

Discussion Paper No. 01-64

**Job Shopping after Vocational Training?  
An Empirical Analysis of the Transition  
from Apprenticeship Training to Work**

Wolfgang Franz and Volker Zimmermann

**ZEW**

Zentrum für Europäische  
Wirtschaftsforschung GmbH

Centre for European  
Economic Research

Discussion Paper No. 01-64

# **Job Shopping after Vocational Training? An Empirical Analysis of the Transition from Apprenticeship Training to Work**

Wolfgang Franz and Volker Zimmermann

Download this ZEW Discussion Paper from our ftp server:

**<ftp://ftp.zew.de/pub/zew-docs/dp/dp0164.pdf>**

Die Discussion Papers dienen einer möglichst schnellen Verbreitung von neueren Forschungsarbeiten des ZEW. Die Beiträge liegen in alleiniger Verantwortung der Autoren und stellen nicht notwendigerweise die Meinung des ZEW dar.

---

Discussion Papers are intended to make results of ZEW research promptly available to other economists in order to encourage discussion and suggestions for revisions. The authors are solely responsible for the contents which do not necessarily represent the opinion of the ZEW.

## **Non-technical Summary**

If and how long youths continue to work in the company where they were trained after completion of their apprenticeship training, is a question the answer to which can help us to gain a better understanding of the labour market in multiple aspects. Of course, withdrawals from the training company without subsequent employment contribute to the explanation of youth unemployment. In addition, there might be an interrelation between the training commitment of companies and the fluctuation of those trained. In-house training is very likely to cause net costs for the training company, and it will be difficult for it to recover the returns arising from a longer period of continued service of the former trainee if he or she leaves the company relatively soon after the traineeship. However, a high level of fluctuations after the end of the traineeship may also be a sign of the company having – for whichever reason – trained more workers than required. After all, the length of continued service for the first employer after completion of traineeship allows for conclusions on the workplace mobility of youths.

This paper deals with the length of continued service of young people after their initial vocational training in the Dual System (German initial vocational training system combining classroom and practical training). The examination of a sample of 4,627 former apprentices shows that the length of continued service is determined by characteristics of the training company as well as by macroeconomic conditions. Former trainees seem to stay longer in companies with high net training costs. Furthermore, the study identifies a willingness of companies to train more personnel than is actually required. However, an increased training commitment, for example in times of tight labour market conditions for young people like in the mid-eighties, leads to lower take-over rates. At the same time, the surplus of recently trained workers curbs the mobility of junior skilled workers in those years.

Apart from determining the factors which impact the mobility behaviour of former trainees, this study contributes towards a better understanding of the training commitment of companies.

# **Job Shopping after Vocational Training? An Empirical Analysis of the Transition from Apprenticeship Training to Work**

**by**  
***Wolfgang Franz\* and Volker Zimmermann\*\****

\*Zentrum für Europäische Wirtschaftsforschung (ZEW)

\*\*Kreditanstalt für Wiederaufbau (KfW)

October 2001

## Abstract

This econometric study deals with the question as to what extent apprentices after successfully completing their training stay with the firm where they have received their training and, if so, how long that job tenure holds. Determinants of both decisions can be seen from both the employer's and the employee's viewpoint. The firm is interested to employ this apprentices in order to collect the returns from its investment in their training which frequently is associated with net costs. On the other hand, the firm dismisses apprentices if training is viewed by the firm as a screening device or if apprentices are engaged in work for which, in terms of wages, they are too expensive afterwards. The young trained worker bases his or her decision to stay or to leave on considerations such as experimenting with several jobs ("job shopping"). The realization of such an experimenting may depend on the situation on the labour market. The empirical part uses individual employee data covering the time period 1980 to 1991 in West Germany and is based on a hazard rate model.

Keywords: Training, Apprenticeship, Youth Unemployment, Matching

**JEL Klassifikation: J62, J63, J41**

# 1. Introduction

The increasing lack of skilled labour, especially but by far not exclusively in the IT-sector, has taken centre stage in the public debate on Germany's future developments. Schooling and vocational training are correctly identified as the most promising instruments to achieve sustainable growth rates in order to meet international competition and to improve labour market conditions.

The focus of this paper is on vocational training. More specifically, we deal with job mobility after apprenticeship training in West Germany.<sup>1</sup> This aspect is, of course, only one of several topics associated with apprenticeship training.<sup>2</sup> But we regard it as important for several reasons. Firstly, difficulties during the transition from apprenticeship training to the first job are a non-negligible source of youth unemployment. Secondly, leaving the firm after apprenticeship training may be voluntarily or not. The youth may prefer some experience with several types of firms in order to learn more about his or her abilities and preferences ("job shopping"). Leaving the firm may also serve as a signal for bad employment conditions associated with this firm. On the other hand, the youth may not receive a contract due to his or her poor performance. Moreover, the firm may by intention hire more apprentices than needed later in order to select the best persons. Thirdly, in view of an increasing excess demand for skilled labour it is interesting to examine whether the behaviour of youths and firms is changing.

The following part provides a short overview of the German apprenticeship system. In 1998, about 66 percent of the 16 to 19 year old youths started an apprenticeship within the dual system of vocational training.<sup>3</sup> Although this figure is slightly declining (1990: 71 percent), apprenticeship is still the most important component of the German vocational training system. In the nineties, 22 to 25 percent of the training contracts, out of all new contracts of the previous three years, were

---

<sup>1</sup> This paper represents a reviewed version of Franz and Zimmermann (1999). The authors are solely responsible for the contents which do not necessarily represent the opinion of the ZEW or KfW.

<sup>2</sup> Cf. Franz (1982), Franz, Inkmann, Pohlmeier and Zimmermann (2000), Franz and Soskice (1995), Franz, Steiner and Zimmermann, 2000 and Zimmermann (2000) for studies on various aspects of apprenticeship training.

<sup>3</sup> Cf. Reinberg and Hummel (2001), p. 3.

terminated prematurely.<sup>4</sup> Most of the drop outs do not cease their efforts in vocational training but start another apprenticeship or continue education at university or in a vocational school.<sup>5</sup> Among those apprentices who do not quit, the overwhelming number (1999: 85 percent) succeed in the final examinations. In 1998, about 65 percent of the 25 to 34 year olds has completed an apprenticeship (1990: 67 percent).<sup>6</sup> After a successful final examination, the former apprentices have good chances to stay within the firm in which they were trained. In 1999 about 60 percent were employed by their training firm.

## **2. The labour market for youths after their traineeship**

This paragraph aims at providing a quantitatively oriented background for the following observations about the length of job tenure in the training firm following initial vocational training. In view of the misery on the German labour market an overview – as brief as it may be – has to begin with the state and development of youth unemployment, albeit very cursorily.

