the ongoing shift towards primary and secondary service jobs (figure 4). Production-related jobs which had a share of almost 39% in 1976 and of 31.5% in 1993[12] are expected to decrease to less than 30% by 2010. In particular, manufacturing and processing work will shrink in importance, whereas the proportion of repair and restoration work and controlling/operating machines and plant are increasing. Primary service activities are expected to drop slightly to 39% in 2010, although their proportions seemed to grow in 1993 compared to 1976. Secondary service jobs will jump to almost 32% by 2010. Within this field, jobs of organization and executive work as well as counselling and information are growing above average, thus continuing the trend of past years. In absolute figures employment growth in the secondary service activities will amount to 1.2 million (+15%) in the period 1993-2010. This increase in jobs could outweigh the drop of primary service jobs (-87 000) and of production-related jobs (-334 000).

[10] the last basic year of the former qualification forecast by IER/Prognos 1989/91 was the year 1987

[11] The impact of technical and socioeconomic factors on jobs, as calculated in the 1989 forecast of IER/Prognos, could not yet be considered in the update, however.

[12] topical results of the microcensus 1993

As a consequence of the shift in the sectoral and job structures as well as of increasing qualification requirements the demand for qualified and highly qualified manpower is expected to grow further. Jobs for unskilled persons which totalled almost 35% in 1976 and 20% in 1991[13] are projected to drop to about 10% by 2010 (figure 5). In absolute figures, this decrease manifests



itself in a significant reduction of employment for unskilled manpower of -2 million in the period 1993 until 2010. Most jobs will be lost in primary and secondary service jobs (-1.34 m together). The share of workers with completed apprenticeship or trade & technical training[14] should increase together from 69% in 1993 to 73% in 2010, gaining around 1.8 million new jobs. The highest employment gains are expected for secondary service jobs, however. Higher education jobs[15] the proportion of which almost doubled from 7% in 1976 to almost 14% in 1993, are expected to increase further above average. Their share in 2010 might total 17%-18% and go along with a growth in employment opportunities of almost 1 million - in particular in the field of secondary service jobs.

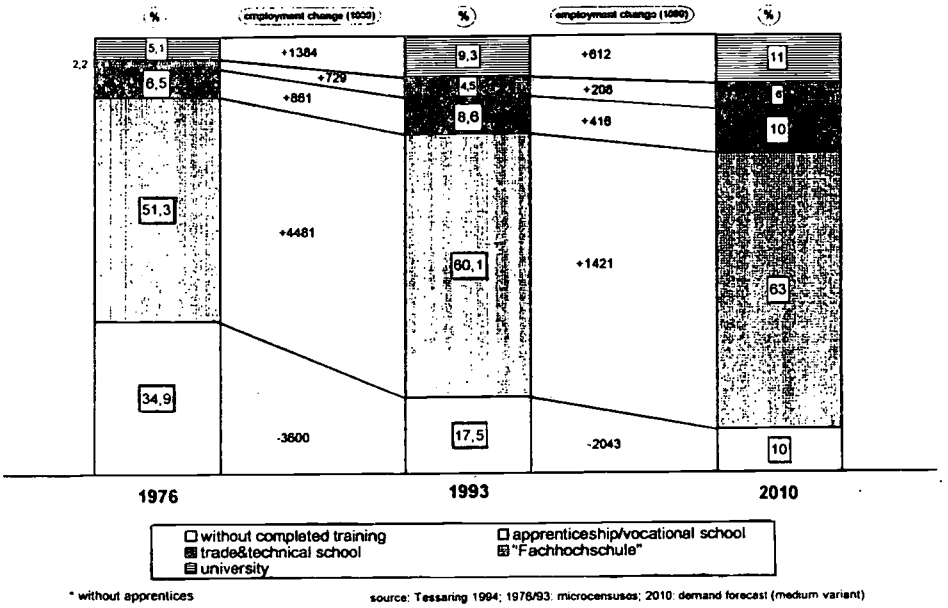
[13] up to 1993 their share dropped further to 17.5% (results of the microcensus 1993)
[14] incl. vocational schools and schools for master craftsmen
[15] university and 'Fachhochschule'-level

Forecasting manpower supply by levels of qualification

The projections of the qualification demand were supplemented by manpower supply projections prepared by the German Joint Commission of Federation and Laender for Education Planning and the Promotion of Research (BLK) 1994. The BLK uses transition models and distinguishes between the new supply (future graduates entering the labour market) and the replacement demand (persons leaving the labour market, e.g. by retirement or death). Together they yield the overall supply by levels of qualification and can be contrasted with the demand projections (manpower balance). Replacement demand and demand change (result of the demand forecast mentioned above) together indicate the recruitment demand and thus the employment opportunities of the future graduates of the education and training system. Figure 6 describes the supply forecasting model for university graduates.

The results indicate that the new supply of unskilled workers will exceed demand and thus will lead to a substantial deterioration in their employment opportunities. On the other hand, the future

(5) Qualification structure of the labour force* in West Germany 1976 - 2010

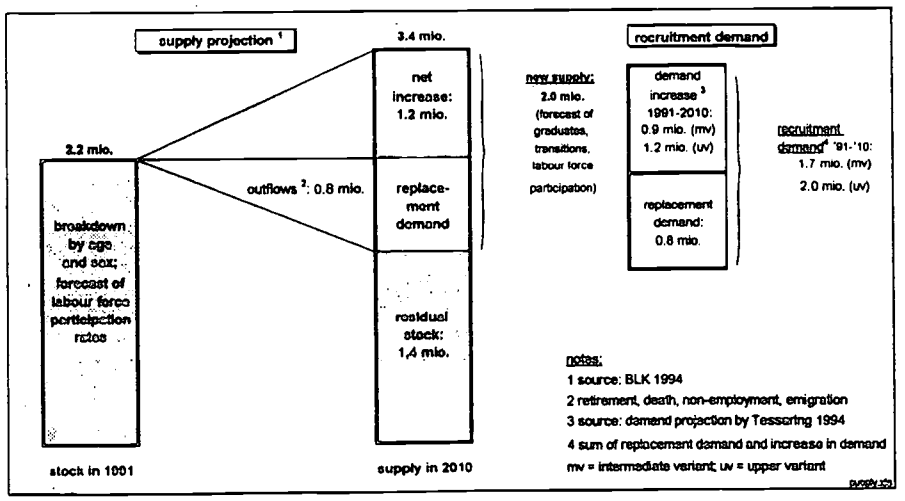


* without apprentices

source: Tessaring 1994; 1976/93: microcensuses; 2010: demand forecast (medium variant)

(6) Forecasting manpower supply and recruitment demand by qualifications

(exemplified with university graduates)



demand for skilled workers will exceed future new supply and thus could cause labour shortages in this qualification group. For the higher qualified persons (Fachhochschule, university), the new supply could exceed demand by a greater or lesser extent depending on the projection variant calculated (cf. table).

Since both forecasts - the demand as well as the supply projections - disregard any substitution effects that are stronger than in the past, the results of this comparison should not be overestimated: as in the past, imbalances on sub-labour markets are expected to result in adaptation processes (substitution or mobility) which could ameliorate the employment risks. All in all, however, due to the global deficit of jobs - compared to the labour force potential - the labour markets of the future be characterized by an ongoing selection of workers, where those with lower skills or with disruptions to their careers (e.g. long-term unemployed) will have the poorest chances.

Demand change, replacement and recruitment demand, new supply of the labour force[a] by levels of qualification up to 2010 (in 1000)

Qualification	Projection variant	Stock in 1991	Demand 2010[b]	Demand change 1991-2010	Replacement demand[c] 1991-2010	Recruitment demand 1991-2010	New supply[d] 1991-2010
		1	2	3 = 2 - 1	4	5 = 3 + 4	6
no formal training[e]	*intermediate*	5601	2837	- 2764	3024	260	1248
	upper	5601	2712	- 2889	3024	135	1248
With completed training[f]	*intermediate*	18677	20509	1832	8634	10466	9073
	upper	18677	20278	1601	8634	10235	9073
Fachhochschule	*intermediate*	1127	1567	440	464	904	1534
	upper	1127	1599	472	464	936	1534
University	*intermediate*	2257	3111	854	844	1698	2058
	upper	2257	3433	1176	844	2020	2058
Total	*intermediate*	27662	28025	363	12965	13329	13910
	upper	27662	28025	363	12965	13329	13910

[a] excluding apprentices - [b] according to the projection by Tessaring (1994) - [c] according to BLK (assumption: persons with same qualification replace those that leave the labour market) - [d] according to BLK - [e] persons without completed formal training - [f] with completed apprenticeship training or training at vocational schools, trade & technical schools
Sources: BLK 1994; Tessaring 1994

Policy measures

The forecasts sketch a number of problems for the future labour market and its educational and training policy implications. They are aggravated by specific problems in East Germany where the transition process will continue throughout the next decade. While education policy cannot increase overall employment, it can promote structural change by striving for adequate and future-oriented qualifications. In view of the individual's educational and occupational choices, efficient educational counselling and an offer of attractive general and vocational training opportunities are required. Therefore it is important[16]

- to offer a sufficient number of educational opportunities to ensure that individuals can enter and complete an appropriate training course

- to identify individuals' insufficient or mismatch qualifications early

- to offer educational alternatives which allow for structural labour market and employment changes

- to realize equal opportunity of general/theoretical training and of practical training and to improve permeability between the different education and training courses

- to offer a sufficient number of further training courses in order to minimize the risk of unemployment or to facilitate the possibility of a re-entry into working life.

[16] cf. BLK 1995, pp. 67 f.

Part II

INTRODUCTION

In view of German reunification, the 1992-1994 recession, and the myriad of on-going demographic, technological, organizational and social changes projections of labour market and employment structures are becoming ever more important. The forecasters are facing a dilemma, though: rapid structural changes are rendering long-term projections based on past developments and interdependencies highly uncertain. On the other hand, projections have never been more necessary, because the people and policy-makers concerned with an active education and labour market policy cannot anymore rely solely on what happened yesterday. In addition, such projections are needed to spot maladjustments early in order to be able to correct them in time.

Alternative projections are specially suited to provide policy-makers with the information they need: they show the effects of policies and policy alternatives, they warn of undesirable developments and they indicate how to arrive at the desired objective. In particular the use of simulation calculations makes causal interdependencies of the economy and the labour market as well as the intervention alternatives more transparent. This helps towards influencing and controlling them more efficiently.

1. Projections for the FRG

In the Federal Republic of Germany different methods are used to project employment and the labour market and their structures according to sectors, occupations, activities and qualifications. At first, this paper attempts to explain structural projections or scenarios for manpower requirements. These forecasts for employment and its structure are based on a set of assumptions and variants. Among them are the IAB/Prognos projections of 1985 and 1989, the 1991 and 1994 IAB projections and the scenarios by Prognos (1993) and the DIW[17] (1994) as well as the structural projections by Weisshuhn/Wahse/ König (1994). In addition, we provide a survey of the econometric projections using the IAB/SYSIFO model and the INFORGE model of Osnabrück University.

For the supply side only the estimates of the Commission for Education Planning and Research Promotion of the Federation and the Laender (BLK 1994) are available apart from the IAB's global projections of the labour force potential. This forecast of labour supply is based on the regular population forecasts of the German Statistische Bundesamt (Federal Statistics Office) and the forecasts of the number of school and university students and graduates from the education and training system provided by the German Conference of the Ministries of Cultural Affairs (KMK).

2. Underlying data

The quality and meaningfulness of projections depends not only on the underlying assumptions and the methods used, but also on the type and quality of the data they are based on. Thus the special responsibility of the forecaster starts with selecting and care-

[17] DIW = Deutsches Institut für Wirtschaftsforschung (German Institute for Economic Research)

fully analysing the data available and it ends with a clear explanation of their pros and cons for the interpretation of the projection arrived at. In Germany a number of sources of data are available for projections in the field of education, the labour market and qualifications. But each has its own weak and strong points and frequently these are incompatible. The major sources of data are:

a) The population statistics which are *inter alia* the base for estimating the final demand for goods and services, the future manpower supply, the development of the education and training system (demographic aspect).

b) The existing education and training statistics which permit us to analyse the proportions in which the different qualification levels will be represented in the future manpower supply, particularly among the newcomers to the labour market.

c) Labour force statistics serve to forecast the future manpower supply and demand, globally and structurally. The following labour force statistics are used for projections in Germany:

- The national accounts divided into sectors. These sectors are classified according to the institutional concept, i.e. the smallest institution (companies, central/regional/ local authorities, churches, charities) is the representative unit; they are grouped according to their economic activities' main focus. This means e.g. that public education and science is classified in the sector 'state', while private education and science are assigned to different classifications. Therefore public and private education and science can be looked at together only with the help of estimates based on other statistics.

- Microcensus, a census of all households (1% sample) normally taken once a year. The microcensus includes a number of characteristics which are very relevant for projections, some of which, however, are only surveyed biannually (e.g. occupations, type of training completed, activity). In contrast to the national accounts, the microcensus follows a functional concept: it is not the institution (e.g. government, company) by which somebody is employed that counts, but the economic focus of the local unit, irrespective of whether it is public or private. Returning to the example above: it is impossible to distinguish whether the sector 'education and science' to which somebody assigns himself is public or private.

- The employment statistics of the German Bundesanstalt für Arbeit covering all persons employed under a contract subject to the payment of social security contributions. These statistics do not include civil servants, the self-employed and assisting family members, unless their employment is subject to the payment of social security contributions. The employment statistics include about 75% of the active population; the extent of this coverage differs from category to category, though[18]. Every employed person has an insurance account which provides additional statistical data (e.g. occupation, training); such data is not entered by the employed person himself (as in the microcensus) but by the employing company. The employment statistics'

[18] The employment statistics include only about 40% of the active population who are university graduates, for example, because a large proportion of these (especially teachers) are civil servants or self-employed.

data on individuals permit both cross-sectional and longitudinal analyses (e.g. career histories).

- In addition, there are statistics of industrial sectors which also include data on the people employed there and their characteristics. Frequently these characteristics are not very discriminating or comparable with the other statistics mentioned above.

- For information that is not contained in official statistics empirical results of surveys are used. These might be the types of jobs desired by certain groups (e.g. married women, foreigners, young people, older people) which tell about their behaviour and the influence they might exert. These are considered , for example, in the projection of the labour force potential or the supply of qualifications.

Global, sectoral and econometric projections are compiled mainly on the basis of the national accounts. However, projections calculating the composition of the occupations and the qualifications of the labour force are usually based either on the microcensuses or on employment statistics, possibly complemented by other statistics (population statistics, education statistics). To link the projections by sectors according to the national accounts with structural features which are only covered by the microcensuses or by employment statistics would require converting the institutional approach of economic sectors (as in the national accounts) to that of functional sectors (as in the microcensuses).

Part II

PROJECTIONS OF GLOBAL AND SECTORAL DEVELOPMENT OF EMPLOYMENT IN GERMANY

Chapter 1

STRUCTURAL PROJECTIONS OF SECTORAL CHANGES

Next we will present the 1989 IAB/Prognos projection on manpower demand by sectors and two new scenarios prepared by Prognos (1993) and the Deutsche Institut für Wirtschaftsforschung (DIW).

1. The 1989 IAB/Prognos Projection

In 1985 IAB and PROGNOS AG published the first long-term structural projection of manpower demand until the year 2000[19]. The second structural projection of these two institutes, to be explained below, was published in 1989 and covers the period until 2010[20]. Both projections forecasted the demand for manpower according to 'branch of industry', 'main activity' and 'qualification' (highest-level of completed training/degree). The discussion below deals first with the manpower demand by sectors according to the national accounts' institutional classification.

1.1 Objective

IAB and Prognos consider the structure they arrived at as model calculations forecasting the possible development under certain assumed conditions. Forecasting only one single course of developments entailed the risk that a higher probability would have been attributed to it than is warranted in view of the complex nature and limited meaningfulness of the statistical base. Therefore three alternative courses of events were calculated describing the range of future changes. This range was generated by distinguishing between more offensive or defensive approaches to future challenges than in the past.

How to assess the change of structures in production and the ensuing development of productivity is a central issue. In view of radically new technologies, the globalization of economic relations and demographic changes, structures will change much faster and more profoundly than in the past. The projection therefore assumes economically relevant individual aggregates and their development, at the end summarized for the national economy ('bottom-up procedure'). Focus is on the development of production and productivity in the different sectors. Here global results for demand of the domestic product following the consumption-plus-investment method are allocated to the different branches and iteratively harmonized with the developments in the individual sectors.

[19] Rothkirch/Weidig, 1985
[20] Prognos et al., 1989

1.2 Procedure

1.2.1 Secenarios for general conditions

The IAB/PRognos projection is based on a number of general conditions considered to be exogenous. This includes the development of the population and of manpower supply, the evolution of the international economy and its consequences for the international division of labour, changes in science and technology and basic principles of economic policy.

a) The size and composition of the (active) population affects the level and nature of the demand for goods and services. Firstly, estimates of population development refer to the natural demographic fluctuations and the number and structure of private households derived therefrom; secondly, they include the forecasts for external-migration and thirdly the forecast of future manpower supply, determined on the basis of assumptions about the activity rates of men and women.

   Calculations were made for three population scenarios. The upper ('more optimistic') variant allows for stronger population growth and manpower supply than the medium and lower ('more pessimistic') variants.

b) Also for the effect of global economic development an optimistic, a pessimistic and an in-between scenario were devised. These considered the following criteria: availability of resources (energy, environment) and prices for energy; scope and frequency of exchange rate changes; the evolution of the international division of labour (e.g. liberalization of world trade vs. protectionism); the evolution of the north-south conflict and the debt burden of the developing countries.

c) Technological change might affect economic growth in two contradictory ways: on the one hand it might stimulate growth as there are new technological solutions and consequently the means of production become more efficent, on the other hand it harbours the high risks related to costly and time-consuming integration of technological developments in existing, traditional operational units. This also includes the general conditions defined by organizational forms and regulations for the application of new technologies.

d) The fourth field affecting economic development is economic policy. This field mainly includes the government's financial policy, the national bank's monetary policy and the wage policy of both sides of industry. The general conditions defined by existing regulations are not questioned: social market economy, collective bargaining autonomy, definition of general conditions by economic policy and of money supply in line with the growth of production potential. The range of scenarios assumed in the projections extends from defensive strategies with stricter regulations and less economic flexibility to offensive strategies to promote structural changes and solve the problems to hand (e.g. environment, north-south/east-west conflicts, world trade).

1.2.2 Methods applied

The medium and long-term developments of the economy and manpower demand are analysed and projected against the backdrop of the general scenarios as described above. In contrast to the simultaneous systems of equations in econometric models (see below) we are achieving consistency by using sub-models and separate equations. Specific assumptions accommodate the effects of changes in the general conditions.

The first step is the analysis and projection of economic interdependencies between the FRG and other countries in the form of imports and exports, total demand/production for the world and the major groups of countries. The results indicate the margin within which gross national product, external trade, exchange rates and energy prices might fluctuate.

The next steps deal with the consumption-plus-investment side of national accounts. The basic hypothesis is that there is a limited growth in demand, i.e. demand is insufficient to fully utilize the existing production potential and this is what impedes economic growth and not the limited availability of productive capital and labour. The major elements for this demand are firstly, private consumption, determined by the developments of the population, private households and manpower supply or unemployment and secondly, public consumption determined by financial possibilities and political priorities.

Investments are deduced from added value and the output-capital ratio. To estimate investments in housing construction and the demand for public investments in infrastructure reference is also made to demographic development and disposable private incomes.

With the results of the GNP's consumption-plus-investment accounts a first assessment of the national economy's output side is made. This does, however, require much harmonization and many consistency checks of nominal and real accounts on the one hand and of output and consumption-plus-investment accounts on the other.

After the volumes of production in output accounts have been determined, the development of productivity and employment is projected. It is assumed that changes in productivity will not occur independently, but will be integrated into the numerous interdependencies between economic and non-economic factors (economies of scale, competition, technological progress and general organizational and institutional conditions).

1.3 The results of the 1989 IAB/Prognos projection

1.3.1 Development of economic growth, productivity and employment

The last year providing actual data for the projection is 1987. As stated above, three variants were calculated: the medium and particularly the upper variant are estimates of the growth curve which is clearly above that of the period 1973-1987; this reflects the speedy restructuring of the domestic economy to adapt to the changes in the general framework. As these problems of adaptation are overcome accelerated growth is expected until the year 2000. This will then slow down, however, mainly due to the receding population. The lower variant supposes that restructuring is only inadequately coped with thus aggravating the need for adaptation. As a consequence growth rates will diminish further.