Figure 1 shows the development of youth unemployment for two age groups (youths under 20 and between 20 and 25 years), and for comparison a group of adults after vocational training and prior to an (early) withdrawal from employment due to higher age. Three observations need to be underscored. Firstly, youth unemployment has increased more than adult unemployment in the first half of the nineties. Secondly, the unemployment rate among 20 to 25 year old persons is in some cases considerably higher than the rate for those under 20 years of age. Thirdly, compared with the unemployment rates of adults unemployment rates among young people have aligned much more in the nineties than in the beginning of the eighties, when the unemployment rate of the 20 to 25 year-olds was at least twice as high as the unemployment rate of adults. One reason for such a disproportionately high youth unemployment in the first half of the eighties might have been the situation on the

---

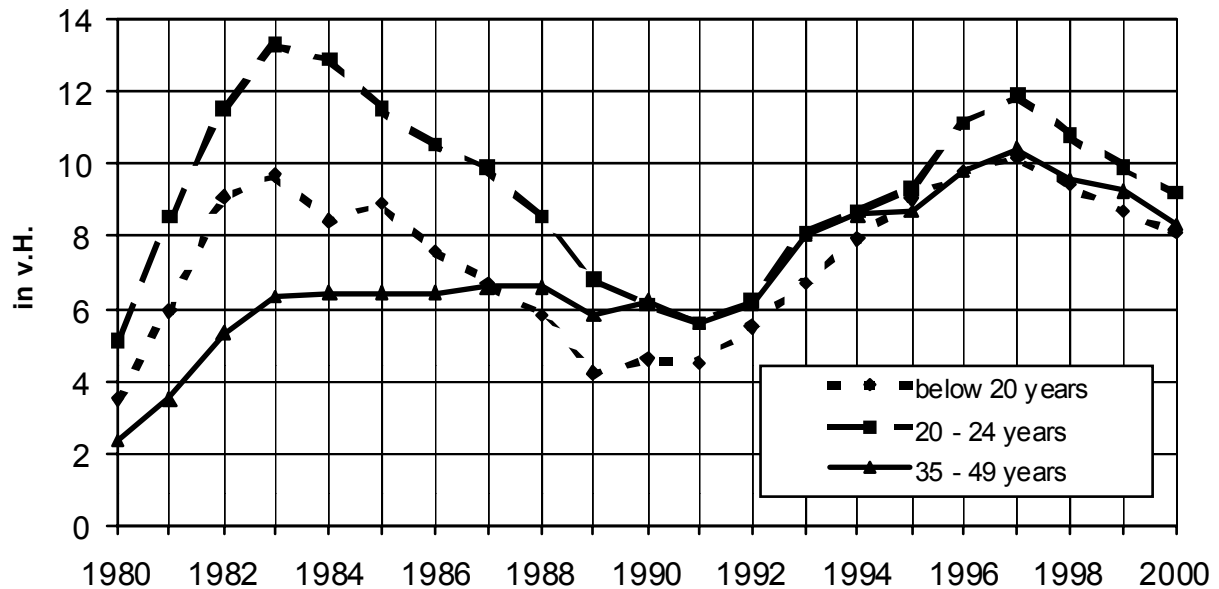
<sup>4</sup> Cf. BMBF, (ed.), *Berufsbildungsbericht*, various issues.

<sup>5</sup> Cf. Alex, Menk and Schiemann (1997).

<sup>6</sup> Cf. Reinberg and Hummel (2001), p. 4.

job market for training positions which was characterized by a significant excess demand (see below).

**Figure 1: Development of unemployment rates for youths in West Germany from 1980 to 2000**



Note: excluding Berlin.

Source: Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (1998), p. 87, Statistisches Bundesamt (ed.), Strukturanalyse, various issues, own calculations

Youth unemployment is an internationally wide spread problem, and Germany actually still does comparatively well.<sup>7</sup> When comparing the unemployment rate of 20 to 25 year old young people – so as to eliminate the special characteristics of the German Dual System – with the unemployment rate of under 25 year olds in other countries, the West German unemployment rate for the time period 1993 to 1997 is approximately 10 percent, while unemployment rates amount to approximately 11 percent in Denmark, the Netherlands, and the United States on the one hand, and

<sup>7</sup> For an international comparison of the school to work transition see Ryan (2001).

approximately 30 percent in France and Italy, on the other hand, not to mention the 42 percent mark in Spain.<sup>8</sup>

Breaking down the unemployment rate into its dynamic components, duration of unemployment and incidence<sup>9</sup>, reveals that the duration of unemployment increases with age, while it is the other way around for unemployment incidence.<sup>10</sup>

In West Germany the duration of unemployment was thus 21 (36) months in 1997 for the age group of 20 to 25 year-olds (35 to 50 year-olds), while the incidence figures amount to 29 (15).<sup>11</sup> Even though the incidence and not so much the duration of unemployment represented the major problem for youth unemployment as opposed to that of adults, it was nevertheless the duration of youth unemployment and not the incidence among young people which has considerably influenced the development of the youth unemployment rate since the eighties, as simulation calculations demonstrate.<sup>12</sup> In other words, it is necessary to ensure, as far as this is possible, that the duration of unemployment for young people is reduced as well. The longer they are unemployed, the more difficult it will be to escape from joblessness. The smooth transition from a traineeship to an employment relationship, or subsequent job changes without intermittent periods of unemployment naturally offer the best guarantee for stable careers. This study examines one aspect of this fluctuation, namely whether and how long, if necessary, the trainee continues to work in the training company.

As the length of service in the training company is at the centre of this study, a few observations and a short quantitative analysis of the job market for training positions is in order for the following reasons.<sup>13</sup> An excess demand for trainees may lead to a situation where companies (have to) decrease their qualification requirements for want of qualified applicants so as to ensure a fresh generation of in-house skilled

---

<sup>8</sup> Source: German Council of Economic Experts (1998), Table 34, p.88.

<sup>9</sup> Incidence of unemployment is calculated as the ratio of the number of newly unemployed persons to the number of persons in dependent employment.

<sup>10</sup> Cf. Franz (1999), chapter 9.

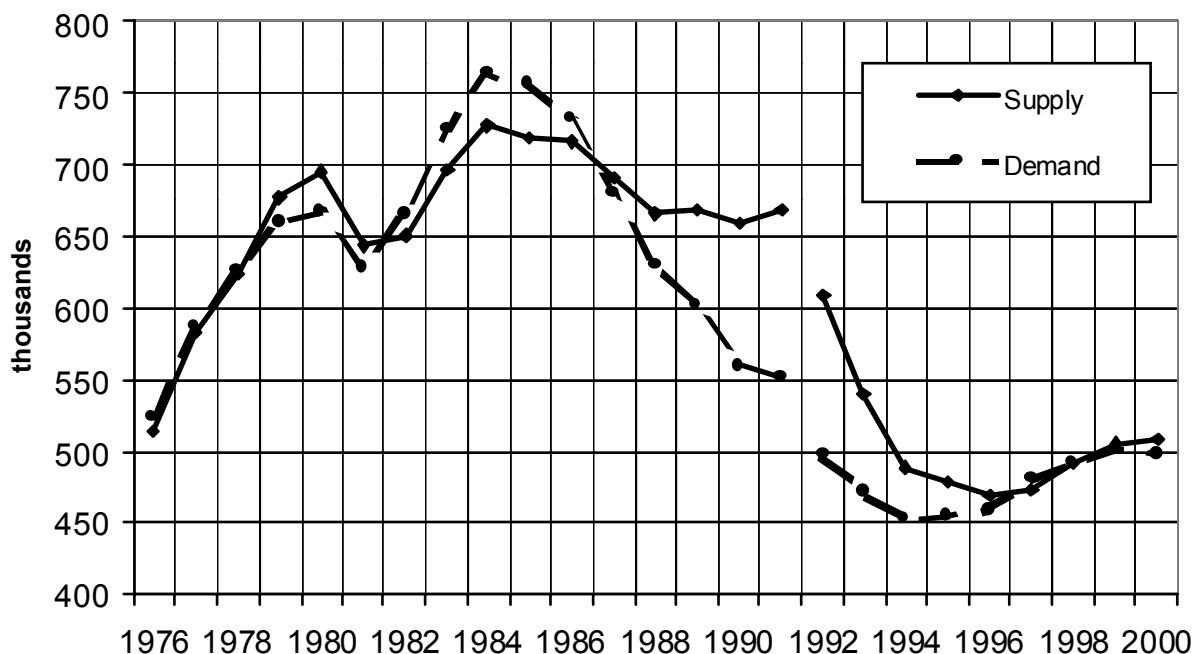
<sup>11</sup> The age group of 35 to 50 year-olds represents unweighted averages of three age groups. Source: German Council of Economic Experts (1998), Table 33, p.87.