This affects the changes in productivity growth to different extents. While productivity is progressing relatively strongly for the upper variant, because new technologies are intensively utilized and there is a positive overall development (inlcuding more flexible working hours), it is not making much headway for the lower variant, a major reason being the lack of investments to modernize and restructure the means of production.

Due to its different rates of economic and productivity growth the upper variant triggers the strongest increase in the labour force. Despite the higher productivity per hour worked (while working hours are shortened on average) the stronger expansion of the economy brings about more employment than in the medium or lower variants. Table 1 provides a general survey of the results of the IAB/Prognos projection.

Table 1: Economic Growth, Productivity and Employment until the Year 2010
- Results of the 1989 IAB/Prognos Projection (West Germany) -

	Dim.	1973-1987	1987-2010		
			lower variant	intermed. variant	upper variant
Growth of the national product [1]	% p.a.	1,8	1,5	2,3	2,7
Productivity increase [2]	% p.a.	1,8	1,6	2,4	2,1
Changes in employment [3]	%	0	-1,9	7,4	3,7
		1987	2010		
Labour force [3]	million	27,0	26,5	29,0	28,0

1 in 1980 prices - 2 Gross national product per active person, in 1980 prices - 3 in the national territory
Source: Prognos AG 1989

The global key projection figures for population and labour force (supply of labour) and economic changes bring about - or rather brought about from the perspective at the time - the following labour market situations: for all variants a reduction in unemployment and the number of discouraged workers must be expected due to the shrinking population. In the medium and particularly the upper variant the demand for labour increases, therefore the labour market situation will clearly relax after the middle of the next decade, there might even be bottlenecks, especially for qualified persons. However, by now the situation is seen differently: after all, the repercussions of the 1992-1994 recession and especially the long-term effects of German reunification could obviously not be considered in the 1989 IAB/Prognos scenario.

1.3.2 Manpower demand by economic sectors until 2010

The industrial origin of the gross domestic product according to economic sectors is estimated with the help of calculations on how the national product will be consumed in

future (private consumption, disposable income, public consumption, gross investment, imports, exports).[21] The extent of the structural changes of gross value added and employment differ for the various variants due to the different assumptions they are based on (Table 2).

The demand for labour continues to shrink in *agriculture* although less rapidly than in the past. The differences between the alternatives analysed are minor. In the period 1987-1995 employment in agriculture will drop by an average 2.3% p.a., from 1995-2010 by 1.8% p.a. The employment share of agriculture is expected to fall from 3.8% (1987) to between 2.3% and 2.4% in 2010. This means that about 400,000 jobs will be lost.

The share of total employment held by the *secondary sector*[22] will go down as well, from 39% in 1987 to about 32% in 2010. Depending on the variant this means 2.2m (lower variant) to 1.3m (upper variant) less jobs; in percent: a reduction by -21% to -12%. Most employment in the secondary sector will be lost in mining (-32% to -29%), in the basic and capital equipment industries (-25% to -23%) and the consumer goods industry (-21% to -16%). The alternative calculations are more widely scattered for the construction industry: ranging from -400,000 (-22%) jobs for the lower variant to -200,000 (-10%) for the upper variant.

Both in absolute and in relative terms the *tertiary sector* can gain even more weight. The plus in employment ranges from a good 2m in the lower to almost 3m in the upper variant; this is an increase by +13% to 24%. Thus this sector's share of all jobs in the economy would soar from 57% in 1987 to almost 66% in 2010; all variants almost coincide here. From a purely arithmetic perspective the jobs lost in the primary and secondary sectors (together -2.0 to 1.6 m) might be offset by the number of jobs gained in the service sector, at least for the medium and upper variant. Only in case of the unfavourable economic situation assumed for the lower variant will the reduction of employment in the primary and secondary sectors (almost -2.6m) clearly exceed the increase in jobs in the tertiary sector (+2m).

Here we must add that this is a calculation based on persons. It seems plausible that much of the employment increase in the service sector will consist of part-time jobs.

The growth in employment varies strongly within the teritary sector. It ranges from a reduction in trade (-17 to -7%) and transport (-10 to -3%) to far above-average gains in 'other private services' and the field 'private education, science, culture' where the growth rates fluctuate between +46% and almost 70%. The government as the biggest employer by numbers in the tertiary sector (in the type of classification used here) will expand its share of total employment, but growth rates are somewhat below-average - compared to the tertiary sector as a whole. Depending on the variant, public employment is expected to go up by +740,000 (lower variant) to almost 1.1m; which amounts to a +18% to +25% increase. Thus the number of persons employed in the public sector as a proportion of total employment would move from 15.4% in 1987 to roughly 18%. In this case as well, a large number of jobs will be part-time jobs.

[21] based on the national accounts (classification by institutions)

[22] The secondary sector comprises the following sectors of the economy: utilities (power and water), mining, manufacturing, construction

Table 2: Labour Force by Industrial Sectors 1987 - 2010

- Results of the 1989 IAB/Prognos Projection (West Germany) -

No.	Sector	Number in thousands				Changes 1987/2010 (%)			Structure in %			
		1987	2010 lower variant	2010 intermed. variant	2010 upper variant	lower variant	intermed. variant	upper variant	1987	2010 lower variant	2010 intermed. variant	2010 upper variant
1	Agriculture, forestry, fishery	1023	645	650	661	-37,0	-36,5	-35,4	3,8	2,4	2,3	2,3
2	Electricity, gas and water supply	246	211	213	220	-14,2	-13,4	-10,6	0,9	0,8	0,8	0,8
3	Mining	205	139	142	145	-32,2	-30,7	-29,3	0,8	0,5	0,5	0,5
4	Basic goods, producer goods	1729	1289	1316	1330	-25,4	-23,9	-23,1	6,4	4,9	4,7	4,6
5	Investment goods	4145	3391	3689	3867	-18,2	-11,0	-6,7	15,3	12,8	13,2	13,3
6	Consumer goods	1668	1320	1363	1403	-20,9	-18,3	-15,9	6,2	5,0	4,9	4,8
7	Food, beverages and tobacco	807	669	707	724	-17,1	-12,4	-10,3	3,0	2,5	2,5	2,5
8	Construction	1824	1423	1520	1649	-22,0	-16,7	-9,6	6,7	5,4	5,4	5,7
9	Commerce	3485	2903	3106	3249	-16,7	-10,9	-6,8	12,9	11,0	11,1	11,2
10	Transport	942	849	884	916	-9,9	-6,2	-2,8	3,5	3,2	3,2	3,2
11	Communications (post office)	515	536	575	598	4,1	11,7	16,1	1,9	2,0	2,1	2,1
12	Credit institutions, insurance	810	759	791	817	-6,3	-2,3	0,9	3,0	2,9	2,8	2,8
13	Catering	907	1068	1151	1188	17,8	26,9	31,0	3,4	4,0	4,1	4,1
14	Education, science, culture	380	556	597	641	46,3	57,1	68,7	1,4	2,1	2,1	2,2
15	Health care, veterinary medicine	612	602	629	648	-1,6	2,8	5,9	2,3	2,3	2,2	2,2
16	Other (private) services	2471	3802	4022	4185	53,9	62,8	69,4	9,1	14,3	14,4	14,4
17	Government	4162	4901	5119	5210	17,8	23,0	25,2	15,4	18,5	18,3	17,9
18	Non-profit org., private households	1105	1438	1522	1582	30,1	37,7	43,2	4,1	5,4	5,4	5,4
	Summary											
1	Primary sector	1023	645	650	661	-37,0	-36,5	-35,4	3,8	2,4	2,3	2,3
2-8	Secondary sector	10624	8442	8950	9338	-20,5	-15,8	-12,1	39,3	31,9	32,0	32,2
4-7	*of these: manufacturing sector*	*8349*	*6669*	*7075*	*7324*	*-20,1*	*-15,3*	*-12,3*	*30,9*	*25,2*	*25,3*	*25,2*
9-18	Teritary sector	15389	17414	18396	19034	13,2	19,5	23,7	56,9	65,7	65,7	65,6
9-16	*of these: mainly private*	*10122*	*11075*	*11755*	*12242*	*9,4*	*16,1*	*20,9*	*37,4*	*41,8*	*42,0*	*42,2*
17-18	*mainly public*	*5267*	*6339*	*6641*	*6792*	*20,4*	*26,1*	*29,0*	*19,5*	*23,9*	*23,7*	*23,4*
	Total labour force	**27036**	**26500**	**27995**	**29032**	**-2,0**	**3,5**	**7,4**	**100,0**	**100,0**	**100,0**	**100,0**

Note: Industrial sectors following the national account's approach (instiutional concept)
Source: Prognos AG 1989

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2. The Prognos Germany Report No. 1 (1993)

Prognos published its first Germany Report in 1993 to take into account the changes following German unification and to include more recent data up to 1991[23]. The Germany Report is a single scenario attempting, on the basis of the 1989 IAB/Prognos Projection, to forecast the probable long-term development of economy and society with detailed assumptions and estimates. The new federal states were included for the first time. Below we shall only summarize the results applicable to West Germany.

2.1 Global development of economy and employment

Prognos '93 assumes the following changes for the basic conditions (in % p.a.): real GDP (economic growth) will improve by an average of +2.1% and productivity per worker by +1.9% in the period 1991-2010. For the nineties Prognos expects that a 'productivity thrust' will replace the slow-down of productivity (productivity growth 1991-2000: +2.0%, then down to +1.9% 2000-2005 and to +1.8% 2005-2010). As a result employment will stagnate until 2000, only thereafter picking up by +0.2% (2000-2005) or +0.3% p.a. (2005-2010). The total labour force (including apprentices) will hover around 29m from 1991 to 2000 and then climb to 29.9m in 2010.

2.2 Sectoral changes in employment

Although the projection of sectoral[24] changes in manpower demand differs in some cases from the results of the IAB/Prognos projection (1989), the general trend is the same. Both projections are, however, not fully comparable, since the assumptions for economic and productivity growth are incongruent, also because of different projection periods. Only the IAB/Prognos projection might possibly be comparable with the Germany Report (economic growth 1987-2010: +2.3% p.a., productivity gain: + 2.4%).

A striking feature of the comparison of both projections is that according to the 1993 projection (Table 3) the share of employment in the secondary sector does not shrink as much until 2010 (33.6%) as in the 1989 study (32.0%). The gain in the share of the tertiary sector is only estimated at around 63%; before the figure had still been almost 66%.

This was caused by far more conservative estimates for the expansions in government and education, science and culture: while the first projection had calculated an increase of the share of those two areas of 20.4% in 2010, the more recent estimate puts it at a mere 18.2%. Recessive public employment is also indicated by the reduction of its share from 15.4% to 14.8% from 1987 to 1991 - although the absolute number of people in public employment grew by 250,000 persons during these years[25].

Prognos' Germany Report thus similarly concludes that arithmetically the over 1.8m jobs lost in the primary and secondary sectors from 1991-2010 might be overcompensated for by the higher number of jobs in the tertiary sector (+2.5m). Whether this is possible in view of the differently structured occupations and types of training in these

[23] Prognos 1993
[24] based on the national accounts
[25] The reduction of the share is due to a even stronger increase of total employment

fields and to what extent this adaptation process needs to be supported by labour market policy (particularly further education, retraining and familiarization)
and/or can be supported by it in view of tight public budgets, cannot be answered at this point.

Table 3: Labour Force by Industrial Sectors 1991 - 2010

- Results of the Prognos Germany Report 1 (1993) for West Germany -

No.	Sector	Number in thousands				Shift '91-'10		Structure in %			
		1991	2000	2005	2010	in 1000	in %	1991	2000	2005	2010
1	Agriculture, forestry, fishery	963	742	659	597	-366	-38,0	3,3	2,5	2,2	2,0
2	Electricity, gas and water supply	280	267	258	247	-33	-11,8	1,0	0,9	0,9	0,8
3	Mining	180	126	115	95	-85	-47,2	0,6	0,4	0,4	0,3
4	Manufacturing sector	9088	8243	7973	7723	-1365	-15,0	31,1	28,3	27,1	25,9
5	Construction	1941	1976	1953	1963	22	1,1	6,6	6,8	6,6	6,6
6	Commerce	3897	3618	3573	3549	-348	-8,9	13,3	12,4	12,1	11,9
7	Transport	1134	1131	1152	1175	41	3,6	3,9	3,9	3,9	3,9
8	Communications (post office)	514	457	431	417	-97	-18,9	1,8	1,6	1,5	1,4
9	Credit institutions, insurance	917	923	926	936	19	2,1	3,1	3,2	3,1	3,1
10	Catering	960	1063	1135	1218	258	26,9	3,3	3,6	3,9	4,1
11	Education, science, culture	457	504	535	572	115	25,2	1,6	1,7	1,8	1,9
12	Health care, veterinary medicine	755	842	904	970	215	28,5	2,6	2,9	3,1	3,2
13	Other (private) services	2499	3084	3338	3610	1111	44,5	8,6	10,6	11,3	12,1
14	Government	4311	4611	4820	5038	727	16,9	14,8	15,8	16,4	16,9
15	Non-profit org., private households	1323	1551	1654	1762	439	33,2	4,5	5,3	5,6	5,9
	Summary										
1	Primary sector	963	742	659	597	-366	-38,0	3,3	2,5	2,2	2,0
2-5	Secondary sector	11489	10612	10299	10028	-1461	-12,7	39,3	36,4	35,0	33,6
6-15	Teritary sector	16767	17784	18468	19247	2480	14,8	57,4	61,0	62,8	64,4
	Total labour force	**29219**	**29138**	**29426**	**29870**	**651**	**2,2**	100,0	100,0	100,0	100,0

Note: Industrial sectors following the national account's approach (institutional concept)
Source: Prognos AG 1993

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3. The 1994 scenario of DIW

The Deutsche Institut für Wirtschaftsforschung (DIW) forecasts two alternative scenarios for west and east German economic and population developments until 2000 based on national acocunts and population statistics[26]. In the 'stagnation scenario' the essential parameters are kept constant; thus it is mainly a status-quo projection. In an 'integration scenario' the general trend of changes is calculated, assuming that east and west Germany will converge in the medium-term.

3.1 Results for the development of the global labour market

With the given general conditions the projection concludes for west Germany that the global surplus of labour supply (labour force potential) might melt away because of the number of jobs available until 2000, if the assumptions of the integration scenario come true. The surplus supply (registered unemployment + hidden unemployment) of over 5m in 1994 would drop to almost 4m by 2000; one half of these would be unemployed and one half discouraged workers. In a stagnating economy the surplus would climb to 6m, whereby the discouraged workers would slightly outnumber the unemployed.

A similar development is expected for east Germany: a reduction of the supply surplus (1994: amost 2m) to 1.6m in the integration scenario and an increase to 2.2m in the stagnation scenario.

Table 4 summarizes the results for east and west Germany:

3.2 Employment structure according to sectors[27] 1994-2000

Like the previously described structural projections the DIW concludes that the service sector in west Germany will continue to grow and that primary and secondary sectors will shrink. In the stagnation scenario the growth in services is less pronounced; therefore the number of people employed in the secondary sector and its share of total employment go down proportionately less (Table 5).

The only areas within the secondary sector which will continue to thrive in west Germany in the integration variant are the capital goods industry and construction. In the tertiary sector minor growth of employment will only happen in government, including non-profit-making organizations and private households (in the stagnation variant there is actually negative growth).

The employment structure in east Germany will change differently from that in the west in many respects. Although a negative trend is expected for the primary and secondary sectors (except for construction) here as well, in addition, substantial losses are expected in the areas 'transport and communications' and 'government, including non-profit-making organizations and private households' in both scenarios.

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[26] Görzig/Gornig/Schulz 1994

[27] based on the national accounts

Table 4: Results of the DIW scenarios 1994 to 2000

	1994	2000	
		Integration scenario	Stagnation scenario
WEST GERMANY			
Economic growth (% p.a.) [1]	-1,3	2,0	1,1
Productivity (% p.a.) [1]	0,2	1,5	1,1
Labour force(1000)	28540	30550	29450
Labour force potential(1000)	33215	34181	35106
Excess supply (1000)	5049	3971	6016
EAST GERMANY			
Economic growth (% p.a.) [1]	5,9	10,1	5,8
Productivity (% p.a.) [1]	8,3	10,7	7,9
Labour force(1000)	6069	6075	5400
Labour force potential(1000)	8433	7952	7880
Excess supply (1000)	1989	1637	2190

1 yearly average changes against 1992
Source: Görzig/Gornig/Schulz 1994

Chapter 2

LABOUR MARKET PROJECTIONS BASED ON ECONOMETRIC MODELS

The point of an econometric model is to include and forecast interdependencies or repercussions of different factors (e.g. on production and productivity). An econometric model is a system of behavioural equations and identities describing the interrelations of the national economy.

Behavioural equations reflect the response of the agents of the economy (e.g. private households' demand for different consumer goods). The parameters for these equations are estimated on the basis of empirical values from time series by means of statistical procedures. Since no economic time series can be explained in full, the equations include a residual variable. This is why they are called stochastic equations.

Identities precisely determine certain variables (e.g. the national product as the sum of private and public consumption) which must always be supplied. Thus they ensure that the model is consistent.

Every econometric model includes endogenous and exogenous variables. Exogenous variables are not explained by the model, but are determined from outside; they might include: developments abroad, policies, labour supply. Endogenous variables are explained by the model itself, either by recursive or by simultaneous models.

Table 5: Sectoral Structure of Employment in West and East Germany 1994 - 2000
- Results of the DIW Scenarios (1994) -

Sector	1994	2000		Shift 1994-2000				Struktur in %		
		in '000		in '000		in %			2000	
	in '000	Integration scenario	Stagnation scenario	Integration scenario	Stagnation scenario	Integration scenario	Stagnation scenario	1994	Integration-scenario	Stagnation-scenario
WEST GERMANY+D27										
Agriculture and forestry	810	800	800	-10	-10	-1,2	-1,2	2,8	2,6	2,7
Energy, mining	410	390	400	-20	-10	-4,9	-2,4	1,4	1,3	1,4
Manufacturing sector	8150	8650	8350	500	200	6,1	2,5	28,6	28,3	28,4
Construction	1920	2090	1900	170	-20	8,9	-1,0	6,7	6,8	6,5
Commerce	3820	4255	4100	435	280	11,4	7,3	13,4	13,9	13,9
Transport, communications	1660	1760	1710	100	50	6,0	3,0	5,8	5,8	5,8
Other services	6080	6835	6550	755	470	12,4	7,7	21,3	22,4	22,2
Governm., non-profit org., priv. househ.	5690	5770	5640	80	-50	1,4	-0,9	19,9	18,9	19,2
Total	**28540**	**30550**	**29450**	**2010**	**910**	**7,0**	**3,2**	**100,0**	**100,0**	**100,0**
EAST GERMANY										
Agriculture and forestry	190	150	160	-40	-30	-21,1	-15,8	3,1	2,5	3,0
Energy, mining	120	85	95	-35	-25	-29,2	-20,8	2,0	1,4	1,8
Manufacturing sector	1320	1390	990	70	-330	5,3	-25,0	21,7	23,1	18,3
Construction	730	690	650	-40	-80	-5,5	-11,0	12,0	11,5	12,0
Commerce	680	735	695	55	15	8,1	2,2	11,2	12,2	12,8
Transport, communications	510	380	370	-130	-140	-25,5	-27,5	8,4	6,3	6,8
Other services	1070	1235	1105	165	35	15,4	3,3	17,6	20,5	20,4
Governm., non-profit org., priv. househ.	1450	1350	1350	-100	-100	-6,9	-6,9	23,9	22,4	24,9
Total	**6070**	**6015**	**5415**	**-55**	**-655**	**-0,9**	**-10,8**	**100,0**	**100,0**	**100,0**

Source: Görzig/Gornig/Schulz 1994

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1. The IAB SYSIFO model[28]

1.1 Origins of the model

Since 1990 the IAB, in cooperation with research teams at the universities of Hamburg and Frankfurt/Main, conceived an econometric model to project the long-term development of the labour market and the structural changes of employment, this was SYSIFO (System for Simulation and Forecasting). At the same time it is the German contribution to the project of multi-country modelling LINK, in which econometric models of all economically significant countries are represented. By linking the models of the different national economies project LINK wants to represent the economic interaction between countries and to allow for international interdependencies in the model of the respective country.

The model has been regularly updated by the IAB to meet the requirements of labour market analysis and forecasting. One of the most important extensions was an econometric part disaggregated into 14 sectors for west Germany and a non-econometric model, linked to the western one and primarily based on the demand side for east Germany.

1.2 Structure of the SYSIFO model

SYSIFO as used by the IAB includes about 2200 time series and about 1350 equations, i.e. the model includes 1350 variables that must be determined endogenously (a large number of these are intermediary aggregates exclusively for the model's internal use). The model requires forecasting of almost 700 exogenous variables, 70 of these for the development of trade in the Federal Republic of Germany's major trading partners (through project LINK).

The basic model for the west may be described in six blocks.

- **Productive capacity/production potential:**

The production potential is defined as the national economy's output with regular utilization of machinery. Here the factor of capital is seen as the limiting production factor. The population and labour force structure and some other factors are determined exogenously.

- **Aggregate demand and circular flow:**

Macroeconomic demand consists of private consumption, investment, public consumption and exports - each disaggregated according to various groups of goods. The model considers the multiplier and accelerator processes used to determine macroeconomic demand. An input/output-based matrix permits the deduction of imports, output and employment according to 14 sectors from disaggregated macroeconomic demand.

- **Investment process:**

Investment has a twofold effect. The production of investment goods generates income which in turn helps to extend the utilization of existing capital stock, at the same time capital stock and production potential go up (capacity effect). In the model, investment

[28] for the following see: Barth 1995

is mainly a function of the degree of utilization, disposals (i.e. replacement for worn out investment goods) and the difference between the return on real capital and long-term interest rates.

- **Mechanism of prices and wages:**

Producer prices disaggregated according to sectors result from capacity utilization, production cost and the prices of foreign competitors on the German market. Nominal wages depend on the labour market situation, the inflation rate and the productivity gain. The latter is the result of technological progress and the change in prices of the input factors.

- **Interest rates and money market:**

The model assumes that the objective of price stability remains a valid one. The most decisive factors for money market interest rates are the inflation rate and the degree of capacity utilization.

- **International economic relations:**

Exports are disaggregated according to five main trading regions. Their development is mainly determined by exchange rates and the growth of the national product of the major trading partners. The actual figures are taken from the medium range projections of the respective countries of the LINK project. Nominal exchange rates are determined by the purchasing- power parity theory; i.e. that in the first stage real exchange rates will be considered to be fixed.

The time series currently available for the east German economy are rather short; in addition, the transformation process has so far prevented any stabilization. Therefore it is not yet possible to design a traditional econometric model for the east German economy. Thus the skeleton of the sub-model so far consists of the Tables of national accounting. Technical or institutional equations are added to this in the form of plausible fixes. At many points one assumes that there will be a gradual adaptation to the respective value for the western model. Those east German behavioural variables which are still mainly determined by policy (such as investment) are treated as exogenous variables.

1.3 The application of the model

The IAB uses SYSIFO for macroeconomic long-term projections and for policy simulation.

The main purpose of the long-term projections is to forecast the demand side of the labour market. The supply of labour is treated as an exogenous variable; this is the potential labour force which is the maximum supply available in boom periods, irrespective of the current economic or cyclical development. The model endogenously splits the difference between the potential labour force and the demand for labour into registered unemployment and hidden unemployment.

A variation of several exogenous variables allows the representation of scenarios for different views of alternative long-term trends. The point of departure for compiling alternative scenarios is a status-quo scenario where policies (e.g. taxation or social policies) are intentionally ignored. Certainly, a status-quo scenario is unrealistic. It does, however, indicate in which fields of policy active intervention will be required and is

therefore "ringing the alarm bells". At the same time it serves as a reference scenario for others which explicitly include policies.

Simulations serve to advise policy makers and to evaluate the policies adopted. Starting from a base-run generally one, possibly even several, exogenous variables are changed to do a simulation experiment. The difference between the result of the base run and the new result represents the simulated effect of a particular economic interference ("shock"), e.g. a tax increase's effect on employment. In view of the manifold simulation alternatives there is a particular onus on the economists using the model. In particular, it must be ensured that the major transmission mechanisms that are expected are really entailed in the formulation of the model's equations, whether the simulated measure is viable in the desired dimensions and whether an intervention with only one variable in isolation is permissible.

In a nutshell: econometric models are a suitable tool to make complex interrelationships visible. However, they cannot deliver fully-fledged forecasts. Finally, one must always be aware that a certain model is not reality but merely a simplified representation thereof. It is precisely this property that enables a filtering out of the main mechanisms for transmissions and provides an opportunity to discuss their conditions.

1.4 Results

The IAB is still working on the SYSIFO model, so the results discussed here are preliminary ones. Below we shall firstly explain the model-based results of the projection for total global labour demand until 2010 (i.e. not disaggregated into sectors) and compare it with the development of the labour force potential in the form of a global labour balance. More recent model results derived from 1994 are available for this purpose.

Secondly, first preliminary results of the SYSIFO model for the labour demand for the different sectors of the economy are reported. The base consists of model calculations up to the year 1992. Two scenarios - a base scenario and a structural change scenario - are selected. We must add that currently other scenarios are being calculated based on up-to-date data; the results are not available at the time of writing (autumn 1995).

1.4.1 Global labour market balance[29]

The labour market balance is the comparison of the potential labour force (PLF) with the number of available jobs, i.e. the working population. The PLF includes all people who would be working in economic boom times, when everybody who wants one can get a job. When the situation on the labour market is worse the PLF comprises both the working population and the registered and hidden unemployed ('discouraged workers'). The PLF depends on desires regarding employment (especially of women) and the demographic developments including migrations.

The labour market balance until 2010 in Table 6 shows a gradual mitigation of the global job deficit for west Germany. But this improvement is solely caused by the increase in employment, which slightly exceeds that of the PLF which will grow from 33.1m in 1994/2000 to 33.6m in 2010. While this will halve the number of of almost

[29] see IAB working paper, VII/1-KI of June 1995 (unpublished)

4.5m underemployed people in 1994 by 2010, still 2.3m people will be affected. Assuming that underemployment considers registered and hidden unemployment at a ratio of 2:1, over 1.5m registered unemployed will have to be expected in 2010 as well (in the yearly average of 1994 there were 2.6m).
In east Germany as well, the PLF is likely to grow, although not as much as in the west. At the same time the number of jobs will probably grow somewhat more, starting from the bottom level of 1994, underemployment will more than halve by 2010 (from 1.9m 1994 to 0.9m). These results are, however, subject to the condition that income and productivity will have come up to western standards by 2010.

1.4.2 The development of employment by sectors

Currently (autumn 1995) the only results available for the development of employment by sectors [30] are those of the preliminary scenarios for west Germany based on the SYSIFO model[31]. They reflect the status of calculations made in mid-1994. More recent results cannot be expected before the spring of 1996.

Table 7 in connection with Table A1 in the appendix presents the results of two scenarios: a base-scenario as reference and a 'structural change scenario' which will account for the sectoral shifts in production and employment induced by long-term structural changes. The SYSIFO model links the elements of the application of the national product and the contributions by the different economic sectors to gross value added as a reduced form of an input-output analysis. The input-output coefficients, which are reflecting the input interdependencies, remain fixed as in the base year (1992) in the base scenario, while the structural scenario assumes trend changes in 9 sectors[32].

The main results demonstrate the progressive shift of employment to the tertiary sector both in the base scenario and even more clearly in the structural-change scenario: its share of total employment is to move up from 58.4% (1992) to 61.3% or 62.7% respectively in 2005, while the secondary sector (1992: 38.5%; 2005: 36.8% or 35.5%) and the primary sector (1992: 3.1%; 2005: 1.9%) lose weight. This is accompanied by a loss of employment in the primary and secondary sectors of a total of -700,000 (base scenario) to 1.1m jobs (structural change scenario). This drop might, however, be offset by the additional jobs created in the tertiary sector, i.e. about 1.1m to 1.5m.

For the structural-change scenario the more detailed Table A1 (appendix) shows that record percentage reductions in employment occur in agriculture and forestry (-41%), extractive industry (-18%), foodstuffs and consumer goods (-12% or -11%). But also services might suffer employment fall-backs: in transport/communications by 7% and in banking/insurance by over 8%.

[30] based on the institutional classification of the national accounts
[31] see IAB working paper, VII/1 of 22 June 1994 (unpublished)
[32] Power industry, mining, basic materials, investment goods, consumer goods, construction, transport, communications, other services, banking, insurance

Table 6: Labour Market Balance for West and East Germany 1990 to 2010 - preliminary results of an IAB base scenario (in million people)

Year	West Germany			East Germany		
	Labour force	Labour force potential [1]	Balance [2]	Labour force [3]	Labour force potential [1]	Balance [2]
	1	2	1-2	3	4	3-4
1990	28,5	31,5	-3,0	8,8	9,1	-0,3
1992	29,5	32,8	-3,3	6,0	8,0	-2,0
1994	28,6 [4]	33,1	-4,5	6,0	7,9	-1,9
2000	29,6	33,1	-3,5	6,4	8,0	-1,6
2005	30,4	33,2	-2,8	6,7	8,1	-1,4
2010	31,3	33,6	-2,3	7,1	8,0	-0,9

1 registered unemployed + hidden unemployed - 2 negative = under employment or job shortage
3 excluding participants in job creation measures - 4 including subsidized employment

Notes
1990-1994 are effektive figures; 1995 is a an intermediate estimate of the IAB Short-term Projection (VII/2). IAB Short-term Projection for 1995. The scenario for west Germany takes trends and attitudes into account which existed up to now as well as forseeable policy measures.
The scenario for east Germany describes a trend directed towards the desired adaptation of earnings and productivity to west Germany up to 2010.

Basic assumptions on the development of economic growth, productivity and employment 1994/2010 : (averages changes in % p.a.)

	West Germany	East Germany
Real gross domestic product	1,8	6,0
Labour force productivity	1,2	4,9
Labour force	0,5	1,1

Source: IAB, Arbeitsbereich VII/1 (internal, preliminary documents)

Table 7: Labour Force by Sectors in West Germany 1992 - 2005
- Preliminary Results of the IAB/SYSIFO Model (Status: mid-1994) -

Sector; scenario	Labour force in 1000			Composition in %		Change
	1992	2005	Change	1992	2005	in % points
Primary sector [1]						
Base scenario	924	556	-368	3,1	1,9	-1,3
Structural change scenario	924	541	-383	3,1	1,8	-1,3
Secondary sector [2]						
Base scenario	11355	11023	-332	38,5	36,8	-1,7
Structural change scenario	11355	10633	-722	38,5	35,5	-3,0
Tertiary sector [3]						
Base scenario	17209	18352	1143	58,4	61,3	3,0
Structural change scenario	17209	18753	1544	58,4	62,7	4,3
Total						
Base scenario	29488	29931	443	100,0	100,0	-
Structural change scenario	29488	29927	439	100,0	100,0	-

1 Agriculture, Forestery - 2 Utilities, mining, manufacturing, construction - 3 Commerce, transport, communications, credit institutions, insurance and other services, private households, non-profit organiizations, government

Differences result from rounding

Source: IAB, Arbeitsbereich VII/1

2. The INFORGE model of Osnabrück University

2.1 Description of the model

The INFORGE model (Interindustry Forecasting Germany) is used within the scope of the international INFORUM association[33]. It distinguishes 58 industrial sectors and 58 product groups and their interdependencies. The industrial sectors are derived from the national accounts' institutional classification.

The application of the incomes of households is explained by the income generation in the different sectors. The input-output structures for this are variable. The demand for goods is broken down into exports, the demand of private households, public consumption, demand for investment goods, the demand for input and imports.

[33] for the following see: Meyer/Ewerhart, 1994

Demand is determined by prices which in turn depend on wages or the cost of labour, the cost of materials and the application of the primary production factors - labour and capital (Cobb-Douglas production function). Private households' consumer demand is determined by their disposable incomes (gross income minus deductions and transfers of the government). The government's production activity follows from its double function: on the one hand as provider of services, on the other hand in the form of the public budgets, receiving income in the form of taxes which it spends.

The model includes about 10,000 equations in total; the behavioural equations are estimated for the period after 1970 with reference to the annual data, however data for the entire base period are not available for all variables. Due to the integration into the INFORUM association almost all interdependencies with foreign countries are endogenously determined.

The model describes the west German economy; for east Germany a simple circular flow model coupled to the west German model is calculated because of a general lack of data.

2.2 Results for the global labour market until 2000[34]

The first preliminary scenario of the INFORGE model predicts an average GDP growth of 1.8% for the nineties for west Germany[35] which will be somewhat less than in the eighties (2.1% on average). Labour productivity of the national economy will improve by an average 2.1% from 1994 to 2000. Thus the productivity increase will exceed economic growth until 2000 causing employment (expressed in working hours) to fall consistently.

Assuming that the annual working hours of the labour force will be reduced by 0.58% p.a. the number of persons employed ('heads') increases by 0.4% p.a. from 1994 to 1995 and by 0.2% in the years up to 2000. When contrasting this with the changes in the labour force potential (according to the IAB)[36] this projection again confirms that the development of employment will be inadequate to take the pressure off the labour market. At the end of the day unemployment - after a slight decrease in 1994 - will reach about 3m (max.) in the period 1995 to 1997. According to the model higher unemployment than in 1994 will have to be expected still in 2000 (about 2.6m).

Briefly stated the model's results for east Germany are:
- average economic growth 1994-2000: + 9.5% p.a.;
- labour productivity: weaker by 13.4% (1993) down to 7.1% (2000);
- unemployment in 2000: about 1m.

The INFORGE model allows for several calculations simulating the consequences of economic policy. When discussing these the forecasters stress that the stagnation of wages will hardly affect the reduction of unemployment, although it might improve the attractiveness of Germany as a location for production: if real wages stop increasing the number of unemployed would go down by no more than 70,000. Shortening working

[34] Sectoral results were not yet available at the time of writing
[35] see Meyer/Ewerhart, 1994
[36] Barth/Klauder 1994

hours even more than assumed in the model could push unemployment in 2000 down to 1.78m, compared to 2m in the base variant.

Therefore the authors conclude that the employment problem is essentially a problem of growth which requires solutions in the form of structural and regional policies: establishing communication and information networks to improve the general conditions for research and development, improvement of basic research and its implementation - in their opinion these are the decisive criteria to upgrade Germany as an industrial location.

Part III

PROJECTIONS OF THE STRUCTURE OF ACTIVITIES AND QUALIFICATIONS OF THE ACTIVE POPULATION

Chapter 1

THE 1989 IAB/PROGNOS PROJECTION

1. Procedure and Methods Applied

1.1 Projection of activities

The manpower requirement projections according to sectors and activity fields[37] is based on the sectoral results of the 1989 IAB/Prognos projection (see above). 'Activities' (Tätigkeiten) are not synonymous with 'occupations' (Berufe): Activities describe a worker's main duties, i.e. they relate to job profiles and functions which occupations do not. Since 1973 activities have been surveyed biannually in the microcensuses[38]. However, the categories were redefined[39] after 1982. The supporting period for the projection is the years 1973-1985.

In order to link activities with industrial sectors the sectoral structure estimated according to the national accounts (institutional classification) had to be transformed into the sectoral structure according to the microcensus (functional classification). This mainly affected services which include a particularly high number of public institutions (e.g. education, science, culture, health care).

The 10 category activity classification of the microcensus was further refined by additional features. Additional features included occupation exercised, occupational status, working hours and earnings, status in the company and the division within the company. These features are also surveyed by the microcensus, some however, only since 1982. This results in a matrix consisting of 37 industrial branches x 34 activity groups, i.e. a total of 1258 cells to be projected. The marginal distribution according to industrial sectors is used as fixed by the transformed sectoral projection.

The projection involved a shift-share analysis forecasting the economic structural effect and the activity structural effect. The *economic structural effect* indicates the changes the structure of activities would undergo if only sectoral structures changed, i.e. if activity structures remained fixed in each sector. Vice versa the *activity structure effect* filters out the changes in the activity structures within each sector.

This projection - which was again calculated in three variants - provides the trend that will govern the sector-related changes of activity structures up to 2010. Simply extend-

[37] Prognos 1989

[38] 1983/84 is an exception,because the microcensus was cancelled then. The microcensus' results for activities were available for 1973, 1976, 1978, 1980, 1982 and 1985.

[39] See classification of the microcensus in the appendix

ing the trend into the future will, however, not do justice to the imminent technological and socio-economic changes, even more so, when these changes are already apparent, but have not been considered in past statistics. To overcome this defect expert ratings were included which define the potential positive or negative trend shifts in the trend for each individual activity, i.e. define and quantify the employment effect of the different factors. With the balance of each of the factors the 'pure' trend for an activity structure effect for each activity can be *modified* upwards or downwards.

The following factors were distinguished:

Technological aspects

a) *Organization and communications sector*:
- transport and communications;
- information and telecommunications;
- office and organizational.

b) *Automation and control sector:*
- production planning, design;
- manufacturing;
- testing and quality control procedures;
- integrated production systems including transport and warehousing.

c) *Process sector:*
- sector to work and process materials;
- process;
- integration of modules and components.

d) Materials sector.

Economic aspects

including: attitudes to sector, changes in the demand for goods and services, organization of production processes.

Government regulations governing production processes and agreements by the social partners

including: regulations for working and machine-running hours, regulations regarding environmental protection and European integration.

Demands on product quality

including: requirements for reasons of health, traffic safety, accident prevention, increasing quality awareness.

Special labour market situation

including; surplus or bottlenecks in certain fields of activity, demand for social/advisory services such as for the unemployed, measures to rationalize the use of labour, new forms to organize work.

Subsequently the projection of this modified activity structure effect is combined with the economy structure effect.

1.2 The 1991 qualification projection of the IAB

Attempting to subdivide further the sector/activity matrixes (with a total of 1,258 cells) into 5 qualification levels (which would mean 6,290 cells) as in the projection of manpower demand according to the highest-level qualification held, which was done by the IAB in 1991[40] would have been irresponsible, because a very high sampling bias had to be expected. This is why the 34 activity groups were aggregated into 10 activity fields, each of which was then subdivided into 5 qualification levels.

The trends of the resulting activity/qualification matrix, with a total of 50 cells per year, was extrapolated in several variants. The following were calculated for each of the three major variants of the IAB/Prognos projection (see above) according to sectors and for the modified trend projections of the activities:

a) a *status-quo variant* (as reference) with fixed proportions for the qualifications per activity;

b) two *global trend variants* of the overall qualification structure, i.e. disregarding activity-related developments;

c) two *activity-related trend variants* updating the qualification structure for each activity.

Different trend functions were used for each of the two variants b) and c):

- an exponential trend for the qualification shares, with a limit based on past experience predetermined for each qualification level;

- an exponential trend (Gompertz trend) for qualification shares, where these limits are automatically determined depending on changes during certain defined periods in the past.

The resulting shares are then integrated and proportionally normed to 1 (or 100%). Finally these percentages are multiplied with the absolute figures of the activity projection.

2. Results

The following discussion will be limited to the results of the activity structure's modified trend projection and the intermediate variant of the IAB/Prognos projection in order to keep within the confines of space. The results are summarized in the text. In doing so the apprentices/trainees who are considered as employed persons in the employment statistics and are included both in the national accounts and in the microcensuses are excluded.[41]

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[40] Tessaring 1991

[41] IAB/Prognos used a different procedure to project the apprentices: the proportion of apprentices in each age group of the population was kept constant and multiplied by the age-related results of the population forecast.

2.1 Development of activity structures in the economic sectors

The transformation of the sectoral definition of the national accounts (institutional classification) into that of the microcensus (functional classification) also changed the sectoral structures. Following the microcensus classification, about 1.1m (4.2%) of the working population belonged to the primary sector and almost 10m (39.7%) to the secondary sector. By comparison, employment in the tertiary sector was clearly higher at 14m (56%). The projection expects the proportion of the tertiary sector to climb still further up to 66% by 2010.

A look at the labour force's activity structure reveals that jobs are much more service-oriented than is expressed by the sectoral view as such. In 1985 65% of all workers were performing service-type work in their jobs and a further increase up to almost 72% is expected for 2010. Table 8 illustrates that service orientation has gained weight in the secondary sector as well (energy, manufacturing, construction). Almost 3.8m workers were performing services in the secondary sector in 1985, these are 38% of all people employed there. The proportion is estimated to become almost 43% by 2010.