<sup>12</sup> Cf. Zimmermann (2000), chapter 3.1.



workers. However, they might decide during training that they will not offer an employment contract to all of their trainees at the end of traineeship due to their inadequate productivity. As a testable hypothesis, the present situation on the job market for training positions therefore might influence the transition probability for young people approximately three years later.

**Figure 2: Demand and supply of apprenticeship training positions in West Germany 1976 - 2000**



Note: As of 1993 excluding Berlin.

Source: BMBF (ed.), Berufsbildungsbericht, various issues.

Figure 2 thus depicts the temporary development of the supply of and demand for training places in West Germany in the period from 1980 to 1998. „Supply“ is defined as the number of new training contracts and training places that are reported to the employment offices, but which are still vacant (effective date September 30 in every year). „Demand“ is defined as the sum of new training contracts plus the registered applicants who have not yet been placed (on the same effective date).

<sup>13</sup> Cf. Franz and Soskice (1995), Harhoff and Kane (1997), and Zimmermann (2000).

Even though this definition is quite common and set forth by law (§ 3 Vocational Training Promotion Act) one should not overlook its weak points, i.e. that employment office services are not engaged in all applications and training vacancies, and that considerable efforts are undertaken on the job market for training positions after the effective date lapsed.

Given these reservations figure 2 displays that the job market for training positions has experienced excess demand for training places since 1980 (for instance from 1982 to 1986 and post-1996) as well as several situations with considerable excess supply (1988 to 1996).

**Table I: Percentage of firms providing vocational training by firm size from 1985 to 1998**

Firm size	1985	1987	1988	1990	1991	1992	1993	1994	1995	1996	1997	1998
1 - 9	27.8	26.8	25.0	21.4	19.7	18.3	17.2	16.7	16.9	16.9	17.1	17.4
10 - 49	57.8	57.5	56.1	51.7	49.7	47.9	46.7	46.3	46.5	46.5	47.0	47.6
50 - 499	76.4	77.1	76.5	73.6	72.0	70.5	69.5	68.2	67.6	67.1	68.5	69.7
> 500	94.0	94.3	94.8	94.0	94.3	94.1	93.7	93.9	93.8	93.2	94.5	93.8
All	34.3	33.4	31.8	28.3	26.7	25.3	24.2	23.6	23.7	23.7	24.0	24.2

Source: Bundesinstitut für Berufsbildung; BMBF (ed.), Berufsbildungsbericht, various issues.

Note: West Germany including Berlin.

The decline of demand for apprenticeship training positions after 1984 is not only a consequence of drastically smaller birth cohorts but also due to lower labour force participation rates. For example participation rates of males (females) under age 20 fell from 45,8 (39,6) percent in 1985 to 37,1 (32,8) percent in 1993 due to an increased demand for higher education.<sup>14</sup> The drop of demand and supply of apprenticeship training positions can be seen by inspection of the ratio of firms which actually train apprentices among all firms. As shown in table I, this

<sup>14</sup> Cf. Franz, Inkmann, Pohlmeier and Zimmermann (2000), p. 389.

percentage of firms decreased by roughly one third. Especially small and medium firms reveal lower training participation rates.

### 3. Explanatory pattern for the duration of job tenure directly after end of traineeship

Theoretically there are two answers to the question as to whether and how long young people continue to work in the training company after the end of their traineeship, depending on whether the employer or the employee gave notice of termination. There is substantial literature on both aspects which we will evaluate briefly with regard to this specific subject.<sup>15</sup> Based on a panel data set of individual firms collected by the IAB Institute for Employment Research table II shows the empirical relevance of the reasons for leaving the training company directly after the end of traineeship. According to the panel young people leave the training company on their own initiative in nearly half of the companies. As many as 38 percent of the companies state that they do not require skilled workers. Only one out of ten firms reported that trainees left the company after the end of their traineeship, because the company felt that the trainee lacked the necessary aptitude.

**Table II: Reasons for withdrawal from the training company after the end of traineeship in West Germany 1996**

Reason for Withdrawal	Percent
Former trainees had other plans	46
At present, company does not require any skilled workers	38
Former trainees do not meet company expectations	9
Company belonging to the same group takes over former trainees	4
No reasons stated	2

Source: Bundesministerium für Bildung und Forschung (1998), (ed.), Berufsbildungsbericht 1998, Figure 19.

<sup>15</sup> Cf. the overviews in Franz (1999), chapters 4 and 6.

When starting out with the companies, basically three determinants have to be considered:

- i. With respect of the general determinants influencing demand for (qualified) labour the expected demand for commodities, which, however, does not necessarily represent an exogenous variable, and production technology plays a certain role. In other words, the output development in individual sectors, be it subject to business activities or to long-term trends due to, for instance, demand shifts triggered e.g. by preference changes, as well as the capital-labour ratio of production which is determined, *inter alia*, by technical progress as well as by the relative labour and capital costs can be seen as determinants.
- ii. Furthermore, when dealing with heterogeneity of labour one has to take into account that the demand for qualified labour has increased relatively to demand for low skilled labour so that the company is *ceteris paribus* to a greater extent interested in taking over its former trainees into regular employment. Technical progress and the increasing international interdependence of output and input markets are primarily held accountable for this structural change of labour demand in terms of quality.
- iii. Moreover, the company has to tackle the question as to whether it intends to meet the demand for skilled workers by employing external employees instead of – or in addition to - taking over its trained employees. Apart from reviewing the personal characteristics of former trainees that were hardly observable at the beginning of the traineeship or have changed (such as qualification level above or below average, morale, personal appearance), the company will nevertheless review the external skilled labour market with regard to availability and remuneration and take into account that net training costs will represent sunk costs, if a former trainee is not employed after an in-house traineeship.
- iv. Finally one has to take into account that companies provide at the outset a high number of training places that does not correspond to the expected demand for skilled workers. This decision might well be based on rational considerations: within a personnel selection process the company can choose the most suited workers from the group of former trainees; or the net training costs are low or even negative, e.g. because trainees perform

activities for which a low skilled employee would have to be employed. In (individual) cases, however, employers might heed the appeals of their associations to increase the number of training places when there is a great need for training places, or company owners might hear such requests in their personal networks and employ more trainees than necessary. This means they act in a social manner which might improve the reputation of the company. This however, does not serve as an explanation for all cases.