Table 8: Labour Force by Economic Sectors and Activity Fields
1985 - 2010
- Results of the 1989 IAB/Prognos Projection (West Germany) -

Economic sector	Activity field: production-related activities	primary service activities	secondary service activities	Total
1985		(a) in 1000		
Primary sector	991.9	46.7	19.3	**1057.9**
Secondary sector	6175.6	2413.8	1366.9	**9956.3**
Tertiary sector	1581.1	8149.5	4302.5	**14033.1**
Total	**8748.6**	**10610.0**	**5688.7**	**25047.3**
2010				
Primary sector	553.2	38.9	32.5	**624.6**
Secondary sector	4840.4	1747.8	1886.1	**8474.3**
Tertiary sector	2176.6	8136.8	7311.6	**17625.0**
Total	**7570.2**	**9923.5**	**9230.2**	**26722.6**
1985		(b) in % of the ***entire*** labour force		
Primary sector	4.0	0.2	0.0	**4.2**
Secondary sector	24.7	9.6	5.5	**39.7**
Tertiary sector	6.3	32.5	17.2	**56.0**
Total	**34.9**	**42.4**	**22.7**	**100.0**
2010				
Primary sector	2.1	0.1	0.1	**2.3**
Secondary sector	18.1	6.5	7.1	**31.7**
Tertiary sector	8.1	30.4	27.4	**66.0**
Total	**28.3**	**37.1**	**34.5**	**100.0**

Source: Table (appendix)

'Growth in services' thus does not only entail the growth of the tertiary sector, but also the growth of activities involving services. Service activities can be summed up (for details see: Table 9) in three groups: 'production-related activities', 'primary service activities' and 'secondary service activities'.[42]

Production-related activities are characterized by a relatively direct relationship to the production of physical goods. This includes handling, control, maintenance and setting of machines and production plant, extracting natural resources, mining and the processing of products, as well as repairing or restoring machinery, plants or buildings.

In general, *services* can be defined according to their objectives:[43]

- *services for distribution:* the link between production and consumption (e.g. commerce, transport, communications and financial services);

- *services for consumption:* mainly to meet directly the demands of households, e.g. entertainment, cleaning, body hygiene, catering;

- *services for investment:* to optimize production processes by applying science such as research, development, education, planning;

- *services for regulatory and organizational purposes:* to maintain and upgrade the organizational and institutional framework and the social/political balance of interests (organization, coordination, law, policing, protecting).

It is difficult, though, to assign the activity matrix defined according to the microcensus in practice, because the different activities surveyed with the microcensuses' matrix overlap or are similar. This is why the microcensuses' service activities were subdivided into two groups:

- *Primary service activities*, which are relatively close to production or distribution, maintain the flow of production in the national economy or are directly consumed. These are mainly the distribution and consumption services described above.

- *Secondary service activities*, which are mainly striving to improve the quality of industrial production by promoting and utilizing human capital or to maintain the overall set-up of society and economy. This involves the services for investments and regulatory purposes.

An examination of the sectors and activities set out in Table 8 reveals different types of changes, depending on perspective. The diagram below sets out the fields according to which this 3x3 matrix can be classified:

[42] cf. Wolff 1990
[43] for the following cf. ibid, p. 66 et.seq.

Sector	Activity fields		
	production-related activ. (PRA)	primary service activities (SVA)	secondary service activities (SVA)
Primary sector (PRS)	1	2	3
Secondary sector (PRS)	4	5	6
Tertiary sector (SVS)	7	8	9

The primary and secondary sectors are denominated production sectors (PRS), the tertiary sector as service sector (SVS), production-related activities as (PRA) and primary and secondary service activities as service activities (SVA). This results in the following categories and proportions (in % of all persons employed) for 1985 and 2010:

Activity x sector	Matrix cells	1985	2010
1. SVA in SVS	(8+9)	49,7	57,8
2. SVA in PRS	(2+3+5+6)	15,4	13,8
3. Total SVA	(2+3+5+6+8+9)	65,1	71,6
4. PRA in PRS	(1+4)	28,7	20,2
5. PRA in SVS	(7)	6,3	8,1
6. Total PRA	(1+4+7)	34,9	28,3
7. Total PRS	(1+2+3+4+5+6)	44,0	34,0
8. Total SVS	(7+8+9)	56,0	66,0

Services as such, as performed by service companies (line 1) will move up from a share of almost 50% (1985) to almost 58% (2010). When including the services performed in the production sectors (line 2) the proportion increases from 65% to 72% between 1985-2010 (line 3). Production sectors and activities will lose out accordingly (line 5): their share drops from 29% to 20%. Only in the service industries (line 5) will it increase slightly. All in all the share of production activities (line 6) shrinks from 35% down to 28%.

2.2 Projections of the 'activity setting'

Below we shall take a more detailed look at the general 'setting relating to activities' by referring to the extensive 1989 IAB/Prognos projection results which are subdivided into 33 individual activity groups[44] (Table 9).

We can observe that among the *production activities* it is especially the activities 'extracting, manufacturing' (both those very close and somewhat removed from the original production process) and 'repairing, restoring' that will diminish both in absolute and in relative terms. Semi- or fully automatic machines perform more and more of the manual and physical work, especially auxiliary functions and technical tasks. Leadership

[44] excluding apprentices (activity group 34)

functions, on the other hand, show a slight increase, except in primary production and industry.

Controlling hi-tech machinery and modern, flexible manufacturing plant requires specialists who bear a high degree of responsibility in view of the high cost of production breakdowns and also for maintaining manufacturing processes. Consequently they need to be sufficiently qualified to live up to this responsibility. This is true for manufacturing companies, but also increasingly for service enterprises with complex and frequently networked data processing equipment. Therefore the activity group 'setting, controlling, operating plant and machinery' is the only field within production activities for which a higher demand for labour is anticipated.

The development of *primary service activities* is not homogeneous either. The general trend is that almost all simple tasks and auxiliary functions are becoming obsolete. This is especially true for sales assistance in trade, simple tasks of any kind, clerical functions in the office and auxiliary functions in warehousing and transport. By contrast there is clearly a higher demand for specialists and executives in these fields. Reorganization and greater integration of operative functional divisions require more people to deal with coordination and integrated control and analysis of operational processes. On balance the higher number of specialists and executives can make up for the loss of simple jobs in trade and sales. In offices and for general services more simple jobs are lost than additional qualified personnel is required.

For all sub-groups the *secondary service activities* show above-average increase rates. The strongest growth in percent is experienced by activities for consulting, caring, training and nursing, particularly in law and publishing. Consulting and training have relatively low growth rates; in education this is due to the lower numbers of students expected in the long-term and the trend that more training is becoming continuing in-company training. Consulting and caring is making relatively little headway as a consequence of tight public budgets, because most of these people work in the public sector.

2.3 How the demand for the different qualifications will develop until 2010

As stated above, the IAB 1991 projection of manpower demand according to qualifications is based on the 1989 IAB/Prognos activity projections. In this case the 33 activity groups were summed up in 10 main activity[45] groups. The supporting period which had ended in 1985 for IAB/Prognos was extended to include 1987.

In analogy to the effects of economic sectors and activities in the IAB/Prognos projection the two elements 'activity effect' and 'qualification effect' can be distinguished. The *activity effect* indicates how the structure of qualifications will change simply because of the changes in the structure of activities - when the proportions of each qualification in each activity remain unchanged. The *qualification effect* in turn, is shown when the structure of qualifications change in each activity in line with the trend, here the sum of the shares of all qualification levels per activity must be 100%.

[45] The field 'regulations, safety, application of law' which was contained in two different activity groups in IAB/Prognos was taken out to constitute a field of its own.

Table 9: Labour Force by Activity Groups 1985 and 2010

- Results of the 1989 IAB/Prognos Projection (West Germany) -

Activity group	in 1000 people		Structure in %		Changes 1985/2010	
	1985	2010	1985	2010	in %	in 1000
Setting. controlling. operating plantsmachines	**2054**	**2882**	**8.2**	**10.8**	**40.3**	**828**
- in manufcaturing companies	1772	2270	7.1	8.5	28.1	498
- in service companies	282	611	1.1	2.3	116.7	329
Extracting. manufacturing. producing	**5135**	**3363**	**20.5**	**12.6**	**-34.5**	**-1772**
- as helper	2394	1324	9.6	5.0	-44.7	-1070
- as skilled worker for:			0.0	0.0		
-- primary production	130	96	0.5	0.4	-26.2	-34
-- crafts	814	569	3.2	2.1	-30.1	-245
-- industrial production	656	395	2.6	1.5	-39.8	-261
-- other fields	92	103	0.4	0.4	12.0	11
- with management functions			0.0	0.0		
-- primary production	413	222	1.6	0.8	-46.2	-191
-- crafts	302	314	1.2	1.2	4.0	12
-- industrial production	201	182	0.8	0.7	-9.5	-19
-- other fields	132	159	0.5	0.6	20.5	27
Repairing. restoring	**1560**	**1325**	**6.2**	**5.0**	**-15.1**	**-235**
Commerce. selling. brokerage as:	**2618**	**2800**	**10.5**	**10.5**	**7.0**	**182**
- sales assistants	950	748	3.8	2.8	-21.3	-202
- skilled salesperson. buyer	1022	994	4.1	3.7	-2.7	-28
- specialist and/or management functions	647	1058	2.6	4.0	63.5	411
Clerical work	**4134**	**3307**	**16.5**	**12.4**	**-20.0**	**-827**
- simple office work	1452	1034	5.8	3.9	-28.8	-418
- clerks in charge of certain matters	2159	1603	8.6	6.0	-25.8	-556
- specialist clerks in charge of certain matters	343	417	1.4	1.6	21.6	74
- clerks in charge with management functions	180	252	0.7	0.9	40.0	72
General services	**3857**	**3817**	**15.4**	**14.3**	**-1.0**	**-40**
- helpers in cleaning/catering	732	851	2.9	3.2	16.3	119
- management functions in cleaning/catering	269	283	1.1	1.1	5.2	14
- helpers in warehousing/transport	1308	880	5.2	3.3	-32.7	-428
- management functions in warehousing/transport	652	733	2.6	2.7	12.4	81
- protective service activities	896	1070	3.6	4.0	19.4	174
Research. development. planning	**1270**	**1912**	**5.1**	**7.2**	**50.6**	**642**
- assistant functions	610	986	2.4	3.7	61.6	376
- qualified activities	660	927	2.6	3.5	40.5	267
Organization and management	**1442**	**2517**	**5.8**	**9.4**	**74.5**	**1075**
Caring. counselling. training. nursing	**2977**	**4800**	**11.9**	**18.0**	**61.2**	**1823**
- legal advice	191	447	0.8	1.7	134.0	256
- non-professional caring/counselling/nursing	1188	1402	4.7	5.2	18.0	214
- professional caring/counselling/treatment	245	359	1.0	1.3	46.5	114
- publishing. artistic work	137	371	0.5	1.4	170.8	234
- teaching. training. educating	737	1045	2.9	3.9	41.8	308
- other counselling/training functions	479	1176	1.9	4.4	145.5	697
Total labour force (excl. apprentices)	**25047**	**26722**	**100.0**	**100.0**	**6.7**	**1675**

Source: Prognos and others. 1989

The key results of the qualification projection for the three major fields of activities (production-related, primary and secondary service activities) are summarized below. These are only the results of the two trend variants of activity-specific qualification structure. For the detailed results please refer to Table A2 in the appendix.

The labour force[46] was clearly becoming better qualified in the period 1976[47] - 1987. The percentage of workers with completed apprenticeship or in-school vocational training (betriebliche or berufsfachschulische Ausbildung) ('skilled workers') of the entire labour force went up from 51% to 58%, that of graduates from continued training at Fach-, Meister- und Technikerschulen[48] ('intermediate qualifications') from 6.5% to 8% and 'higher education graduates' (university and Fachhochschule higher education) from 7% to 11%. In contrast, the share of workers without formal training ('unskilled') dropped from 35% to 23%.

The decrease in most *production-related activities* forecast by IAB/Prognos, where most unskilled (1987: 30%) and skilled workers (1987: 66%) are employed, will, of course, have repercussions on the demand for such qualifications: the demand for unskilled workers will drop by -42 to -47% according to both variants. The (negative) activity effect for skilled workers is partially offset by the effect of the rising qualification level. As a result the demand for skilled workers will essentially stagnate. A slight increase in demand can be noted for intermediate qualifications (+6% to +24%), however, these forecasts are relatively uncertain. The same applies to higher education graduates, but this field is of minor significance in quantitative terms. Table 10 illustrates the development of the structure of qualifications in production-related activities.

Table 10: Qualifications Demanded in Production-Related Activities until 2010 - Results of the extended 1989 IAB/Prognos projection (West Germany); in 1000 -

Year		No formal training		Apprenticeship training, Berufs-Berufsfach-schule		Fach-, Meister-, Technikerschule		Fachhoch-schule		University		Total
	Dim	TR 1	TR 2	TR 1	TR 2	TR 1	TR 2	TR 1	TR 2	TR 1	TR 2	TR 1; TR 2
1976	1000	4161,2		4760,2		545,5		40,7		27,7		9535,2
1987	1000	2738,8		5395,0		694,5		80,0		49,8		8956,1
2000	1000	2029,5	1873,5	5489,8	5532,2	737,3	824,1	99,7	112,3	48,8	63,0	8405,1
2010	1000	1585,8	1458,7	5359,7	5332,8	734,9	860,1	110,5	119,4	48,3	68,3	7839,3
'10-'87	1000	-1153,0	-1280,1	-35,3	-62,2	40,4	165,6	30,5	39,4	-18,1,5	5	-1116,8
'10/'87	%	-42,1	-46,7	-0,7	-1,2	5,8	23,8	38,1	49,3	-37,3,0	1	-12,5

Source: Tessaring 1991

[46] Again apprentices are excluded as a rule.

[47] Although microcensus data is available for activity projections since 1973, they were not surveyed for qualifications in comparable categories until 1976.

[48] For explanation of the terms for educational institutions and certificates please refer to p. 69 - p. 71.

he IAB/Prognos projection foresees a slight reduction in employment in primary service activities as a whole; but this is true to different extents for individual groups of activities. Qualification structures develop somewhat ambivalently: on the one hand the overall field is going down, while there is a clear trend towards higher qualification requirements in specific sub-groups.

As for production activities it is again the unskilled workers who will suffer most. While they still accounted for one quarter of the people employed in 1987, their employment will decrease by -40% to -50%. Thanks to the compensating qualification effect, employment of skilled workers will generally stagnate and that of people holding intermediate qualifications will rise slightly by +8% to +19%. The demand for higher education graduates will expand somewhat more, although their main concentration is not in the field of primary service activities (Table 11).

Table 11: Qualifications Demanded in Primary Service Activities until 2010 - Results of the extended 1989 IAB/Prognos projection (West Germany); in 1000 -

Year	Dim	No formal training		Apprenticeship training, Berufsfachschule		Fach-, Meister-, Technikerschule		Fachhochschule		University		Total
		TR 1	TR 2	TR 1	TR 2	TR 1	TR 2	TR 1	TR 2	TR 1	TR 2	TR 1; TR 2
1976	1000	3206,6		5332,3		402,2		129,2		116,7		9187,0
1987	1000	2396,1		6459,0		462,2		231,1		209,8		9758,2
2000	1000	1807,4	1713,5	6548,2	6608,0	487,6	493,2	269,8	274,0	260,8	285,2	9373,8
2010	1000	1448,3	1194,4	6444,5	6580,5	498,2	552,1	301,6	314,9	292,7	343,5	8985,3
'10-'87	1000	-947,8	-1201,7	-14,5	121,5	36,0	89,9	70,5	83,8	82,9	133,7	-772,9
'10/'87	%	-39,6	-50,2	-0,2	1,9	7,8	19,5	30,5	36,3	39,5	63,7	-7,9

Source: Tessaring 1991

Most of the growth springs from secondary service activities which are at the same time characterized by an upgrading of the qualification level. In this case a positive activity effect and a positive qualification effect are having the same thrust, reinforcing each other. As a consequence the absolute demand for unskilled workers remains constant, especially due to the positive activity effect (-10% to +20%). Skilled workers benefit most as demand for them will increase by 40% to 53%. The demand for workers with intermediate qualifications might experience a well-above-average growth of 85% to 100%, likewise for higher education graduates. For these the improvement for Fachhochschule graduates will be +107% to +111% and for the university graduates +83% (table 12).

Table 12: Qualifications Demanded in Secondary Service Activities until 2010
- Results of the extended 1989 IAB/Prognos projection (West Germany); in 1000 -

Year	Dim	No formal training		Apprenticeship training, Berufs-fachschule		Fach-, Meister-, Technikerschule		Fachhoch-schule		University		Total
		TR 1	TR 2	TR 1	TR 2	TR 1	TR 2	TR 1	TR 2	TR 1	TR 2	TR 1; TR 2
1976	1000	1181,7		2511,2		652,3		368,7		1112,2		5826,1
1987	1000	769,6		2899,4		826,4		668,5		1535,4		6699,3
2000	1000	789,3	941,7	4072,1	3778,4	1309,4	1394,5	1142,6	1183,6	2407,6	2422,8	9721,0
2010	1000	699,5	925,5	4445,7	4049,9	1525,7	1656,5	1384,8	1452,6	2830,9	2802,3	10886,6
'10-'87	1000	-70,1	155,9	1546,3	1150,5	699,3	830,1	716,3	784,1	1295,5	1266,9	4187,3
'10/'87	%	-9,1	20,3	53,3	39,7	84,6	100,4	107,2	117,3	84,4	82,5	62,5

Source: Tessaring 1991

The developments in the demand for qualifications in all fields point to the following structural changes:

The number of jobs for *unskilled workers* would dwindle from 5.9m (1987) to 3.6 to 3.7m by 2010. Thus their share of total employment will drop from 23% to roughly 13%. Most of the jobs are lost because of the recession in production activities: these alone account for almost half of the reduction in demand. In addition the higher qualifications are demanded across the board in all fields, whether they are going up or down, which further accelerates the abolition of jobs for unskilled workers.

For *skilled workers* the projection predicts essentially a stagnation of their share in total employment. Employment increases in secondary service activities are mostly offset by reductions in primary services (especially office work) and in production activities (except for machine and plant control). The requirement for higher qualifications does not cause above-average growth of the skilled-worker demand in all of the individual activities. Therefore the increase does not exceed the job increase (+9%) forecast by IAB/Prognos for the economy as a whole. All in all the demand for skilled workers should increase by 1.2 to 1.5m; that is by 8% to 10%. Skilled workers will make up almost 60% of the total demand in 2010 which is roughly the same as in 1987 the first year of the forecast (58%).

The demand increases for workers with *intermediate qualifications*, which are generally obtained by further training after an in-plant or in-school first training (e.g. master craftsmen or middle-management qualifications) will be above-average. Here changes of the structure of activities and the higher qualification demands coincide. The reason might be that in many fields of activities in which tasks are becoming more sophisticated, an upgrading of initial vocational training by vocational further training is a must. From 1987 - 2010 demand for intermediate qualifications will grow by 550,000 to 730,000 jobs (+39% to +55%); roughly 10% of all jobs would then require a qualification at the intermediate level.

The gains in employment in secondary services and the higher qualifications required in that and other fields are highly favourable for *higher education graduates*. At this level the demand for *Fachhochschule graduates* should almost double, their share of total employment would go up from 3.9% (1987) to almost 7% (2010). The upswing for *university graduates* will not be quite as pronounced, but still above-average. Their share of total employment goes up from 7% to 11%-12% in the period 1987-2010. This means 1.5m or almost +80% more jobs.

Table 13 summarizes the results of the qualification projection.

Table 13: Projection of the Qualification Demand until 2010 - Results of the extended 1989 IAB/Prognos projection (West Germany) -

Level	197	1987	2010		Shift 1987/2010				Qualification Structure			
									1976	1987	2010	
	ACTUAL		TR 1	TR 2	TR 1	TR 2	TR 1	TR 2	ACTUAL		TR 1	TR 2
	in 1000 employed persons						in %					
no formal	8550	5905	3636	3461	-2269	-2444	-38,4	-41,4	34.8	23.2	13.6	13.0
Apprenticeship	12604	14751	15735	15477	984	726	6,7	4,9	51.3	58.0	58.9	57.9
Berufsfachschul												
Fach-, Meister-, Technikerschu.e	1600	1983	2638	2937	655	954	33,0	48,1	6.5	7.8	9.9	11.0
Fachhochschule	539	980	1710	1801	730	821	74,5	83,8	2.2	3.9	6.4	6.7
University	1257	1795	3003	3048	1208	1253	67,3	69,8	5.1	7.1	11.2	11.4
Total	24548	25414	26723	26723	1309	1309	5,2	5,2	100.0	100.0	100.0	100.0

Notes: Labour force excl. apprentices; intermediate variant of the 1989 IAB/Prognos Projection
TR 1, TR 2:activity-related trend of qulification structure
Source: Tessaring
1991

Chapter 2

UPDATING THE IAB 1994 ACTIVITY AND QUALIFICATION PROJECTIONS

In 1993/94 the IAB updated its activity and qualification projections to determine the manpower demand with respect to activities and qualification levels until 2010[49]. The new federal German states could not yet be considered, though. The update was made, because the 1989 and 1991 microcensuses provided more recent data which also covered the first years after the fall of the wall (1989) and Germany's reunification (1990).

[49] Tessaring 1994

The examination of activity structures revealed that some took a different course in the 1989-1991 period from the one they had followed in the previous period. It was remarkable that production activities and services receded at a slower pace and in some cases even gained momentum. The same is true for the share held by unskilled workers. This might be attributed to the economic boom after reunification ('the unification boom'): at first, trade, construction, transport and the manufacture of simple consumer goods benefited from the enormous demand created by the desire to catch up which existed in the east of Germany.

Whether this unification boom is a permanent feature or a short-lived one is an open question, though. Likewise the long-term implications of the subsequent recession for the nature of labour demand cannot yet be predicted.

1. Procedure and method

This is why three variants were calculated, both for the activity projection and for the qualification projection. The lower variant assumes that the 1989-1991 development is a sustained one and thus the trend shifts for some activities and qualifications. The upper variant assumes that the unification boom was a temporary phenomenon and that activities and qualifications will revert to their former trend. The intermediate variant attributes less weight to the unification boom than the lower variant; at the same time there is a more obvious deviation from the long-term trend.

The update considered neither the sectoral development, nor the modifications of trends originated by the technological and socio-economic factors explicitly contained in the 1989 IAB/Prognos projection. Rather, structural trends characterizing the changes of activities were calculated and projected, and subsequently the share held by each qualification in each activity was forecasted.

Most of these trend functions were non-linear trends (exponential or logistic functions) considering saturation limits of the shares. In some few cases linear trends were used, if their quality of adjustment was much superior to that of the non-linear functions.

The trend functions are as follows:

$$T = a \cdot f(t) + b$$

where: $f(t) = t$ (linear trend)

$f(t) = p^* / (1 + e^{wt})$ (exponential trend)[50]

$f(t) = p^* / (1 + e^{(p-wt)})$ (logistic trend)

w and p as growth coefficients[51], t as point in time ($t > 0$) and p^* as saturation point ($0 \leq p^* \leq 1$). Parameters a (gradient) and b (constant) are determined by regression equations.

[50] For values of t between 0 and $+\infty$ the function is either monotonously rising or falling, depending on the exponent's sign.

[51] w and p were iteratively varied until the highest correlation coefficient resulted, whereby the saturation range $0 \leq p^* \leq 1$ had to be observed.

These trend functions were selected assuming that the structures of activities and qualifications of the total economy will change over a relatively long period. It was further assumed that the demand for labour according to qualifications is related to the size and nature of the supply of labour, especially the new supply: the expansion of education in the last 20 years will most probably trigger structural changes in the demand for labour - at first extreme and later more moderate changes. The shares will then move towards a 'physical' saturation point which cannot be exactly defined beforehand.

To anticipate activity structures or activity-specific qualification structures several variants were calculated. The lower variant extends the conditions prevailing in 1991 almost unchanged. Although the resulting trends conform relatively well to the real empirical values for 1976-1991 in this variant, it seems highly improbable that the structures will remain unaltered in view of the dynamic changes that the activity and qualification structures underwent in the years prior to 1991. Thus the lower variant should be considered as a reference variant for the other variants, even though these do not conform optimally all cases. The intermediate variant includes the structural changes of recent years and the upper variant those of the entire period 1976-1991.[52]

After they had been added up and standardized to 1 (or 100%) the activity structures or activity-specific qualification structures were multiplied with the absolute figures for labour demand[53] as forecast by Prognos in the 'Germany Report 1993'[54] (see above), Thus sectoral changes of labour demand are also implicitly considered.

2. Structural changes in labour demand until 2010: projection results

The results of the activity and qualification projections deviate from the 1989 and 1991 IAB/Prognos projections in some aspects. These deviations are not only due to the fact that no technological and socio-economic effects on the activity fields' development were especially allowed for, but also to the fact that they evolved differently after 1987 (the last year with actual data for the 1991 projection) than was predicted at the time.

It is to be expected, though, that the activity structure of 1991 (the last year providing actual values) characterized by a thriving economy and the reunification boom, which affects the lower, but also the intermediate variant quite heavily, might distort long-term trends. The result might be a two-fold distortion: for one, the high utilization of capacity in boom times makes the traditional branches of the economy become relatively more important. On the other hand, certain west German sectors such as trade and other services benefited more from the structural deficits and the desire to catch up in east Germany than others.

This also affects the development of activities in these industries, particularly the relatively higher increase or more moderate decrease of the share of production-related activities (extracting, manufacturing and construction) and primary service activities (general services, trade/selling, transport and others). Therefore there is ample reason to believe that the intermediate and upper variants for the activity trends which do not focus as much on 1991, will be more plausible than the lower variant.

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[52] Therefore the upper variant is the one that corresponds most nearly to the earlier IAB/Prognos projections.

[53] On the basis of a projection of the number of apprentices according to the total educational accounts of the IAB, apprentices were excluded.

[54] Prognos 1993

2.1 Manpower demand according to fields of activity

By 2010 the share of production activities (extracting/manufacturing, controlling machines/plants, repairing) of total manpower demand might fall from 33.4% (1991) to almost 30% or a good 28% (Table 14). In absolute terms this means the loss of 1.0 to 1.2m jobs. It is striking that the deterioriation of production activities is exclusively due to the decreasing share of the field 'extracting/manufacturing': activities in the field of control of plant and machinery can clearly boost their share (from 8.2% to 9.5 to 10.7%) and repair moves up slightly from 6.1% to 6.3% to 6.4%.

Primary service activities (trade/selling, office work, general services) might stagnate both regarding shares (about 39%) and absolutely at 11m jobs in the projection period. In this field of activities trading and selling will slightly move up to 11%, while general services and office work will go down somewhat; IAB/Prognos (1989) forecasted a much stronger decline in office work. The stagnation predicted by the new projection might be caused by the boom effect of 1991 and/or the restructuring within this field of activities, e.g. routine work (typing, calculating, booking) is replaced by integrating tasks using information and communication technologies which upgrades these tasks, although less manpower is used.

The share of secondary services (research/development, organization/management, security/law, training/counselling/informing) moves up from 27% (1991) to 31.5% to 32.4% in 2010. This translates into 1.4 to 1.6m additional jobs; which is slightly less than predicted by IAB/Prognos in 1989. But the development within secondary services will be heterogenous. Organization and management has the strongest relative increase (from 6.3% to 9.1 or 9.5%); which amounts to 800,000 to 900,000 additional jobs. The wide field of training, counselling and information provision will also expand: their share might climb from almost 12% to 14.6%, i.e. by 1.8m jobs.

The share of R&D seems to stagnate at around 5%. This might be due to the less intensive pursuit of R&D in recent years, but also to a shift within this field of activities, e.g. measuring, testing and drawing being replaced by analytical and planning/research as such. The field of security and law will slightly drop from 3.8% to 1.7-3.1%.

All in all this update confirms that the trend towards services, most of all human capital-intensive secondary services, will persist. The shift might not be as pronounced as expected by the 1989 IAB/Prognos projection, though. This is especially true for primary services the share of which will stagnate at around 40%. The present projection indicates a more hesitant increase of secondary services (to about 32%) than estimated at the time. Likewise the share of production-related activities drops to almost 30% which is not as drastic as expected by the IAB/Prognos projection.

2.2 Projection of the qualifications demanded for specific activities

Just as for the composition of activities several variants for the composition of qualifications in the different activities were calculated in the projection. These are taking the last years with actual data available more or less explicitly into account. To keep the results manageable the lower, intermediate and upper variants of the activity projection are linked to the corresponding variant of the qualification projection. This should cover the range of the future demand for qualifications from today's perspective[55].

[55] A status-quo variant was calculated in addition. In this variant the qualification structure of 1991 is frozen for the intermediate activity variant and multiplied by the figures of the activity projection.

Table 14: Projection of the Activity Structure of the Labour Force*) in the Former FRG until 2010
Results of the 1994 IAB projection

Focus of the activity	Number in '000				Structure in %			
	1991	2010			1991	2010		
	Actual	lov	inv	upv	Actual	lov	inv	upv
Extracting/manufacturing	5308	5049	3531	3489	19	18	13	12
Controlling plant/machinery	2263	2377	2999	2662	8,2	8,5	10,7	9,5
Repairing	1677	1785	1766	1785	6,1	6,4	6,3	6,4
Production-related activities	***9248***	***9211***	***8295***	***7937***	***33,4***	***32,9***	***29,6***	***28,3***
General services	3297	3170	3083	3167	11,9	11,3	11,0	11,3
Commerce/selling	2973	2965	3114	3111	10,7	10,6	11,1	11,1
Office work	4708	4728	4708	4728	17,0	16,9	16,8	16,9
Primary service activities	***10978***	***10862***	***10905***	***11005***	***39,7***	***38,8***	***38,9***	***39,3***
Research/Development	1386	1424	1424	1457	5,0	5,1	5,1	5,2
Organization/Management	1738	1880	2550	2668	6,3	6,7	9,1	9,5
Safety/Applying the law	1058	717	757	862	3,8	2,6	2,7	3,1
Training/Advice/Information	3253	3932	4094	4094	11,8	14,0	14,6	14,6
Secondary service activities	***7435***	***7952***	***8825***	***9082***	***26,9***	***28,4***	***31,5***	***32,4***
Total manpower demand	**27662**	**28025**	**28025**	**28025**	**100,0**	**100,0**	**100,0**	**100,0**

*) excluding apprentices

lov=: lower variant, inv= intermediate variant; upv= upper variant

Source: Tessaring 1994

According to these results the trend towards qualified and highly qualified workers will continue in all activities; this trend works against the people without any formal training (Table 15).

In *production activities* the percentage of people with vocational training and further training (apprenticeship/full-time vocational school, trade and technical schools) might go up from 71.5% (1991) to 81-83% in 2010; there will be few additional jobs for higher education graduates. In absolute terms employment will not expand, because the number of jobs is bound to shrink in this field of activities. Those that will suffer most are people who have not completed any training.

In the field of *primary services* the demand for people with vocational training might increase from 72% to 77-80% and with higher education from almost 6% to over 9-11% in 2010. Despite the general stagnation of this field of activities both of these levels of qualifications will experience an increase in employment in absolute terms to the detriment of the unskilled.

In *secondary services* both effects, higher overall share and more exacting demands on qualifications reinforce each other. Higher education graduates who have traditionally been strong in these activities will benefit most: their share might increase from 35% (1991) to 40% (2010). In absolute terms the employment of vocationally trained workers will expand, but will remain in the same proportions of 56-58%.

2.3 Conclusions regarding the demand for qualifications

When summarized the results of projections for activities and qualifications for all activities according to qualification levels are similar to those of former structural projections (Table 16).

The demand for unqualified labour (i.e. those without formal training) is shrinking even more strongly according to the updated projection than according to the 1991 IAB projection. While in 1991 every fifth worker had no formal training, their share will have dropped to 10-12% by 2010. In absolute terms employment opportunities for this group will fall from 5.6m in 1991 to 2.7 to 3.3m in 2010; this means a loss of 50% of all unskilled jobs.

Skilled workers having completed an in-plant or full-time vocational school training will be more sought after. Their share might rise from 59% in 1991 to about 63-64% in 2010. This translates into 1.2 to 1.5m additional jobs over the entire projection period. This is a below-average increase compared to that for higher qualified workers (see below) and is caused by contrary shifts in activities and qualifications: the receding or stagnating activity groups in production-related and primary services partially eat up the increase in the skilled workers' share. In many industries new forms of the organization of work may also cause a stagnation or below-average increase of the demand for skilled workers.

The demand forecast for the intermediate qualification level shows to what extent vocational further training in trade, technical and master craftsmen schools might play a role as an addition to initial vocational training. Between 1991 and 2010 jobs should increase by 14-19% or 400,000 which is a growth from 8.4% (1991) to almost 10% (2010) of total demand. Potential substitution processes have been ignored here, such as

Table 15: Activity-related Structure of Qualifications of the Labour Force (1) in the Former FRG 1991 - 2010 (in %)

- Results of the 1994 IAB-Projection -

Field of activity	1991						2010					
	Total	no formal training	Apprentic. Berufs-fachschule	Fach-, Meister-, Techn.sch.	Fach-hoch-schule	Univer-sity	Total	no formal training	Apprentic. Berufs-fachschule	Fach-, Meister-, Techn.sch.	Fach-hoch-schule	Univer-sity
lower variant												
Produktionstätigkeiten	100,0	26,8	63,0	8,5	1,0	0,7	100,0	17,3	70,7	10,1	1,1	0,8
Primäre Dienstleistungstätigkeiten	100,0	22,4	66,7	5,3	2,8	2,9	100,0	12,9	72,2	6,2	4,5	4,2
Sekundäre Dienstleistungstätigkeiten	100,0	8,9	43,1	12,8	9,8	25,3	100,0	3,4	44,4	13,1	10,6	28,5
Arbeitskräftebedarf insgesamt	**100,0**	**20,1**	**59,2**	**8,4**	**4,1**	**8,2**	**100,0**	**11,7**	**63,8**	**9,4**	**5,1**	**10,0**
intermediate variant												
Production-related activities	100,0	26,8	63,0	8,5	1,0	0,7	100,0	16,6	70,6	10,4	1,2	1,2
Primary service activities	100,0	22,4	66,7	5,3	2,8	2,9	100,0	11,6	73,0	6,6	4,4	4,4
Secondary service activities	100,0	8,9	43,1	12,8	9,8	25,3	100,0	2,2	44,6	13,3	11,1	28,8
Total Manpower Demand	**100,0**	**20,1**	**59,2**	**8,4**	**4,1**	**8,2**	**100,0**	**10,1**	**63,3**	**9,8**	**5,6**	**11,1**
upper variant												
Production-related activities	100,0	26,8	63,0	8,5	1,0	0,7	100,0	14,2	72,6	10,6	1,4	1,3
Primary service activities	100,0	22,4	66,7	5,3	2,8	2,9	100,0	11,7	71,0	6,4	4,4	6,6
Secondary service activities	100,0	8,9	43,1	12,8	9,8	25,3	100,0	3,3	43,8	13,1	11,1	28,7
Total Manpower Demand	**100,0**	**20,1**	**59,2**	**8,4**	**4,1**	**8,2**	**100,0**	**9,7**	**62,6**	**9,8**	**5,7**	**12,3**

1 excluding apprentices

Source: Tessaring 1994

ciretoq/tab15.xls

Table 16: Qualification Structure of the Labour Force (1) in the Former FRG 1976 - 2010
- Results of the 1994 IAB Projection -

QUALIFICATION LEVEL	Numbers in 1000					Structure in %					Shift 1991/2010					
			2010					2010			in 1000			in %		
	1976	1991	lower variant	interm. variant	upper variant	1976	1991	lower variant	interm. variant	upper variant	lower variant	interm. variant	upper variant	lower variant	interm. variant	upper variant
No formal training	8612	5601	3266	2837	2712	34.9	20.2	11.7	10.1	9.7	-2335	-2764	-2888	-41.7	-49.3	-51.6
Apprenticeship, Berufsfachschule	12678	16352	17884	17753	17545	51.3	59.1	63.8	63.3	62.6	1533	1401	1194	9.4	8.6	7.3
Fach-, Meister-, Technikerschule	1609	2325	2641	2756	2733	6.5	8.4	9.4	9.8	9.8	316	430	408	13.6	18.5	17.5
Fachhochschule	543	1127	1434	1567	1599	2.2	4.1	5.1	5.6	5.7	307	440	472	27.3	39.0	41.9
University	1263	2257	2802	3111	3433	5.1	8.2	10.0	11.1	12.3	544	854	1176	24.1	37.8	52.1
Total manpower demand	**24705**	**27662**	**28025**	**28025**	**28025**	**100.0**	**100.0**	**100.0**	**100.0**	**100.0**	**363**	**363**	**363**	**1.3**	**1.3**	**1.3**

1 excluding apprentices

slight differences due to rounding

Source: Tessaring 1994

the employment of more 'Fachhochschule'[56] (higher education) graduates in these jobs which used to be typical for the intermediate qualification level. These will curtail the Fachschule graduates' employment opportunities and correspondingly expand those of the higher education graduates'[57].

There will be an above-average growth in the demand for higher education graduates. According to the upper variant this will be slightly less pronounced for Fachhochschule than for the university. Employment opportunities for the Fachhochschule graduates will expand by 27-42% or 307,000 - 470,000 jobs in the projection period. Their total employment might go up from 1.1m to about 1.4-1.6m and their share of total demand from 4% to 5.1-5.7%. These figures might be even higher, if more of these graduates (i.e. more than assumed in the shift projection) move into the intermediate field at master craftsman or Fachschule graduate-level or into the former strongholds of university graduates (e.g. vocational school teachers, lawyers, engineers and business managers).

The calculations provide for an above-average increase in the demand for workers with completed university degrees: the number of jobs for them should rise by 540,000 to almost 1.2m, i.e. by 24-52%. The number of such graduates in employment would grow from almost 2.3m (1991) to 2.8-3.4m (2010). This means that 10-12% of all available jobs will be open to university graduates compared to 8% in 1991.

2.4 Conclusions

The first update of the activity and qualification projection of 1994 reaffirms the continued trend towards services and higher qualifications of the labour force; the peculiarities of the years following 1989 should not generally change this. The intermediate projection variant calls for the following qualification structure in 2010:

On the whole about 72% of the jobs in 2010 will be filled by skilled workers with initial vocational training (apprenticeship, full-time vocational school) or continued training in Fachschulen and Technikerschulen; this is slightly more than in the 1991 projection, which arrived at 69%[58].

The demand for higher education graduates might be around 17% in 2010. In absolute figures these are 4.7m graduates, 1.3m more than in 1991. The demand for Fachhochschule graduates might be even higher if these manage to penetrate the intermediate level (of Meisterschulen and Fachschulen graduates) and the higher, traditional university-graduate-dominated level more than the estimates provide for.

The proportion and number of the jobs for unskilled people will fall even more drastically than assumed in the earlier projections: their share might halve between 1991-2010 and fall to about 10%, this means that almost 2.8m jobs for unskilled workers will be eliminated.

How additional technological and socio-economical effects might affect this pattern must remain an open question, just as the results of further updates.

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[56] For translation and explanation of all terms for types of educational institutions and certificates see p. 69 - p. 71.

[57] Drexel 1993

[58] Tessaring 1991

Chapter 3

PROJECTION OF THE STRUCTURE OF MANPOWER DEMAND BY WEISSHUHN/WAHSE/KÖNIG 1994

The projection of the structure of manpower demand by Weisshuhn/Wahse/König[59] covers the period 1990 to 2010. It projects the demand for labour arising in west and east Germany according to the different sectors of the economy, occupations and qualification levels. The projection for the west is based on the figures for the years 1978 to 1990 with five focus years[60]. An adaptation scenario was calculated for east Germany.

1. Data and procedure

The sectoral labour demand projection for west Germany is based on the national accounts which were transformed into the functional sectoral classification of the microcensus with reference to the calculations of IAB/Prognos 1989 (see above). Sectoral employment according to occupations and qualifications is analysed with the help of the employment statistics of the Bundesanstalt für Arbeit. These statistics only include the workers in employment subject to the payment of social security contributions, i.e. they do not include civil servants, the self-employed and assisting family members[61]. Therefore the occupational and qualification structures of the latter were determined separately, at first with reference to the microcensuses and then linked with the pattern yielded by employment statistics ('statistics mix'). This procedure entailed a number of adjustments and estimates.

The composition of the labour force is expressed in a three-dimensional matrix, subdivided into 14 economic sectors, 22 occupations and 4 qualification levels for each of the reference years. Thus the projection involves forecasting of 14 x 22 x 4=1232 separate rates. This is done by trend regressions of the reference periods by means of their linear extrapolation into the future. The structural projection does not calculate variants.

The resulting labour force structures are multiplied with the absolute figures of a projection of the national economy's labour demand. Four variants of economic development are forecast, the lower variant (economic growth 1990-2010: +2.1% p.a., productivity: +1.9% p.a.) is comparable to that of the 1994 IAB projection, which is in turn based on the 1993 Prognos projection for the economy (see above)[62]. So only the absolute figures of workers in the different sectors, occupations and qualification change in the Weisshuhn/Wahse/König (below referred to as WWK) projection, but not their percentages.