On the other hand there are determinants influencing the decisions of former trainees as to whether and for how long they will continue to work in the training company. The young people will analyse their options just as the employers did. When general labour demand and wage offers of other companies are increasing, it is more likely that young people will be willing to work for a different company. Furthermore, their willingness to move to another place in the region – if there are no adequate alternatives near their home – and their satisfaction with their working conditions represent significant determinants. A former trainee may also enter into a more preferred job, i.e. the training place met the trainee's preferences only to a very limited degree, nevertheless the trainee accepted it at that point in time, because there were no other alternatives. Finally, job changes at the beginning of working life might reflect the intention to try out different activities and to determine optimum productivity.

## **4. Empirical analysis**

### **4.1 Econometric model**

In this paragraph we will briefly present a hazard rate model with which we will examine the take-over of former trainees into regular employment and their subsequent length of continued service in the training company. The hazard rate represents the conditional probability that a situation, e.g. the period of employment in a company, is terminated within a certain interval  $[t, t+\Delta t)$  under the condition that this situation has lasted until the time  $t$ . The hazard rate is defined as the limiting value of this probability for  $\Delta t \rightarrow 0$ .

$$\lambda(t) = \lim_{\Delta t \rightarrow 0} \frac{1}{\Delta t} \Pr(t \leq T < t + \Delta t | T \geq t), \quad (1)$$

where  $T$  is a continuous variable indicating the completion time of the situation. The length of continued service in a certain situation is distributed with the corresponding distribution function  $F(t)$  according to the density function  $f(t)$ . The function  $S(t) = 1 - F(t)$  is designated as survivor function. It indicates how probable it is that the length of stay is equal to or greater than  $t$ . The hazard rate can be expressed as quotient of density function and survival function:

$$\lambda(t) = \frac{f(t)}{S(t)}. \quad (2)$$

For the following analysis a discontinuous hazard rate model is formulated.<sup>16</sup> To this end the time axis is subdivided into intervals. If a situation ends in the interval  $[I_{t-1}, I_t)$  the length of continued service variable  $T$  takes on the value  $t$ . The hazard rate of a former trainee  $i$  is dependent on a time-variable covariable vector  $x_i(t)$ .<sup>17</sup>

$$\lambda_i(t | x_i(t)) = \Pr(T_i = t | T_i \geq t, x_i(t)). \quad (3)$$

The survivor function can be calculated from the transition rates of the individual rates. The probability that a former trainee will not leave the training company within an interval  $t$  is thus:

$$\Pr(T_i > t | T_i \geq t, x_i(t)) = 1 - \lambda_i(t | x_i(t)). \quad (4)$$

The probability that a trainee will continue to work in his or her training company until the specific point in time  $t$  is thus:

$$\Pr(T_i > t | x_i(t)) = \prod_{\tau=1}^t [1 - \lambda_i(\tau | x_i(\tau))]. \quad (5)$$

---

<sup>16</sup> Cf. Narendranathan and Stewart (1993), and Steiner (1997).

<sup>17</sup> Within this model it is also possible to consider unobserved heterogeneity by applying the Heckman-Singer-method. As unobserved heterogeneity proved to be irrelevant in this problem formulation we will not go into further detail. Cf. Heckmann and Singer (1984) and Steiner (1997).

One can assume that the influence of the right hand variable  $x_i(t)$  on the hazard rate directly after the end of traineeship differs from the influencing factors in the subsequent periods. The coefficient vector  $\gamma$  represents these deviating effects which might occur directly after the end of traineeship. The hazard rate is presented as a logit model. It has the following form for a transition within one interval:

$$\lambda_i(t | x_i(t)) = \frac{\exp(\alpha(t) + \beta' x_i(t) + \gamma' x_i(t) \alpha(1))}{1 + \exp(\alpha(t) + \beta' x_i(t) + \gamma' x_i(t) \alpha(1))}. \quad (6)$$

The parameter vector  $\alpha(t)$  measures the dependency of the transition rate on the continued length of stay. It is defined as vector of dummy variables which take on the value one if the transition rate of the corresponding interval is determined. If one considers right censored observations based on a random process, the probability function is:

$$L = \prod_{i=1}^n \left[ \frac{\lambda_i(t_i | x_i(t_i))}{1 - \lambda_i(t_i | x_i(t_i))} \right]^{\delta_i} \prod_{\tau=1}^{t_i} [1 - \lambda_i(\tau | x_i(\tau))], \quad (7)$$

where  $\delta_i$  is an indicator variable which takes on the value of one, if the former apprentice is observed to leave the training firm.

## 4.2 Data

The empirical study on the length of service after initial vocational training is performed on the basis of the most recent available cross-sectional poll conducted in cooperation between the BiBB – Federal Institute for Vocational Training and the IAB – Institute for Employment Research in the framework of the survey „Acquisition and application of occupational skills“. <sup>18</sup> In the context of this survey, data were collected in 1991/92 in a representative poll on initial vocational training and careers of approximately 34,000 individuals between 15 and 65 years in West

---

<sup>18</sup> The data was prepared and documented for the analysis by the Central Archive for Empirical Social Research (ZUMA). Neither the BiBB nor the IAB are responsible for the analysis or interpretation of the data presented in this paper.

and East Germany. Only a very small share of those surveyed are persons with a foreign citizenship.<sup>19</sup>

The analysis conducted here is constrained to former trainees from West Germany, in order to avoid extraordinary effects that might arise due to the fact that the so-called Dual System, the German vocational training system which combines classroom and practical vocational training, had not been fully established in the eastern constituent states. Furthermore, among those who completed initial vocational training, only those are included who completed their traineeship in the Dual System between 1980 and 1991. The data surveyed on training in the Dual System relate to the most recent traineeship completed. In order to restrict the survey to those who completed their first traineeship, all those individuals were removed from the sample, who were more than 30 years old at the end of their traineeship. Apart from that, individuals were excluded who were unable to give details on the time they spent in the training company and on the company itself. The remaining sample comprised 4,627 former trainees. Table III shows the cases left after each selection step.

**Table III: Number of individuals remaining in the sample after removal due to various selection criteria**

Preclusion criterion	remain ing cases
Total	34,277
East Germany	23,245
Traineeship not completed	16,490
End of traineeship not between 1980 and 1991	4,838
Older than 30 at end of traineeship	4,776
No details on job tenure	4,639
No details on training company	4,627

Source: BiBB/IAB survey of 1991/91, own calculations.

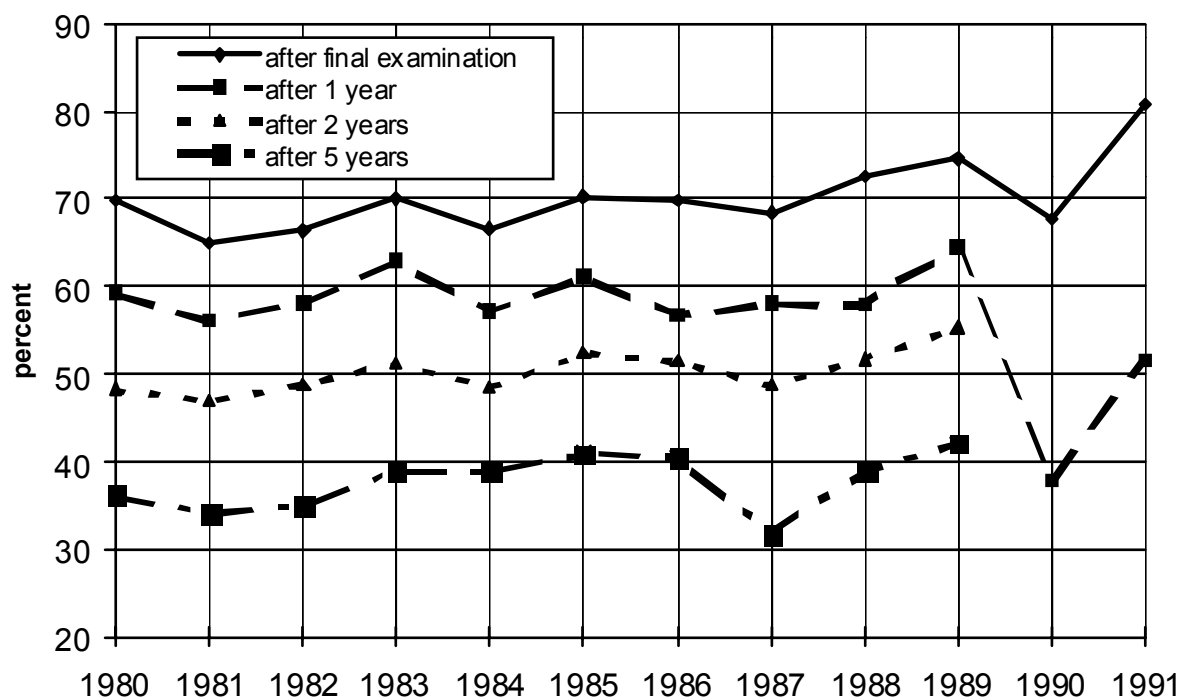
The length of continued work after the end of the traineeship is determined according to six categories. The poll identifies whether a former trainee left the company immediately, within a year, in a period ranging from one to under two

<sup>19</sup> It is therefore not possible to study the impact of foreign citizenship on length of job tenure.



years, and within a period ranging from two to under 5 years. In addition, the answers „more than 5 years“ length of service and „still employed in the training company at the time of the poll“ were possible. Based on these possible answers, four categories for the length of continued service for the training company were devised accounting for censoring at the end of the observation period. These categories refer to those leaving their training company immediately after completing their traineeship, within a year, within a period ranging from 1 year to under two years, and within a period ranging from two years to under five years. 192 former trainees leave the training company due to military service. Even though in reality it is possible to influence the point in time of military service to a certain degree, this process is regarded as an exogenous factor. The length of continued service of the former trainees is regarded as censored at that point in time.

**Figure 3: Empirical survivor function for job tenure in the training firm after apprenticeship training**



Source: BiBB/IAB survey of 1991/92, own calculations.

Based on a graduated life table,<sup>20</sup> figure 3 shows the calculated period spent in the training company after the end of the traineeship in relation to the year of the end of traineeship for the period between 1980 and 1991. As a rule, 400 to 450 observations were obtained per traineeship completion year. The share of employees who do not leave their training company immediately after the traineeship has increased since the beginning of the eighties. This increase is especially strong in the second half of the eighties. The other categories of length of continued work, too, experienced a slight increase in the continued service curves in the eighties.

In the following some explanatory variables for the length of service underlying the study are described. Table IV shows descriptive statistics of the applied variables.

The economic sector to which the training company belongs allows for conclusions on various training company characteristics. Firstly, the economic sector reflects the cost of training as well as the degree to which trainees can be entrusted with productive activities in the company already during their traineeship. Traineeship costs are studied regularly for the industrial and the trade sectors.<sup>21</sup> According to the most recent studies, net costs of training in the craft trades are lower than those in the sectors of industry and trade. They correspond to approximately two thirds of the net costs of training incurred by the latter sector.<sup>22</sup> The fact that training costs are lower in the craft sector combined with the high volume of productive work performed by trainees during their traineeship result in net costs of approximately one third of all training companies in the craft sector in 1991.<sup>23</sup> Due to this cost structure craft businesses quite frequently train a surplus of workers, whom they do not intend to take over into regular employment after completion of training. At the same time, trainees do not regard craft businesses as attractive employers, so that it is quite frequently on their own accord that youths look for employment in other sectors after the end of their traineeship.

---

<sup>20</sup> Cf. Blossfed, Hammerle and Mayer (1986), p. 42.

<sup>21</sup> Cf. for example Sachverständigenkommission Kosten und Finanzierung der beruflichen Bildung (1974), Falk (1982) as well as Noll, Beicht, Böll, Malcher and Wiederhold-Fritz (1983).

<sup>22</sup> Cf. Bardeleben, Beicht and Fehér (1997). The values stated are based on the variable costing approach.

<sup>23</sup> Cf. Bardeleben, Beicht and Fehér (1995).

**Table IV: Descriptive Statistics**

Variable	percent / mean (st. dev.)
<u>Training firm:</u>	
Sector:	
Craft	32.8
Industry	23.3
civil service	13.8
Trade	15.5
other sectors	14.7
firm size:	
less than 4 employees	8.9
5 to 9 employees	19.8
10 to 49 employees	27.8
50 to 99 employees	10.6
100 to 499 employees	16.1
500 to 999 employees	5.6
1000 and more employees	11.2
production technology	
capital-labour ratio:	
capital-labour ratio not available	4.6
Mean	0.193 (0.257)
<u>former apprentice:</u>	
age at final examinations	19.9 (2.06)
gender (1 = female)	42.1
general educational background:	
no certificate	0.1
lower secondary school	40.3
secondary school	44.0
entitlement for university (of applied sciences)	14.9
other schools	0.7
<u>macro economic conditions</u>	
Unemployment rate (percent)	7.7 (2.99)
Trainee-employee ratio (percent)	7.7 (1.71)

Source: BiBB/IAB survey of 1991/91, own calculations.

The size of the training company also allows for conclusions on the training costs. The net training costs in larger training companies are higher. According to calculations of the BiBB - Federal Institute for Vocational Training, the net costs of training per trainee and training year in companies with over 500 employees are 6.5 times as high as in companies with less than 10 employees.<sup>24</sup> The higher costs are to be attributed to the frequent deployment of full-time trainers and the fact that trainees are trained in special training facilities. The number of trainees per employee in these companies is also much lower than in small businesses. In addition, the more complex structures and processes in larger companies seem to require the formation of company-specific human capital, so that these companies are more likely to train junior skilled personnel to meet their own needs. This leads to the assumption that both the take-over rate and the length of continued service for the training company after the end of the traineeship increase with the size of the company.

At the same time, large companies seem to be more attractive for former trainees than smaller businesses: Companies with a larger internal labour market offer better prospects of an internal career. Very frequently, larger companies pay higher wages and salaries than smaller businesses. These are some of the considerations that lead us to assume that former trainees are more likely to stay in larger training companies than in smaller training companies.

The capital-labour ratio, measured as the net capital invested per employee, describes the state of the production technology of the training company. The training companies included in the sample are subsumed under 33 industrial segments and their capital-labour ratio is considered on an annual basis. We could, for example, assume that a higher capital-labour ratio stands for more complex work processes and that skilled workers and a high company-specific human capital stock would be required for these processes. If so, a longer length of service period in the training company would be expected. However, it is also possible that a high capital-labour ratio stands for a high level of automation, which would entail lower

---

<sup>24</sup> Cf. Bardeleben, Beicht und Fehér (1997).

requirements on the skill level of the employees. If so, employment relationships are more likely to be shorter in companies with a high capital-labour ratio.