For east Germany an 'adaptation scenario' is calculated on the basis of the employment patterns of 1989. The assumption is that the nature of the east German labour market will have adapted to that of the west by 2010 at the latest.

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[59] Weisshuhn/Wahse/König 1994
[60] 1978, 1982, 1985, 1987, 1990
[61] unless they do not hold any employment subject to social security
[62] This is why the following discussion of results relates to the lower WWK variant

2. Results

2.1 Labour demand according to economic sectors

WWK's projection of sectoral labour demand[63] which closely follows the 1989 sectoral forecasts of IAB/Prognos, again finds that the tertiary sector will experience quantitative growth to the detriment of the primary and secondary sectors in west Germany (Table 17). It might provide 64% of all employment in 2010, from 57% in 1990, while the secondary sector will drop from almost 40% to almost 34%. This means a loss of 1.6m jobs in the primary and secondary sectors which might be far outweighed by the creation of jobs in the tertiary sector (+2.7m). It is interesting to note that public services will expand more than private services. This result merits some discussion in view of tight public budgets which will certainly be with us for some time.

The structure described by the adaptation scenario for east Germany in 2010 is comparable to the western one (Table 18): secondary sector down to 33%, tertiary sector up to 64%. The initial levels of the secondary and the primary sectors are much higher, though. In the period 1990-2010 the primary sector will shrink by 7.5 percentage points (west Germany: -1.7 points) and the secondary sector by over 10 percentage points (west Germany: -6 points). If the general trend of the projection does indeed come true we can get a feeling for the enormous adaptation process the east will have to cope with in the years to come.

2.2 Labour demand by sectors, occupations and qualifications[64]

A look at the qualification structure of the major sectors of the economy in west Germany (Table 19) reveals several trends. The number and percentage of workers without vocational training is falling in all sectors. The highest number of jobs is lost in the secondary sector (-1.68m or -54%) which accounts for more than half of the reduction in demand for the 'unskilled' (in total -3.2m). There is also a marked reduction in the demand for unskilled workers in the tertiary sector, specifically in public services.

The growing trend towards employment in the tertiary sector also concerns workers with completed vocational training. The increase is above average, especially in public services. Surprisingly the former stronghold for skilled workers, the secondary sector, offers only a minor increase in employment for them: only 270,000 (+4%) additional jobs will be created here until 2010.

While most of Fachhochschule graduates were hitherto employed (64% in total) by the private economy (secondary and private tertiary sectors), an above average employment increase in public services now emerge. It will amount to over 400,000 jobs (total private economy: 280,000) and thus represent the highest increase for all qualification levels at +129%.

[63] following the classification of the microcensus (functional appraoch)

[64] Weisshuhn/Wahse/König (1994) do not print all matrixes (sector x occupation x qualification) therefore only some outlines are discussed here.

The opposite is true for the situation at university level. So far most university graduates have worked in public services (1990: 56%). Demand in this field will, however, only grow at a below-average rate: by almost 290,000 or +29% by 2010. More employment

Table 17: Manpower Demand by Industrial Sectors 1990 - 2010 - Results of the 1994 WWK Projection for West Germany (1) -

Sectors	Numbers in 1000		Structure in %		Shift 90/10	
	1990[2]	2010	1990[2]	2010	in 1000	in %
Agriculture, forestry, horticulture, husbandry	1016	586	3.8	2.1	-430	-42.3
Energy, water supply, mining	467	363	1.7	1.3	-104	-22.3
Manufacturing industry	8336	7538	31.1	27	-798	-9.6
Construction	1811	1535	6.8	5.5	-276	-15.2
Trade	3475	3266	13	11.7	-209	-6
Transport	1093	977	4.1	3.5	-116	-10.6
Communications	500	558	1.9	2	58	11.6
Credit institutions, insurance	807	837	3	3	30	3.7
Private catering, residential homes, hotels	840	1089	3.1	3.9	249	29.6
Private education, science, culture, sports etc.	474	698	1.8	2.5	224	47.3
Private health care and veterinary medicine	727	754	2.7	2.7	27	3.7
Other private service providers	2041	3099	7.6	11.1	1058	51.8
Government	4092	5025	15.3	18	933	22.8
Priv. households, non-profit organizations	1122	1591	4.2	5.7	469	41.8
Total	26801	27916	100	100	1115	4.2
Summary:						
Primary sector	1016	586	3.8	2.1	-430	-42.3
Secondary sector	10614	9436	39.6	33.8	-1178	-11.1
Total tertiary sector	15171	17894	56.6	64.1	2723	17.9
of these: predominantly private[3]	9957	11278	37.2	40.4	1321	13.3
predominantly public[4]	5214	6616	19.5	23.7	1402	26.9

1 excluding apprentices; lower growth variant - 2 estimates based on the 1990 employment statistics and the 1989 microcensus - 3 Commerce/trade and other private service providers - 4 government, private households/non-profit organizations

Source: Weisshuhn/Wahse/König 1994

opportunities are opening up in the private tertiary sector (+340,000 jobs or +64%) and in the secondary sector (+120 or 55%). Consequently half of all university graduates will be employed in the private (secondary and private tertiary) sectors in 2010; in 1990 these were a mere 44%. The role of the public sector will diminish correspondingly, although it still offers employment for the other half of university graduates.

A classification according to *occupations* results in a similar scenario (Table 20): decline of the occupations in agriculture, production and manufacturing, expansion of service occupations, in particular personal, consumption and production services. The demand for unskilled people will fall in all occupations.

Table 18: Manpower Demand by Industrial Sectors 1989 - 2010 - Results of the 1994 WWK Projection for East Germany (1) -

Sector	Numbers in 1000		Structure in %		Shift 89/10	
	1989[2]	2010	1989[2]	2010	in 1000	in %
Primary sector	925	147	9,6	2,1	-778	-84.1
Secondary sector	4166	2266	43,4	33,1	-1900	-45.6
Tertiary sector	4515	4435	47	64,8	-80	-1.8
Total	9606	6848	100	100	-2758	-28.7

1 excluding apprentices; lower growth variant - 2 estimates based on "Speicher Gesamtwirtschaftliches Arbeitsvermögen (GAV)"
Source: Weisshuhn/Wahse/König 1994

2.3 The qualification structure of the labour force from 1990 to 2010

When taking together the qualification structures for all economic sectors and occupations the WWK projection - just as the 1994 IAB projection (see above) - indicates a clear trend towards higher qualifications for the labour force (Table 21). In contrast to the discussion so far which has related to the lower growth variant of the WWK projection, we now also include the upper growth variant to illustrate the entire range. We must stress again that the variants differ only regarding their absolute figures; the composition of the qualifications is the same for all variants.

From 1990 to 2010 the loss of jobs for workers without formal vocational training will be dramatic: -2.7 to -3.2m, i.e. -47% to -39%. Although the 1994 IAB projection is based on different figures, also the WWK projection concludes that the share of unskilled workers of the entire labour force will halve: while they still accounted for 26% of the labour force in 1990, they will constitute only about 13% in 2010.

The percentage of skilled workers with formal apprenticeship training[65] will grow from 64.5% in 1990 to 72% in 2010. This is precisely the same percentage as forecast by the 1994 IAB projection. But here again, one should not forget the different starting points: WWK assume 64.5% in 1990 and consequently arrive at higher growth rates than the IAB projection. Therefore the employment increases for this qualification category will

[65] Apprenticeship, full-time vocational school, trade or technical school, master craftsmen schools.

Table 19: Manpower Demand 1990-2010 by Sectors and Qualification Levels
- Results of the 1994 WWK Projection for West Germany (lower growth variant)-

Sector	Numbers in 1000		Structure in %		Shift 90/10	
	1990 [2]	2010	1990 [2]	2010	in 1000	in %
without formal training						
Primary sector	476	59	7	2	-417	-88
Secondary sector	3126	1447	45	39	-1679	-54
Tertiary sector (private) [1]	2297	1775	33	48	-522	-23
Tertiary sector (public) [2]	980	389	14	11	-591	-60
Total	**6878**	**3669**	**100**	**100**	**-3209**	**-47**
with completed vocational training						
Primary sector	523	508	3	3	-15	-3
Secondary sector	6957	7229	40	36	272	4
Tertiary sector (private) [1]	6870	8219	40	41	1349	20
Tertiary sector (public) [2]	2932	4229	17	21	1297	44
Total	**17283**	**20183**	**100**	**100**	**2900**	**17**
with Fach-hochschule degree						
Primary sector	11	15	1	1	4	36
Secondary sector	313	427	35	27	114	36
Tertiary sector (private) [1]	258	424	29	27	166	64
Tertiary sector (public) [2]	320	732	35	46	412	129
Total	**901**	**1593**	**100**	**100**	**692**	**77**
with university degree						
Primary sector	6	7	0	0	1	18
Secondary sector	219	339	13	14	120	55
Tertiary sector (private) 1	532	871	31	35	339	64
Tertiary sector (public) 2	983	1269	56	51	286	29
Total	**1739**	**2485**	**100**	**100**	**744**	**43**

1 Construction, trade, communications, credit/insurance companies, private catering, private education, science etc., other private service providers

2 Government, private households, non-profit organizations
Source: Weisshuhn/Wahse/König 1994 (differences due to rounding)

Table 20:

Manpower Demand 1990 - 2010 by Occupation Fields and Qualification Levels

- Results of the 1994 WWK Projection for West Germany (lower growth variant)

Occupational field	Number in 1000		Structure in %		Shift 90/10	
	1990 [2]	2010	1990 [2]	2010	in 1000	in %
no formal training						
Farming, mining, extracting, quarrying	554	108	8	3	-446	-81
Manufacturing [1]	2499	1446	36	40	-1053	-42
Production services [2]	909	497	13	14	-412	-45
Distribution services [3]	1401	792	20	22	-609	-43
Personal and consumer services [4]	1339	679	19	19	-660	-49
Helpers without further details	176	136	3	4	-40	-23
Total	6878	3658	100	100	-3220	-47
with apprenticeship training						
Farming, mining, extracting, quarrying	615	617	4	3	2	0
Manufacturing [1]	4937	5363	29	27	426	9
Production services [2]	5730	6806	33	34	1076	19
Distribution services [3]	3144	3358	18	17	214	7
Personal and consumer services [4]	2687	3825	16	19	1138	42
Helpers without further details	172	216	1	1	44	26
Total	17283	20183	100	100	2900	17
with Fachhochschule degree						
Farming, mining, extracting, quarrying	20	38	2	2	18	90
Manufacturing [1]	9	11	1	1	2	23
Production services [2]	684	1244	76	74	560	82
Distribution services [3]	47	68	5	4	21	45
Personal and consumer services [4]	136	316	15	19	180	133
Helpers without further details	7	16	1	1	9	135
Total	901	1691	100	100	790	88
with university degree						
Farming, mining, extracting, quarrying	12	28	1	1	16	133
Manufacturing [1]	5	6	0	0	1	19
Production services [2]	705	1192	41	49	487	69
Distribution services [3]	41	59	2	2	18	44
Personal and consumer services [4]	957	1118	55	46	161	17
Helpers without further details	19	28	1	1	9	47
Total	1739	2431	100	100	692	40

1 Occupations in manufacturing; metal production, fitters/mechanics, electricians, textiles/clothing, food processors, occupations in construction, carpenter/painter, other manufacturing occupations

2 production services: technical/science occup., executive administrative services, other administrative services (business, occupations in communications, clerks), other corporate services (advertising, organization, auditing, data processing, law, journalists, artists)

3 Distribution services: occupations in warehousing, transport, business services (merchants of goods, brokers, financial services)

4 Personal and consumer services: health care, body hygiene, education training, social services, priests, other services (leasing, guarding, safety, catering, housekeeping)

Source: Weißhuhn/Wahse/König 1994 (differences due to rounding)

range between 2.9m (lower growth variant) and almost 5.8m (upper variant) - which is a 100% variation. Thus the percentage increase also ranges from almost 17% to 33.5%.

By far the highest growth in demand in per cent is predicted for Fachhochschule higher education: here employment will increase between +77% and 102% or +0.7m to 0.9m depending on variant, this means almost twice as much as in the beginning. Thus the number of Fachhochschule higher eduation graduates of the entire labour force will rise from 3.4% in 1990 to almost 6% in 2010.

Employment for university graduates will grow above average as well, albeit not as much as for Fachhochschule graduates. Their share will go up from 6.5% in 1990 to almost 9% in 2010. This means +740,000 to 1.1m new jobs or +43% to +63%.

Taking together all forms of higher education the proportion of these graduates will increase from 10% of the labour force in 1990 to almost 15% in 2010. Much more important than this higher share are the additional jobs the higher education graduates can expect. This number differs considerably according to variant. While 1.4m jobs for graduates are expected from 1990 - 2010 in the lower variant, the upper variant calculates about 2m.

Whether or not this increase will be sufficient to provide the growing number of graduates from higher education with a job may only be answered with reference to the calculation of the supply: the balance indicates potential imbalances in some sub-labour markets, where such balance must also allow for the replacement demand required by retirement; such a balance must also be drawn up for the other qualification categories. These will be detailed in chapter 5.

Chapter 4

A COMPARISON OF THE PROJECTIONS OF QUALIFICATION DEMAND UP TO 2010

The projections of the qualification demand by the IAB (1994) and by WWK 1994, especially the differences in their results caused many heated discussions. Quite frequently one forgets in these discussions that projections are merely model calculations, the results of which are subject to the underlying data, assumptions and the methods used. Below we attempt to deal briefly with these aspects.

It is surprising that on the whole the forecasts for the future qualification structure coincide, despite all differences in the details. One must add that both projections could not consider the 1992-1994 recession and its potential implications for the qualification structure, specifically the demand for labour.

1. Projection results

- According to both projections the demand for unskilled labour will halve between 1990/91 and 2010 in the west of Germany: WWK says it will drop from almost 26% to 13%, IAB from 20% to 10% or almost 12% - depending on the variant (Table 22). The requirement for skilled workers will go up from almost 65% to 72% according to WWK. The IAB arrives at a similar result, although it starts from a higher actual value in 1991 (67.5%).

Table 21: Manpower Demand 1990 - 2010 by Qualification Levels

- Results of the 1994 WWK Projection for West Germany [1] -

Qualification	Numbers in 1000			Structure in %			Shift 1990/2010			
		- 2010 -			- 2010 -		in 1000		in %	
	1990	lower variant	upper variant	1990	lower variant	upper variant	lower variant	upper variant	lower variant	upper variant
No formal training	6878	3657	4223	25.7	13.1	13.2	-3221	-2655	-46.8	-38.6
With apprenticeship training	17283	20183	23065	64.5	72.3	72.2	2900	5782	16.8	33.5
With Fachhochschule degree	901	1593	1816	3.4	5.7	5.7	692	915	76.8	101.6
With university degree	1739	2483	2842	6.5	8.9	8.9	744	1103	42.8	63.4
Total	26801	27916	31947	100	100	100	1115	5146	4.2	19.2

1 excl. apprentices; trend projection

Note: The variants relate to the national economy's development (average economic growth 1990-2010 p.a.: lower variant = 2.1%, upper variant = 3.1%; productivity per person employed: lower variant = 1.9%, upper variant = 2.2%)

Source: Weißhuhn/Wahse/König 1994 (differences due to rounding)

wwk1.xls (qualwwk)

- The share of Fachhochschule graduates expands from 3.4% to 6.5% in the WWK projection and from 4.1% to 5.1%-5.7% in the IAB projection. The predicted demand for university graduates varies slightly more: WWK says 6.5% to 9%, IAB 8.2% to 10.0%-12.3%. For the future demand for graduates as a whole both projections forecast a range from almost 15% to 18%, providing for similar increases in the shares: WWK forecasts a 5 percentage point increase, IAB about 3-6.

Table 22: Qualification structure of the labour force 1990/91 and demand 2010 according to recent projections[a] for West Germany - in % -

Qualification	Weißhuhn et.al. 1994		Tessaring (IAB) 1994			
	1990	2010 trend	1991	2010 (trend variants)		
				lower v.	intermed. variant.	upper v.
without formal training	25.7	13.1	20.2	11.1	10.1	9.7
with completed training	64.5	72.3	67.5	73.2	73.1	72.4
- apprenticeship training [b]	-	-	*59.1*	*63.8*	*63.3*	*62.6*
- Fachschule &Techniker-schule	-	-	*8.4*	*9.4*	*9.8*	*9.8*
Fachhochschul-degree	3.4	5.7	4.1	5.1	5.6	5.7
university degree	6.5	8.9	8.2	10.0	11.1	12.3
Total	100.0	100.0	100.0	100.0	100.0	100.0
(Total in 1000)	26801	27916	27662		←	*28025* →

[a] of gainfully employed, without apprentices - [b] incl. completed vocational schools -
Legend: uV/mV/oV: lower/intermediate/upper variant (see text), slight differences due to rounding

Sources: Weißhuhn et. al. 1994; Tessaring 1994

2. Comparison of underlying data, methods and assumptions

The different results are due to the of underlying data, methods and assumptions used. Both projections wanted to forecast the number of jobs (demand) available under certain assumed conditions and the qualifications these call for until 2010. The conditions assumed include the long-term economic development and the continuation of the trends that characterized these structures in the past.

The statistical basis for the projections is the information available about the qualifications of the current working population together with other characteristics.

	Weißhuhn et.al.	Tessaring
Data and reference period	Combination of **employment statistics** (employment subj. to social sec) and **microcensuses** (self-employed and civil servants) 1978-1990 with 5 reference years; domestic concept	**Microcensuses** 1976-1991 with 8 ref. years; qualification structure 1991 from the IAB's **educational accounts**; concept of determining value-added on the basis of resident status within the national territory
Criteria	**Economic sectors** (14 categories) **occupations** (22 categories) **levels of qualification:** (1) no formal training (2) completed vocational training (apprenticeship, Fach-/Technikersch and similar) (3) Fachhochschule degree (4) university degree *The projection consists of results for* *14 x 22 x 4 = 1232 percentages*	**Main focus of activity** (10 categories) **levels of qualification:** (1) no formal training (2) apprenticeship, full-t. voc. school (3) Fach-/Technikersch. and similar (4) Fachhochschule degree (5) university degree *The projection consists of results for 10 x 5 = 50 percentages*

- The growth of demand for labour in the national economy is determined according to growth scenarios. WWK is calculating 4 variants with different assumptions for economic growth and productivity; the IAB stays with the scenario of the Prognos Germany Report (1993)[66]. WWK's lower variant is comparable to the IAB or Prognos: both projections are expecting an average annual economic growth of 2.1% and a productivity increase of 1.9% for the respective projection periods.

- How the qualifications to meet this demand will be made up is predicted by extrapolating the shares held by certain occupations or activities and by qualifications held for the occupations/activities in the past by means of trend regressions. The projections are using different trend functions for this purpose.

The discrepancies between the qualification structures of the reference periods[67] caused by the use of different statistics ('base effect', see Table 22) extend into the projection period. They arise from the different approaches to data collection for the statistics used: the microcensus is the self-assessment of interviewees which tend to put more emphasis on status and to opt for higher qualifications. In employment statistics it is the companies that enter the qualifications and occupations of their workforce; these will tend to emphasize functions which might work towards lower qualifications. Furthermore the projection results might deviate because of the different projection methods used: linear trends in the case of WWK and non-linear trends used by Tessaring.

[66] Prognos 1993

[67] Neither of the projections could consider the cuts in employment since 1992 induced by the recession and their possible consequences for qualification structures.

	Weißhuhn et.al.	*Tessaring*
Trend func-tions	**linear trends** of percentages according to regression calculations for the years 1978-1990	generally **non-linear trends** (exponential / logistic) of the percentages according to regression calculations for the years 1976-91; **Saturation points** of percentages
Variants of structural trends	none (the *structure* of qualifications - not the absolute values - are the same over all growth variants)	**3 trend variants** for activity structures or aaa-related qualifications *structures*: **lower variant:** more emphasis on recent years ('unification boom') **intermediate variant**: less emphasis on recent years **upper variant**: more emphasis on long-term trends since 1976

Chapter 5

QUALIFICATIONS OFFERED BY THE LABOUR FORCE AND RECRUITMENT DEMAND UP TO 2010

To determine employment prospects not only must the overall demand be known, but also the qualification-related supply and the recruitment demand during the projection period. When demand falls not all jobs that become vacant (because somebody left) will be filled again.

1. The 1994 BLK supply projection

In 1995 the Joint Commission of Federation and Laender for Education Planning and the Promotion of Research (BLK) submitted a report[68] on the future supply of labour according to qualification levels. It contains a summary of the two model calculations by WWK and the IAB on the qualifications demanded and a model calculation for the future supply of labour for the different qualification levels.

The BLK forecast for the supply of labour includes both the new entrants and the replacement demand[69]. The number of new entrants is calculated mainly on the basis of the forecasts by the Conference of the Ministers for Cultural Affairs of the future number of school and university students and estimates of the number of transitions to the labour market. Replacement demand is inferred from assumptions about the future employment rate of men and women of different qualifications according to age groups.

[68] Joint Commission of Federation and Laender for Education Planning and the Promotion of Research 1995

[69] The 'number of active people retiring from active life' were forecast. When assuming that these people leaving the labour market will be replaced by persons with the same qualifications the result will be the replacement demand. BLK is stressing that this is a doubtful assumption, because substitution might occur when vacancies are filled again (BLK 1995, p.62ff). An example might be a worker without formal training who rose to perform the work of a skilled worker and will be replaced by a skilled worker when he leaves.

Two models are calculated: one based on the combination of employment statistics and microcensuses according to the WWK approach, the other one based on the microcensuses according to the IAB approach[70].

Table 23 summarizes the results.

Table 23: New Supply, Replacement Demand and Total Manpower Supply By Qualifications until 2010 (former FRG)

Qualification	TOTAL SUPPLY 1990				New supply	Replacement demand 1991-2010		TOTAL SUPPLY 2010			
	Model 1 [a]		Model 2 [b]		1991-2010	Model 1 [a]	Model 2 [b]	Model 1 [a]		Model 2 [b]	
	'000	%	'000	%	'000	'000	%	'000	%	'000	%
No form. training	7688	26.7	6218	21.6	1248	3649	3024	5285	17.7	4440	14.9
Completed vocational training	18380	63.7	19257	66.8	9073	8158	8634	19294	64.6	19696	66.2
Fachhochschule	941	3.3	1127	3.9	1534	384	464	2090	7.0	2197	7.4
University	1835	6.4	2219	7.7	2058	692	844	3201	10.7	3432	11.5
TOTAL	**28844**	**100.0**	**28820**	**100.0**	**13910**	**12883**	**12965**	**29871**	**100.0**	**29765**	**100.0**

[a] Model 1 based on: Employment statistics + mockrocensus (foll. the approach by *Weißhuhn/ Wahse/ König*) - [b] Model 2 based on: microcensus (foll. the approach by *Tessaring*)
Source: BLK 1995

According to these model calculations the share of manpower without formal training will drop by 9 (model 1) or 7 percentage points (model 2) to about 18%-15% between 1990 and 2010. A slightly higher (model 1) or stagnating share (at 65-66%) is expected for people with apprenticeship training. Both models predict an increase in the shares of higher education graduates: from 10% to almost 18% (model 1) or from almost 12% to 19% (model 2). This means that about 7% of the manpower will hold a Fachhochschule degree and 11% a university degree.

2. Recruitment demand

The recruitment demand can be derived from the combination of the demand projections by WWK or the IAB and the estimate of replacement demand by both BLK models. Table 24 shows the margins estimated for recruitment demand over the general period and per year; adjustments have been made for the projection period of the IAB which was one year shorter.

- Demand for manpower without formal training takes a negative turn in both projections and for all alternatives investigated; replacement demand will only be negligibly higher. This means that only a small proportion of the 'unskilled workers' leaving the labour force until 2010 will be replaced by 'unskilled workers'. Recruitment de-

[70] The reference figures for the calculation of replacement demand (particularly age structures according to sex) differ in the various statistics

mand ranges from 7,000 to 36,000 persons annually which is far less than the new supply estimated by BLK (62,000 persons p.a. on average).

- The annual recruitment demand for people with apprenticeship training lies between 553,000 (WWK) or 539,000 to 552,000 (IAB). Compared to an average new supply of 453,000 persons p.a. the trend points to a deficit of skilled workers under the given assumptions.

- Fachhochschule graduates can expect an annual recruitment demand of 54,000 (WWK) or 41,000 to 49,000 (IAB). The discrepancies for university graduates are striking: WWK predicts an annual recruitment demand of 72,000 and the IAB between 73,000 and 106,000.

For all higher education graduates the recruitment demand will range between 126,000 (WWK) and 114,000 to 155,000 (IAB). Thus it is below the number of graduates entering the labour market estimated by BLK (almost 180,000 p.a.).

Any comparison of new supply and recruitment demand is subject to the condition that the projections did not explicitly allow for potential substitution on the demand side and mobility on the supply side above the known levels. Thus it might very well be that higher education graduates will in future find more employment in intermediate positions which used to be filled mainly by workers with completed apprenticeship training and further training (such as master-craftsmen, graduates of Fachschulen). Whether this will go along with a dequalification process or not cannot be said yet; possibly new forms of organization in the companies in combination with technological progress will require higher qualifications.

Table 24: Shift in Demand, Replacement Demand and Recruitment Demand until 2010 (in '000)

Qualification	Projection Variant [a]	Stock 1990/91 [b]	Demand 2010	Shift of demand	Replacement demand [c]	Recruitment demand	
						total	p.a. [d]
		1	2	3 = 2 - 1	4	5 = 3 + 4	6=5/n
no formal training	*WWK - Tr*	6878	3657	- 3221	3649	428	**21**
	IAB - lov	5601	3266	- 2335	3024	689	**36**
	IAB - inv	5601	2837	- 2764	3024	260	**14**
	IAB - upv	5601	2712	- 2889	3024	135	**7**
completed vocational training	*WWK - Tr*	17283	20183	2900	8158	11058	**553**
	IAB - lvv	18677	20525	1848	8634	10482	**552**
	IAB - inV	18677	20509	1832	8634	10466	**551**
	IAB - upv	18677	20278	1601	8634	10235	**539**
Fachhochschule degree	*WWK - Tr*	901	1593	692	384	1076	**54**
	IAB - lov	1127	1434	307	464	771	**41**
	IAB - inv	1127	1567	440	464	904	**48**
	IAB - upv	1127	1599	472	464	936	**49**
University degree	*WWK - Tr*	1739	2483	744	692	1436	**72**
	IAB - lov	2257	2802	545	844	1389	**73**
	IAB - inv	2257	3111	854	844	1698	**89**
	IAB - upv	2257	3433	1176	844	2020	**106**
Total	*WWK - Tr*	26801	27916	1115	12883	13998	**700**
	IAB - lov	27662	28025	363	12965	13329	**702**
	IAB - inv	27662	28025	363	12965	13329	**702**
	IAB - upv	27662	28025	363	12965	13329	**702**

[a] IAB: lov/inv/upv=lower/intermediate/upper variant of qualicikation structure, WWK: Tr= trend variant of qualification structure - [b] *WWK*: 1990; *IAB*: 1991 - [c] Basis: Calculations of BLK 1994 - [d] linear interpolation (*WWK*: n=20 years, *IAB*: n=19 years)
slight differences due to rounding

Part IV

MERITS AND CONSTRAINTS OF PROJECTIONS FOR POLICY-MAKERS AND VOCATIONAL GUIDANCE

''To be able to actively shape the future policy-makers depend on scientific, i.e. rational, comprehensible and verifiable projections of... future developments. Therefore such prognoses are accepted and common practice in all fields of policy, including educational policy, as a necessary instrument of future-oriented planning....

From our experience with compiling and using such projections we have learnt, though, that this instrument must be considered with certain reservations and limitations. Such reservations and limitations relate to the many uncertainties and imprecisions which even the most sophisticated scientific methods entail...; after all, these are model calculations, are based on certain assumptions about future economic growth, the development of production structures and the like, predictions are made about future conditions for employment in certain occupations, which depend on these underlying assumptions for better and for worse. In many cases the numerous assumed interrelationships between cause and effect are not sufficiently ascertained by empirics. When keeping these quite important limitations in mind, such projections might offer certain guidance and orientation. In addition, there are reservations and limitations concerning the actual and legal impediments to translating academic projections into real policies....

As long as one does not lose sight of these reservations such projections are useful and legitimate even when they fail to predict the development that really occurs; however, if they are forgotten, such projections may cause dangerous misunderstandings and lead to false conclusions. This is especially true for the so-called demand projections in education policy and education counselling.''[71]

This statement which dates from 1980 is still valid and topical. It also shows that policy-makers and career guidance officers are frequently not aware of the (limited) value such projections have for them, despite all of their shortcomings.

It therefore seems helpful to outline briefly their merits and their limitations.

- Projections can only be as good as the assumptions they are based on. Economic and social conditions are subject to permanent changes; while some of these changes will only temporarily affect the way people with certain qualifications will be deployed in the labour market others will do so more thoroughly.

- Long-term projections are always facing a 'forecasting trilemma': the longer the projection period, the more they differentiate, the lower their probability which, of course, also depends on the 'quality' of the data they are based on.

[71] The German Federal Minister for Education and Science: Status, Development and Results of Projection Research on the Future Demand of Labour and Qualifications. Report to the Committee for Education and Science for the German Parliament, Bonn, 22 August 1980, p. 1f.

- Long-term projections of the structured labour demand cannot allow for future cyclical fluctuations of the economy; they are based on consistent long-term trends in the economy. Neither may projections anticipate exogenously caused structural disruptions or turnabouts of the long-term development (unless they do so as a model assumption). Supply projections are only ill equipped to consider or even forecast the behaviour of the players, the motives that will affect their decisions on education, training and employment.

- Demand projections are projections of the numbers and types of jobs available in the future. Therefore the projection assumptions are dominated by economic parameters, for the most part ignoring other influences on labour demand - which are subject to social, personal, political standards, attitudes/behaviour as well as interactions between the supply and demand of labour. Substitutions taking place when jobs are filled with persons holding different qualifications are usually considered only in their vertical dimension as a structural change (e.g. changes in the number of higher education graduates in an occupation vs. the number of skilled workers). Aspects of substance relating to these substitution processes are mostly left out; the same holds true for the question of whether a forecasted vertical substitution process is functional or disfunctional for the utilization of this training (e.g. using more higher education graduates for jobs that used to be filled by people with other qualifications).

- Both supply and demand projections depend not only on the assumptions made, but also on the 'quality' of the underlying data. Employment statistics (labour force statistics, censuses, microcensuses) reflect the 'real' structure of the population and its occupations, qualifications, activities etc., to a limited extent only.

- This permits the conclusion that researchers and policy-makers must live with uncertainties and contradictions. Forecasts focussing on certain points are not helpful as they attempt to predict an allegedly certain future development: the future can only be described in terms of ranges (e.g. by calculating several variants).

- The question arises whether and to what extent the recent recession affected the long-term direction and specific patterns of employment. It is too early, though, to attempt to answer this question, no representative statistics are available as yet[72]. So far there is no indication that one must doubt the 'mega trends' of long-term structural development and the factors affecting them: growing significance of the service sectors and service activities or occupations; higher demands on qualifications for jobs in line with the technological and socio-economic development; increasing decentralization and internationalization of job functions and contents; growing importance of social and key qualifications in line with the changing division of labour and organization of work.

- Conclusion: neither the IAB, nor the BLK or the WWK model calculations present the 'real' demand or the 'real' supply of labour for the next 20 years. Structural projections of the qualification demand and supply may at best assist in planning and devising policies for education. In using such projections one should never forget that the dimensions, directions and ranges of forecasted changes are derived from past

[72] One must recall the delay until the data of the microcensus and on unemployment become available.

trends, from statistics with many shortcomings and from assumptions about future development.

In its assessment of model calculations for the future supply of and demand for qualifications the Joint Committee of the Federation and the Laender for Educational Planning and the Promotion of Research concludes[73]:

> ''All in all the study concludes that the demand for higher qualifications will increase. The model calculations describe the following development:
>
> - As before, people without any formal training will have to expect most problems on the labour market. Considerable efforts on the part of the general education system, vocational guidance and occupational preparation as well as for the promotion of people with special needs are required to qualify this group and thus improve their employment prospects.
>
> - In the western part of the FRG a deficit of skilled labour with completed vocational training might emerge, while there seems to be surplus in the eastern part. Such regional imbalances might be ameliorated by migration from east to west. However, this will be insufficient to offset the deficit in the west. Thus in the west priority must be assigned to making vocational training more attractive, in particular by improving employment conditions.
>
> - Higher education graduates have to expect more difficulties in the transition from university to the labour market. Restructuring of the deployment of labour will probably help to mitigate the expected surplus. This means that a growing number of jobs for which skilled workers have been employed will be filled with higher education graduates, in particular 'Fachhochschule' graduates.

- The use of structured long-term projections for an individual's choice of training and occupation is much more limited. Projections are much too general to be able to assess anybody's prospects for employment in certain segments of the labour market with sufficient precision. They are geared towards the long term and cannot make medium-term statements such as the inquiring person might want. But still projections can warn about general risks (e.g. of not getting any training at all).

[73] see press release by the BLK 'Report on the Employment Perspectives for Graduates from the Education System', Bonn 13 December 1994

Part V

STATISTICAL SOURCES AND CLASSIFICATIONS

Chapter 1

THE EDUCATION AND VOCATIONAL TRAINING SYSTEM OF THE FEDERAL REPUBLIC OF GERMANY

The German education system is subject to the authority of the different federal Laender and is - roughly speaking - subdivided in the field of general education, first vocational training in companies or in full-time vocational schools, higher eduation and further training (see diagramme).

There are many types of transition between the different fields but all require the successful completion of the previous stage. General education in the first stage of secondary education is a three-tier system in most Laender: Hauptschule, Realschule and Gymnasium (lower secondary, intermediate secondary and grammar schools). Alongside these there are special needs schools and comprehensive schools. Initial vocational training is usually done within the dual system - training in a company plus part time at a vocational school, alternatively it takes place in a Berufsfachschule (full-time vocational school). Successful completion of this stage provides a vocational qualification which has basically the same standing as completing intermediate secondary school. Prior to vocational training there might be basic vocational education which is to provide students with the maturity to take up vocational training.

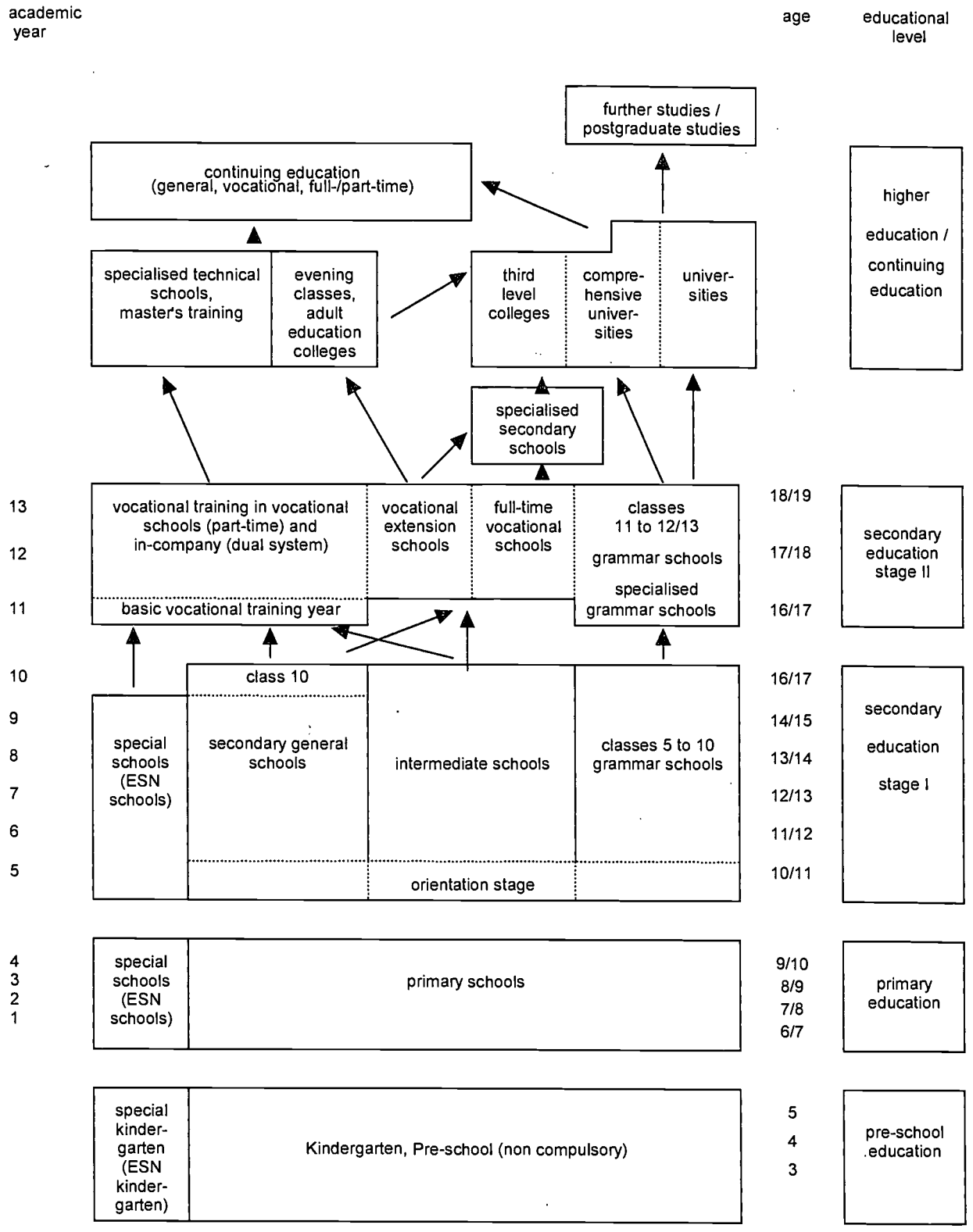
Higher education consists of Fachhochschule and university (including technical, teacher training and fine arts colleges) and Gesamthochschulen (comprehensive universities). For admission to university general or specialized (restricted to certain subjects) university entrance certificate (Hochschulreife), for admission to Fachhochschule the certificate of aptitude for specialized short-course higher education (Fachhochschulreife) are required as a minimum.

Intermediate school-leaving certificates and access qualifications to higher education can be achieved in the general school system and also in the so-called 'second-chance education institutions': mainly vocational extension colleges, specialized upper secondary schools and evening colleges.

Further training includes the Fachschulen, Technikerschulen and Meisterschulen (specialized and general technical colleges and master craftsmen's colleges) which usually require a prior vocational qualification and experience in this occupation. Other than that there are a great number of general and vocational further training opportunities: part-time or full-time studies, in companies, schools, or by correspondence courses.

Table 25 shows the attendance rates in education and training institutions in west Germany in 1992 according to age, related to the population of the same age between 15 to 35 years.

The structure of the educational system in Germany



N.B.
There are variations between the different Länder; the length of full-time compulsory education is of 9 years (in Berlin and NRW 10 years); technical schools include schools for nurses, midwives etc.; part-time vocational schooling is compulsory up to the age of 18, if no other education / vocational training is attended.

Source: BMBF

Table 25: Participation Rate of the Population Aged 15 to under 35 in Education, Training and the Labour Force[1] in 1992 (West Germany) - in % -

Age	general education	vocational training/apprenticeship[2]					Labour force [3]	Non-active popul. [4]	Total population
		initial vocational training	Fach-schule	other vocational schools	University, Fach-hochschule	Total			
15	89.3	6.3		2.7		**9.0**	0.7	1.0	100.0
16	62.9	27.0		7.5		**34.4**	2.1	0.7	100.0
17	25.3	46.9	0.4	7.9		**55.2**	8.0	1.4	100.0
18	26.2	51.6	1.4	5.2	0.2	**58.4**	11.3	4.1	100.0
19	13.9	39.6	2.4	4.0	3.4	**49.4**	30.9	5.8	100.0
20	3.2	25.1	2.6	2.9	8.6	**39.2**	51.9	5.8	100.0
21	0.5	14.5	2.2	2.1	12.6	**31.5**	62.5	5.4	100.0
22	0.2	6.9	1.9	1.5	15.0	**25.3**	68.2	6.4	100.0
23	0.1	3.8	1.6	1.1	15.8	**22.3**	70.3	7.4	100.0
24		2.5	1.5	0.8	15.8	**20.6**	71.3	8.1	100.0
25		1.8	1.2	0.3	14.7	**18.0**	71.8	10.1	100.0
26		1.4	0.9	0.3	12.9	**15.5**	72.6	11.9	100.0
27		1.1	0.8	0.2	10.7	**12.8**	73.6	13.7	100.0
28		0.9	0.6	0.1	8.7	**10.3**	74.8	14.9	100.0
29		0.6	0.4	0.1	6.8	**7.9**	76.5	15.6	100.0
30		0.3	0.4	0.1	5.3	**6.1**	77.5	16.4	100.0
31		0.1	0.3	0.1	4.3	**4.8**	77.9	17.4	100.0
32		0.1	0.3		3.5	**3.9**	79.1	17.0	100.0
33		0.1	0.3		2.8	**3.1**	80.0	16.9	100.0
34			0.2		2.3	**2.6**	79.8	17.6	100.0

[1] in % of the population of the same age - [2] Full-time education - [3] Labour force (exclud. apprentices) and unemployed - [4] excluding students and apprentices
Source: Reinberg et.al. 1995 (based on the Educational Accounts of the IAB)

Employment statistics (see below) define 'qualification' as the most recent or the most advanced school or vocational training/further training completed. As such these are formal levels of education certified by generally accepted certificates. These include

a) for general education 'Hauptschulabschluß' (lower secondary school leaving certificate), Realschulabschluß ('mittlere Reife'- intermediate secondary school leaving certificate) and 'Abitur'(university entrance certificate);

b) for vocational education:
- successful completion of training in the dual system, granting the status of a skilled worker (or journeyman);

- completion of full-time vocational school (or equivalent) qualifying to exercise an occupation;

- completing practice courses at Fachschule, Technikerschule and Meisterschule which usually entails further training;

- graduation from Fachhochschule or university.