There is a small number of companies for which capital-labour ratios cannot be considered. These companies were not removed from the data set but left there marked with a dummy variable indicating the fact.

The educational background of the former trainees is also observed. Among the former trainees, a majority (44 percent) holds a general certificate of secondary education, while 40 percent hold a secondary school leaving certificate. 15 percent hold a university or university of applied sciences entry certificate. Hardly any members of the sample had no school leaving certificate or other certificates than those mentioned above.

The training companies are more likely to want to keep the former trainees with the higher-level leaving certificates in the company in order to augment their human capital. Against this backdrop, we would expect the length of continued work for the training company to be longer with increasing levels of leaving certificates held by the former trainees. Here, a counter effect is to be expected due to the options the former trainees have thanks to their education, since it seems as if youths have more options outside the training company the higher their level of education is. On the one hand, it seems as if former trainees with a higher level of education receive job offers from other companies more frequently, on the other hand, these youths – especially those with university or college entry certificates – have access to further education. This means that the influence of the school education level on the continued service in the training company cannot unambiguously be explained a priori.

To what extent gender influences the length of continued work in the training company also cannot unambiguously be explained by theory. However, it seems as if young women interrupt their careers more readily than young men due to their family situation.<sup>25</sup> Whether a shorter continued service of women can be identified in the period of no more than 5 years after completion of the traineeship studied here is an aspect to be shown by the empirical analysis.

What is also known of the former trainees is their age at completion of the traineeship. Since no further personal characteristics, like for example the marital status or the number of children in their care, are known for the period under examination, these characteristics are mapped according to the age of the former trainees. Thus, reduced mobility is to be expected with increasing age due to the family situation. The average marriage age rose by approximately 2 years during the eighties, i.e. among unmarried women to 25.5 and among unmarried men to almost 28 years. It is very likely that men who are older at completion of their traineeship have already rendered military or alternative military service and are therefore less likely to be forced to leave the training company due to these reasons.

Furthermore, opportunities on the labour market change with increasing age. A higher age at completion of the traineeship may, if checked against the educational level, inform about the fact that the youth had started his or her traineeship late, a fact which could be attributed to difficulties in finding a training place or difficulties at school, or about the fact that this was not the first traineeship the person underwent. This might mean that the former trainee's opportunities on the labour market are restricted and that they are therefore more likely to remain in the training company. On the other hand, this group might be more likely to include youths who do not live up to the expectations of the training company and whom the training company might want to release. Thus, the influence of the former trainees' age on the length of continued service for the training company is not absolutely clear from the theoretical point of view.

In the sample, the average age at completion of the traineeship is slightly below 20 years. During the seventies and eighties, the average age of trainees rose. As table V shows, we can also observe this development for the eighties in the sample.

The scope of options of the former trainee is determined, among other things, by the situation on the labour market. Therefore, the unemployment rate of each year is accounted for in the study. A rising unemployment rate will be accompanied by reduced opportunities on the labour market and thus a longer continued work in the training company.

---

<sup>25</sup> Cf. Fobe and Minx (1996) on the life project of young people.

**Table V: age of apprentices and former apprentices**

Year	age of apprentices (mean)	Age of apprentices after final examination (sample mean)
(1)	(2)	(3)
1980	17.6	19.4
1985	18.2	19.8
1990	19.0	20.5

Source: Column (2): BMBF (1997) (ed.), Berufsbildungsbericht 1997, p. 54; column (3): own calculations.

The analysis also accounts for the training rate on a macro-economic level, i.e. the number of trainees per employee covered by social insurance. This variable allows for the examination to what extent a changed training intensity during the period under observation can result in changes in the take-over behaviour and the length of service. Thus it can be determined whether a declining training intensity results in more trainees being taken over into regular employment after the end of their traineeship. Such an observation might inform about the fact that in this case the training companies attempt to avoid training surplus labour or that they have improved the selection criteria for trainees so as to ensure that take-over decisions can be restricted to a smaller selection of „candidates“. A constant take-over rate combined with a lowered training intensity seems to inform about the anticipation of the future demand for skilled labour by companies, who adjust their training commitment to reduced demand for junior skilled personnel. For the period under examination, the training proportion is only available in aggregate terms. Although it would be helpful to disaggregate it according to industry level is not possible. Figure 4 shows the development of the training rate between 1980 and 1991. With an increasing number of students finishing school, the training proportion increases up to the year 1986 and then, along with the declining number of students finishing school, the quota slumps to a measurably lower level than at the beginning of the eighties.

**Figure 4: trainee-employee ratio in West Germany 1980 to 1991**



Source: Statistisches Bundesamt (ed.), Fachserie 1 Reihe 4.2, various issues; Statistisches Bundesamt (ed.), Bildung im Zahlenspiegel, various issues, own calculations.

### 4.3 Regression results

Table VI depicts regression results and figure 5 the graphical display of the survivor function in the training company.<sup>26</sup> This figure shows the survivor function of a reference person as well as the respective function for other persons when changing the attribute for the reference person. Table VII presents the percentage change in the survivor function in the case of such variations. The reference person is defined as follows: an almost twenty year-old employee who completed training (average value of sample: 19.9 years of age) with an intermediate level of schooling working in a craft business with less than five employees. Further attributes, such as the capital-labour ratio, training proportion, and unemployment rate also take on the average values of the sample.

---

<sup>26</sup> Unobserved heterogeneity cannot be detected in the analysis. The Akaike criterion was used as test statistic. Cf. Akaike (1973).



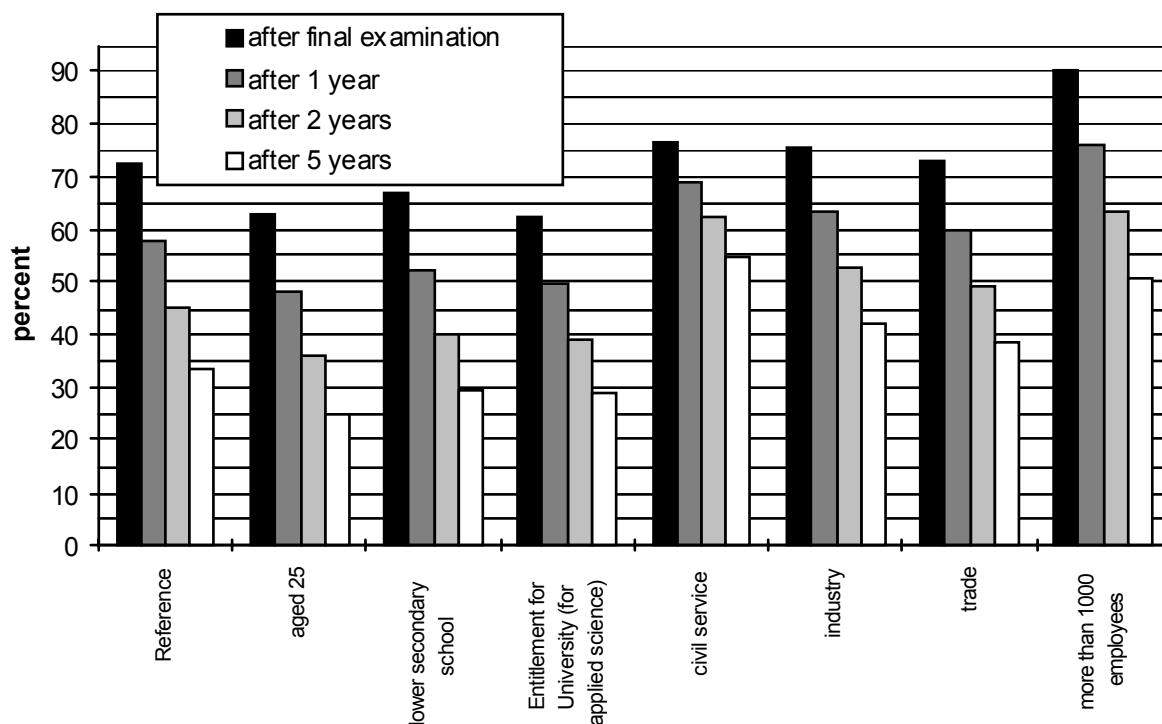
**Table VI: Regression results**

Variable			interaction terms hazard rate at the end of vocational training	
	coefficient	t-value	coefficient	t-value
Constant	-3.918	-6.6		
<u>apprentice</u>				
Age	0.038	2.1	0.047	1.8
gender (male)	0.072	1.1	0.317	3.1
no certificate, lower secondary, other school	0.073	1.1	0.189	1.7
entitl. for university (for appl. Sciences)	-0.015	-0.1	0.475	3.1
<u>training firm</u>				
sector (craft)				
Industry	-0.317	-3.3	0.165	1.1
civil service	-0.912	-7.7	0.709	4.0
trade	-0.209	-2.2	0.197	1.3
other sectors	-0.339	-3.3	0.327	2.1
production technology				
capital-labour ratio	0.178	1.6	-0.101	-0.6
capital-labour ratio not available	0.088	0.7	0.024	0.1
firm size (< 4 employees)				
5 to 9 employees	-0.116	-1.0	-0.231	-1.3
10 to 49 employees	-0.025	-0.2	-0.295	-1.7
50 to 99 employees	-0.100	-0.7	-0.535	-2.6
100 to 499 employees	-0.134	-1.0	-0.438	-2.2
500 to 999 employees	-0.284	-1.6	-0.835	-3.0
1000 and more employees	-0.336	-2.2	-0.879	-3.7
<u>macro economic conditions</u>				
unemployment rate	-0.025	-2.0	-0.006	-0.3
trainees-employees ratio	-0.039	-1.9	0.230	4.5
interval dummies (immediately)				
within 1 year	2.259	3.2		
within 1 to 2 years	2.336	3.3		
within 2 to 5 years	1.379	1.9		
number of cases		4,627		
Loglikelihood		6,508.9		

Source: BiBB/IAB survey of 1991/91, own calculations.

The regression coefficients in table VI demonstrate how various attributes influence the hazard rate, i.e. the probability that former trainees will leave their training company. According to equation (5) the effects on the survivor function are calculated from these different determinants and presented in figure 5. In order to allow for attributes influencing the take-over probability that might deviate from other factors influencing the remaining periods of employment, interaction terms of these attributes are formed with a dummy variable designating the point in time when the former trainee is taken over into regular employment. The last two columns of table VI show the effects of these interaction terms.

**Figure 5: Survivor functions for job tenure in the training firm of former apprentices**



Note: Reference person is defined as follows: 20 year old male former apprentice with secondary school certificate; was trained in a crafts firm with less than 5 employees. The variables capital-labour ratio, trainee-employee ratio and unemployment rate at sample means.

Source: BiBB/IAB survey of 1991/91, own calculations.

Among the former trainee's socio-economic attributes age effects prove to differ significantly from zero in all periods. Age is particularly important for the take-over probability. Particularly older trainees frequently leave the training company directly

after the end of traineeship. A quadratic term proved to be insignificant and was dropped from the regression equation. Figure 5 reveals that the survivor function for a former trainee, who is five years older, is much lower than the curve for a former trainee who is just under 20. According to table VII the difference between the take-over rates of both groups of persons is just under 13 percent to the disadvantage of the older former trainee. Young women leave the training company significantly sooner than their male colleagues. However, if they do stay in the training company their hazard rates do not differ significantly from those of their male colleagues. The deviations from the survivor function for a one year to five year period presented in table VII are exclusively due to the differing take-over probabilities.

Similarly, school education proves to be only relevant for the take-over probability: former trainees with intermediate schooling are most frequently taken over into regular employment. The withdrawal behaviour of former trainees employed after training, however, does not differ according to their educational background. This points to a selection process after the end of traineeship that was mentioned in the last section. As the human capital of the former trainees increases, the company is more interested in keeping the young people employed. In parallel, however, young people's options increase as well, which is reflected particularly in the low take-over rates for young people with a university (of applied sciences) entrance qualification: after the end of traineeship thus approximately 28 percent of former trainees with intermediate schooling leave the training company. Thirty-three percent of former trainees with a lower level of schooling and more than 37 percent of former trainees with a higher level of educational attainment left their training company at the end of traineeship.

Compared to the reference category of the craft trades, all other economic sectors have higher survivor curves. The increased hazard rates in the craft trades apply to the take-over rate as well as to the withdrawal of former trainees who had been taken over into regular employment. This confirms the observation in the last section that firms train more apprentices than actually are needed.

**Table VII: Variation of survivor function for job tenure after apprenticeship training**

Variable	variations of survivor function			
	percent			
	after final exami- nations	within one year	within two years	within five years
former Apprentice				
age: 25 year old	-12.9	-16.5	-20.2	-25.0
gender: female	-11.6	-12.9	-14.3	-16.1
general educational background				
no Certificate, lower secondary school	-7.6	-9.0	-10.5	-12.4
entitlement for university (of applied sciences)	-13.8	-13.5	-13.2	-12.9
training firm				
sector (craft)				
Industry	4.0	10.1	17.1	26.8
civil service	5.3	20.0	37.9	64.8
Trade	0.3	4.3	8.8	14.9
other sectors	0.3	6.6	13.6	23.6
production technology				
capital-labour ratio: 10 percent higher	-0.04	-0.1	-0.2	-0.3
firm size (less than 4 employees)				
5 to 9 employees	8.7	11.2	13.9	17.6
10 to 49 employees	8.1	8.7	9.2	10.0
50 to 99 employees	14.8	17.1	19.6	22.9
100 to 499 employees	13.6	16.6	19.8	24.3
500 to 999 employees	22.7	29.2	36.5	46.8
1000 and more employees	23.9	31.6	40.3	52.5
macro economic conditions				
unemployment rate: 10 percent higher	0.7	1.1	1.5	2.0
trainee-employee ratio: 10 percent higher	-4.2	-3.6	-2.9	-2.1

Note: Reference person is defined as follows: 20 year old male former apprentice with secondary school certificate; was trained in a crafts firm with less than 5 employees. The variables capital-labour ratio, trainee-employee ratio and unemployment rate at sample means.

Source: BiBB/IAB survey of 1991/91, own calculations

The amount of net training costs brings about the expected effect with regard to the size of the training company: the take-over rate increases with company size. The hazard rates in the subsequent periods, however, do not differ significantly from each other with the exception of companies with more than 1000 employees. Major companies are thus able to retain their former trainees for a longer period of time. In doing so it is possible to amortize the investment they carried out in the trainees' human capital.