Anybody who holds none of these qualifications is considered as being 'without completed vocational training' or 'without formal training', including drop-outs from training or university studies (unless they have completed some other training) and those who completed an advanced general school certificate (e.g. Abitur).

Chapter 2

EDUCATION, EMPLOYMENT AND LABOUR MARKET STATISTICS

Statistics on education, employment, population and the labour market are compiled by the Statistische Bundesamt (Statistische Bundesamt), the Laender Statistics Offices and the Bundesanstalt für Arbeit.

- Education statistics cover the entire range of general and vocational schools: they are compiled annually by the Laender and combined by the Statistische Bundesamt. Statistics on higher education are published every term. Statistics for vocational training in the dual system concerning vocational schools are kept by the Laender or the Statistische Bundesamt; the responsible authorities or the Chambers of Commerce or Trade compile statistics on vocational in-plant training and submit them to the Statistische Bundesamt and the Bundesinstitut für Berufsbildung (Federal Institute for Vocational Training - BIBB).

  The Federal or Laender Statistics Offices publish the statistics in serials. In addition, the Joint Conference of the Ministers of Cultural Affairs (KMK) and the BIBB analyse and publish the statistics relating to their special fields. The KMK regularly publishes forecasts for the number of students entering into, graduating from and attending schools and higher education institutions. The BIBB anaylses these statistics, in particular vocational training statistics, for its annual vocational training reports.

- The Statistische Bundesamt and the Laender Statistics Offices also publish population statistics. They include the population stock, its composition, natural population movements and migrations.

- Employment statistics include the annually compiled microcensuses, censuses and occupation censuses 1950, 1961, 1970 and 1987[74] as well as the employment statistics of the Bundesanstalt für Arbeit (since 1975).

1. Microcensus

The microcensus is a 1% sample of all households and includes both a standard catalogue of features and additional features which are not surveyed every year[75]. The mi-

[74] The Statistische Bundesamt surveyed the employed persons in the new German Laender in 1990
[75] See Statistisches Bundesamt: Fachserie 1, Reihe 4.1.2 (several years)

crocensus is based on law, therefore those questioned must provide the information required. Since 1991 certain questions, such as for example, the type of education or training completed, have become voluntary questions[76]. For the projection the following features of the microcensus are most relevant, in addition to demographic data such as age, sex, nationality:

- participation in the labour market (working, unemployed, not working);
- last/highest level of completed training;
- current occupation;
- job characteristics (tasks assigned on the job);
- branch of industry;
- employment status (blue-collar, white-collar, civil servant, assisting family member).

These features are defined as follows.

1.1 Participation in the labour market

Participation in the labour market depends on the 'activity concept', thus anybody living in the national territory[77] who is working during the week the microcensus survey is made is considered active, i.e. who is either employed or self-employed, an assisting family member or is unemployed. It is immaterial whether this is the first or second job and how many hours it involves. The feature 'working hours' and another separate question introduced in 1990 allow a more precise distinction between the type of activity, i.e. whether it is marginal employment (employment not subject to payment of social security, usually less than 15 hours per week). Somebody is considered 'unemployed' they are not working but looking for work, irrespective of whether or not they are registered as 'unemployed' at the labour office. Therefore the data on registered unemployment (statistics of the Bundesanstalt für Arbeit) are not fully comparable to those on 'unemployment' according to the microcensus.

1.2 Employment status

This is to determine which category a person belongs to - blue-collar worker, white-collar worker, civil servant (including judges and soldiers), self-employed, assisting family members and apprentices (which are legally employees). Normally assisting family members and apprentices are not considered in qualification projections.

1.3 Branch of industry

From 1971 to 1983 the microcensus was based on its own systematics of the economy; since then systematics derived from the official basic systematics of industrial sectors have been used. The workers are directly asked about the economic focus of the local unit (not the company) in which they work. The answers are then organized according to the microcensus systematics. The functional approach of the microcensus differs from the institutional concept of the national accounts (see below).

[76] The Statistische Bundesamt has pointed out repeatedly that this meant losses in answers and distortions.
[77] i.e. people having their residence within the national territory.

1.4 Occupation followed

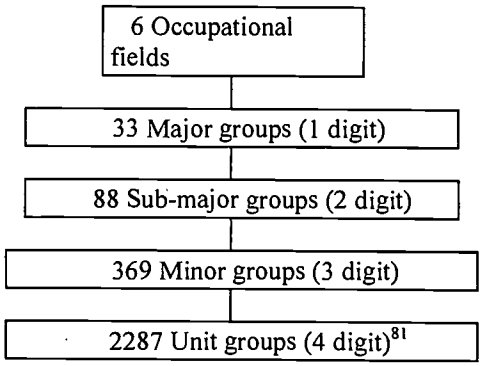
'An occupation is defined as the activities at work requiring characteristic skills, knowledge and experience which are combined in a typical way and destined for commercial use which constitute the individual's contribution to the national economy.'[78] This definition does not include housewives, old age pensioners, pupils/students, volunteers or people pursuing a hobby. The unemployed are considered according to their former occupation or the according to the one they are aiming at; school-leavers or other people who have not yet had an occupation are classified in a special category ('labour with no determined occupation (yet)'). Unless they hold a particular occupation assisting family members are also grouped into a special category.

Normally the microcensuses survey occupations every two years; they progressively break occupations down to a 3-digit level and this data is available in comparable versions for 1976, 1978, 1980, 1982, 1985, 1987, 1989 and 1991. Until 1991 (inclusive) the classification of occupations was based on the 'Classification of Occupations 1975' (Editor: Statistisches Bundesamt). After the 1993 microcensus the new edition of the occupation classifications by the Statistische Bundesamt has been used; when applying a conversion code it is comparable to the former systematics[79] and the international systematics of occupations ISCO 88. Appendix 2 contains this conversion code.

The systematics of occupations is classified according to the following levels.[80]

1.5 Job characteristics

Every two years the microcensus collects data about the 'job characteristics' which are independent of the data on occupations. These are meant to provide information about the main focus of activities, taken from a certain department within the company and its position in the company. Questions about job characteristics have been included in the microcensus since 1973[82]. Since 1982 the type of classification has been changed



somewhat and is no longer fully comparable to that of previous years. Questions about department and position in the company were included in 1982. The list in appendix A3 shows the categories of these three job characteristics.

[78] Offical definition of: Statistisches Bundesamt: Klassifizierung der Berufe - Systematisches und alphbetisches Verzeichnis der Berufsbenennungen- 1992 edition, Stuttgart 1992, p.15.
[79] In some cases the comparison is problematic on the 3-digit level and on the 2-digit level due to the new classification.
[80] The diagram is based on the 1992 classification.
[81] Not surveyed in the microcensus; unit groups are only surveyed in the census and occupation censuses.
[82] i.e. in the microcensuses 1973, 1976, 1978, 1980, 1982, 1985, 1989, 1991, 1993.

Most important for the 1989 IAB/Prognos and the 1991/1994 IAB projection are the most relevant activities.

The IAB projection used the following categories:

a. Production-related activities

1. Setting up machines: controlling, operating, setting up or maintaining technical plant (including data processing/NC/CNC plant).
2. Extracting/quarrying/manufacturing: planting, growing, extracting/quarrying/mining, processing, cooking, constructing/expanding, installing, assembling.
3. Repairing, restoring.

b. Primary services

4. Retail and wholesale trade: buying/selling, cashier, brokerage, customer advice, negotiating, advertising.
5. Office work: typing/correspondence, handling printed forms, calculating/estimating, booking, programming, VDU work.
6. General services: serving food/beverages, accommodating, ironing, cleaning/waste removal, packing, loading, transporting/delivering, sorting/filing, driving vehicles

c. Secondary services

7. Research, development: analysing, measuring/testing, testing/trying, researching, planning, designing, drawing, creating/doing artwork.
8. Management: planning, coordinating, organizing, leadership, management.
9. Protecting, applying the law: protecting, guarding (work safety, plant security, traffic control), applying/intepreting regulations/laws, certifying.
10. Nursing/informing: educating/teaching/training, assisting with advice, nursing/caring, treating medically/cosmetically, publishing, entertaining, lecturing, informing.

1.6 Education and training

Every two years the microcensus asks for the respondents' general education certificates and their most recent vocational qualification. This data has been available since 1976 in a comparable manner; an exception is 1980 when a slightly different and more discriminating classification of vocational qualifications was used. Since 1991 the answers to the questions on education and training have been voluntary. Consequently about 10% of the respondents did not answer, this reduction was not 10% across the board, however, but depended on the qualification. These distortions limit the validity of long-term time series on the development of qualifications. After reunification, in 1991, additional categories of features were inquired about in the former GDR, because the qualifications there differed from those of the west.

We distinguish the following levels of education and training:

- General education levels:

- Volks-/Hauptschule (primary/lower secondary school) (including schools for special needs, unless there is no higher qualification);

- Realschule (intermediate secondary school) or equivalent (e.g. completion of a Berufsaufbauschule <vocational extension school> or Berufsfachschule <full-time vocational school> which confer a Fachschulreife <certificate of aptitude for technical college studies>);
- polytechnsiche Oberschule <polytechnic secondary school> (in the former GDR);
- Fachhochschulreife <certificate of aptitude for specialized short-course higher education> (completion of a Fachoberschule <specialized upper secondary school> or Fachgymnasium <specialized academic secondary school> or an upper full-time vocational school);
- General or subject-related Hochschulreife <aptitude for higher education> (completion of a grammar school>, upper secondary evening institute, specialized academic secondary school etc.).

- Vocational qualification levels:

- no completed vocational training;
- completion of an apprenticeship or orientation training or equivalent full-time vocational school; this entails training in the dual system or at a full-time vocational school for occupations where only such training is possible (e.g. laboratory assistants, advanced commercial school 'Höhere Handelsschule') of at least two years duration;
- vocational practical course (minimum 6 months);
- completion of Meisterschule (master craftmen's college), Technikerschule (technical college) or equivalent. This includes an examination as master craftsman taken before a Chamber of Trade/Industry and Commerce and certificates of specialized or technical colleges which provide profound vocational training or continued training after initial vocational training has been completed and practical experience has been gained;
- completion of a specialized school in the former GDR. These were colleges for engineers or primary school teachers, economists, librarians, advertising and design specialists;
- completion of Fachhochschule, including completion of a former 'Ingenieurschule' (in 1971-1975 Ingenieurschulen and Höhere Fachschulen were transformed into Fachhochschule); also included are 'Berufsakademien' (dual training in an institution and in a company);
- completion of higher education. These include all kinds of degrees, Staatsexamen, diplomas, master, and doctoral degrees of universities including comprehensive universities and open universities.

The features included in the microcensuses can be filtered (e.g. only those in employment, excluding apprentices) and combined in any way. In doing so one must be aware of problems arising with regard to the representativeness of the sample and privacy protection. For this reason the Statistische Bundesamt does not publish any data in which one single cell of the table includes less than 50 persons (or when raised less than 5,000 persons). To ensure privacy the evaluations of the Statistische Bundesamt are overlaid with arbitrary numbers between +-4 (raised +/- 400); this results in distortions especially for very discriminating evaluations of small groups.

2. Employment statistics of the Bundesanstalt für Arbeit

The employment statistics of the Bundesanstalt für Arbeit are global statistics for all persons employed with an employment contract subject to the payment of social security

contributions; civil servants, self-employed and assisting family members (unless they are subject to social security contributions) are not covered, the same applies to people holding marginal employment who are exempted from the payment of social security contributions.

There is an insurance account for each person paying social security contributions on which the employer enters the duration of employment, interruptions thereof, gross wage, full-time/part-time work and other data describing the activity. Such data[83] includes the occupation, status in the company and education/training. Every establishment with one or more employees has its own establishment number. The field in which the enterprise exercises most of its economic activities determines which number is assigned to it (this assignment of a certain economic field is regularly updated). It is codified according to the classification of the economic branches (Bundesanstalt für Arbeit's edition). This classification roughly corresponds to that of the national accounts.

- The data on the occupations is derived from the Bundesanstalt für Arbeit's classification of occupations, which in turn generally corresponds to the official classification of occupations by the Statistische Bundesamt, 1975 edition (see above).[84]

- The status in the job represents one of the following groups:

a) Full-time employees
- apprentices (including trainees for semi-skilled jobs, persons doing practical courses, internships);

- workers not employed as skilled workers;
- workers employed as skilled workers;
- master craftsmen, foremen (as blue-collar or white-collar employees);
- white-collar employees (excluding master craftsmen employed as salaried employees);
- outworkers.

b) Part-time employees are not subdivided according to their position in the job; part-time employment includes two groups, one whose weekly working time is less than 18 hours and a second one with more than 18 hours but less than full-time.

- Data on education/training and their combination distinguish the following categories:

a) - primary/lower secondary school, intermediate secondary school or equivalent;
- without completed vocational training;
- with completed vocational training (apprenticeship or orientation training, Berufsfachschule; this entails training in the dual system or at a Berufsfachschule, Technikerschule, Fachschule or Meisterschule or equivalent.

[83] See Bundesanstalt für Arbeit: Code list ... (several years)
[84] The Bundesanstalt für Arbeit has not yet adopted the new classification of 1992.

b) Certificate of aptitude for general higher education or specialized short-course higher education;
- without completed vocational training;
- with completed vocational training (apprenticeship or orientation training, Berufsfachschule; this entails training in the dual system or at a Berufsfachschule, Technikerschule, Fachschule or Meisterschule or equivalent.

c) Completion of specialized short-course higher education (Fachhochschule) (including former Ingenieurschulen and Höhere Fachschulen).

d) Completion of higher education.

e) Type of education unknown, cannot be identified.

Because every employee has his/her social-security number and insurance account employment statistics enable individual longitudinal studies e.g. career histories, to be made. In addition, a sample of employees' insurance accounts (about 5%) was set up at the IAB which likewise permits longitudinal investigations.

3. Other statistics and surveys

- In addition to the sectoral statistics the Statistische Bundesamt regularly makes its own surveys of certain sectors (e.g. agriculture, construction, trades, industry, commerce, catering and others). Personnel statistics of the public service (federation, Laender, local authorities), educational and health care institutions and the judicature describe the number and structure of the manpower in these fields.[85]

- The Bundesanstalt für Arbeit keeps labour market statistics[86]. These include the monthly unemployment statistics which are quite crude in their classifications. This is why special surveys are made bi-annually: one is a process analysis for the unemployed covering the duration of unemployment, inflows and outflows as well as qualifications and other features not included in the monthly statistics. Furthermore there is an annual structural survey of the unemployed (since 1973) which includes detailed data on occupation, qualification, field trained in, new entrants to the labour market, etc.

- Further labour market statistics relevant for research on occupations and qualificaitons are:

- statistics on vacancies;
- statistics on vocational guidance and placement in apprenticeships;
- statistics on continuing training and retraining;
- statistics on special groups, e.g. the handicapped, foreigners;
- statistics on the specialized placement services for highly qualified occupations, etc.

In the IAB's occupation information system the results of these statistics (including microcensuses and employment statistics) are evaluated and summarized for use in voca-

[85] See Statistisches Bundesamt: Ds Arbeitsgebiet der Bundesstatistik (several years).
[86] See Bundesanstalt für Arbeit: Amtliche Nachrichten der Bundesanstalt für Arbeit (ANBA).

tional guidance. The occupation information system includes detailed information on employment structure and development, on the labour market and earnings, etc., in each case classified according to individual occupations and fields of training.

- From the large number of empirical surveys of certain sub-sectors only a few with relevance for education and qualification forecasts will be mentioned below.

- BIBB/IUAB survey on the German labour force. This is a 0.1% sample of the entire German labour force; these surveys were done in 1979, 1985/86 and 1991/92 (including the new German Laender)[87]. The features they contain are much more detailed than those of the microcensus; they include for example, qualification profiles (multiple qualifications, places where trained/studied, further training, foreign languages etc.), occupations and position in the job, characteristics of the working place (including detailed description of functions, instruments used, status in the company), career status (e.g. is the job adequate for the qualification, job satisfaction, earnings) and more.

- Labour Market Monitor for the new federal Laender[88]. Since November 1990 panel surveys (i.e. interviewing mainly the same individuals) were made in eight phases, the most recent being in November 1994. The monitor was intended to bridge the gap until official statistics and labour market statistics have been compiled in the new German Laender. The questions concerned structural matters (qualification, occupation, industry) and the situation on the labour market and personal views and expectations.

- The Labour Market Monitor was complemented by an Education Monitor[89] concentrating on young people and their problems in crossing the first threshhold (from school to vocational training) and the second threshhold (from training into a job). The Education Monitor was compiled in the years from 1991 to 1994.

- The Education Accounts of the IAB[90]. The Education Accounts are a system of national economic accounts covering stock, inflows, outflows and transitions between all types of statuses in the education and training system, the employment system and non-employment for the entire population. By now the Education Accounts have been extended to include the new Federal Laender. They are based on the cohort approach: all people are categorized according to age-classes and gender. All applicable statistics are used and consistently prepared to describe the stock. Some of the movements (transitions) are estimated with the help of statistics, some with the help of empirical surveys or other sources using optimizing procedures (ENTROPIE algorithms). The results of the Education Accounts are used to analyse and forecast certain aspects of the education system and the supply of qualified labour.

- Surveys on the progress of studies and entry into the labour market of university graduates. One of these surveys is performed by the Working Group on University Research of Konstanz University and covers the situation during the period of study

[87] See Parmentier et al. 1993
[88] See Infratest et al. (several years).
[89] See IAB Kurzberichte 5/1992, 20/1992, 1/1993, 3/1993, 4/1994, 3/1995, 5/1995.
[90] See Fischer et al. 1993.

and the students' expectations[91]. There are also regular surveys on the progress of students' courses and the jobs taken after graduation by Hochschul-Informationssystem GmbH (HIS), Hanover.

- Surveys on the situation of apprentices and the jobs taken by skilled workers after training. These surveys are regularly made by the Bundesinstitut für Berufbildung (BIBB). They relate to issues like dropping out of training, the situation during training, whether or not former apprentices stay with their training company and how they fare etc. BIBB publishes the results in its research reports and summarizes them in Berufsbildungsberichte (annual vocational training reports) [92].

- Expert interviews concerning recognized training occupations by the IAB. In 1990 and 1993 the IAB interviewed experts on the employment prospects and vocational requirements in about 90 occupations with apprenticeship training[93]. These questions related to the current situation and to the medium-term outlook both regarding training (requirements, willingness to provide training by the companies) and employment (e.g. intentions to keep former apprentices in the company, demand for skilled workers). In addition, demand profiles for each occupation were defined for the individuals' abilities and skills (e.g. language and communication skills, social competence) and their knowledge and know-how (e.g. computers, knowledge of the industry, foreign languages, leadership abilities).

[91] See an up-to-date analysis by Bargel/Ramm 1995.
[92] Since 1977 Vocational Training Reports have been published (editor. Federal Ministry for Education and Science).
[93] For the expert interviews 1993, see: Parmentier et al. 1994.

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CEDEFOP Document

Luxembourg: Office for Official Publications of the European Communities

1997 — IV, 82 pp. — 21.0 x 29.7 cm

ISBN 92-828-1172-7

Price (excluding VAT) in Luxembourg: ECU 8

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ISBN 92-828-1172-7

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