The coefficient determined for production technology suggests that the number of trainees remaining in their training company declines with an increasing capital-labour ratio. This influence, however, proved to be insignificant.

The level of the unemployment rate is a significant factor influencing the probability of continued service in the training company. Based on the observations in the last section, the level of the unemployment rate reflects the former trainees' options to find a job outside the training company. According to these calculations a 10 percent higher unemployment rate will lead to a probability increase of approximately 2 percent that they will continue to be employed in the training company five years after the end of traineeship.

The aggregate training rate also proves to be a significant factor. This influence, however, is distributed unequally. The take-over probability declines with an increasing training proportion, which suggests that training exceeds demand, particularly in view of the tense situation on the labour market for young people. The survivor rate for former trainees taken over into regular employment increases, however, with the training intensity of companies. This might lead to the conclusion that, when the proportion of training firms is high, young people are faced with stronger competition of a fresh generation of skilled workers which limits their possibilities on the external labour market.

## **5. Summary of Findings**

The end of traineeship is followed by considerable mobility within the company. During the period under review approximately half of the former trainees left their training company within a period of two years. The regression results suggest that

reasons for these withdrawals can be found on the part of the companies as well as on the part of the young people. Furthermore, the analysis reveals that the determinants for employment and continued work of a former trainee in the training company partially differ from each other after take-over into regular employment.

Contrary to continued work at a later point in time, the socio-economic background of a trainee thus plays a vital role for take-over into regular employment. Options on the external labour market determine the trainee's inclination not to leave the training company.

Enterprises with high net training costs have longer periods of employment. This observation is in line with the hypothesis that companies attempt to amortise investments in the human capital of the young people. Furthermore, companies are willing to train more young people than are actually needed. Increased willingness to train young people, e.g. during tight labour market conditions for young people in the mid-eighties, leads to lower take-over rates. At the same time the surplus in former trainees limits the mobility of these young skilled workers in those years.

## References

- Akaike, H. (1973), „Information Theory and the Extension of the Maximum Likelihood Principle“, in B.N. Petrov and F. Csaki, (eds.), *Second International Symposium on Information Theory*, p. 267-281, Budapest.
- Alex, L., Menk, A, und M. Schiemann (1997), „Vorzeitige Lösung von Ausbildungsverträgen“, *Berufsbildung in Wissenschaft und Praxis*, 26/1997/4, pp. 34-39.
- Bardeleben, R. v., U. Beicht and K. Fehér (1995), *Betriebliche Kosten und Nutzen der Ausbildung. Repräsentative Ergebnisse aus Industrie, Handel und Handwerk*, Bonn.
- Bardeleben, R. v., U. Beicht and K. Fehér (1997), *Was Kostet die betriebliche Bildung? Fortschreibung der Ergebnisse 1991 auf den Stand 1995*, Bundesinstitut für Berufsbildung, Bonn.
- Bardeleben, R. v. and K. Troltsch (1997), „Betriebliche Ausbildung auf dem Rückzug? Entwicklung der Ausbildungsbeteiligung von Betrieben im Zeitraum von 1985 bis 1995“, *Berufsbildung in Wissenschaft und Praxis* 26/1997/5 pp. 9-16.
- Blossfeld, H.-P., A. Hamerle, and K.U. Mayer (1986), *Ereignisanalyse*, Frankfurt.
- BMBF (Bundesministerium für Bildung, Wissenschaft, Forschung und Technologie), various issues, (eds.), *Berufsbildungsbericht*.
- Falk, R. (1982), „Kosten der betrieblichen Aus- und Weiterbildung. Repräsentative Erhebung für 1980“. In U. Göbel and W. Schlaffke, (eds.), *Berichte zur Bildungspolitik 1982/83 des Instituts der deutschen Wirtschaft*, pp. 63-172, Institut der Deutschen Wirtschaft Köln, Köln.
- Fobe, K. and B. Minx (1996), *Berufswahlprozesse im persönlichen Lebenszusammenhang*, Nürnberg.
- Franz, W. (1999), *Arbeitsmarktökonomik*, 4. Edition, Berlin.
- Franz, W. (1982), *Youth Unemployment in the Federal Republic of Germany: Theory, Empirical Results and Policy Implications.*, Tübingen.

- Franz, W. and D. Soskice (1995), „The German Apprenticeship System“. In F. Buttler, W. Franz, R. Schettkat and D. Soskice, (eds.), *Institutional Frameworks and Labor Market Performance: Comparative Views on the US and German Economies*, pp. 208-234, London.
- Franz, W. and V. Zimmermann (1999), „Mobilität nach der beruflichen Ausbildung. Eine empirische Studie für Westdeutschland“. In W. Franz, (ed.), *Lohnstrukturen, Qualifikation und Mobilität. Jahrbücher für Nationalökonomie und Statistik*, Vol. 219, Number 1+2, pp. 143-164.
- Franz, W., V. Steiner and V. Zimmermann (2000), *Die betriebliche Ausbildungsbereitschaft im technologischen und demographischen Wandel*, Baden-Baden.
- Franz, W., J. Inkmann, W. Pohlmeier and V. Zimmermann (2000), „Young and Out in Germany. On the Youths' Chances of Labor Market Entrance in Germany“. In: D. Blanchflower and R. Freeman, (eds.), *Youth Unemployment and Joblessness in Advanced Countries*, pp. 381-426.
- Harhoff, D. and T.J. Kane (1997), „Is The German Apprenticeship System a Panacea for the U.S. Labour Market?“, *Journal of Population Economics* 10, pp. 171-196.
- Heckman, J.J. and B. Singer (1984), „A Method for Minimizing the Impact of Distributional Assumptions in Econometric Models for Duration Data“, *Econometrica*, Vol. 52, pp. 271-320.
- Narendranathan, W. and M.B. Stewart (1993), „How Does The Benefit Effect Vary As Unemployment Spells Lengthen?“, *Journal of Applied Econometrics*, Vol. 8, pp. 361-381.
- Noll, I., U. Beicht, G. Böll, W. Malcher and S. Wiederhold-Fritz (1983), *Nettokosten der betrieblichen Berufsausbildung*, Bundesinstitut für Berufsbildung, Berlin.
- Reinberg, A. and M.Hummel (2001), „Stillstand ist Rückschritt“, *IAB Kurzbericht*, 8/2001.
- Ryan, P. (2001), „The School-to-Work Transition: A Cross-National Perspective“, *Journal of Economic Literature*, Vol. 39, pp. 34-92.



- Sachverständigenkommission Kosten und Finanzierung der beruflichen Bildung (1974), *Kosten und Finanzierung der außerschulischen beruflichen Bildung*, Bielefeld.
- Sachverständigenrat zur Begutachtung der gesamtwirtschaftlichen Entwicklung (1998), *Jahresgutachten 1998/99*, „Vor weitreichenden Entscheidungen“, Stuttgart.
- Steiner, V. (1997), Extended Benefit-Entitlement Periods and the Duration of Unemployment in West Germany, *ZEW Discussionpaper*, 97-14.
- Zimmermann, V. (2000), *Der Arbeitsmarkt für Jugendliche. Eine empirische Untersuchung ihres Weges in die Beschäftigung*, Baden-Baden.