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EMPLOYMENT PROSPECTS AND SKILL ACQUISITION OF APPRENTICESHIP-TRAINED WORKERS IN GERMANY

RAINER WINKELMANN*

Using data from the German Socio-Economic Panel for 1984-90, the author analyzes the entrance of young individuals into the German labor market, comparing the experience of apprenticeship graduates to that of graduates from universities, full-time vocational schools, and secondary schools. Apprentices experienced fewer unemployment spells in the transition to their first full-time employment than did non-apprentices. Among apprentices, those trained in large firms had the smoothest transition to employment; once employed, however, apprentices (whether they stayed in their training firm or not) and non-apprentices had similar job stability (as measured by tenure). An estimated 70% of apprenticeship trainees left their training firm within a five-year period. These findings are consistent with the view that apprenticeship training develops general, portable skills rather than firm-specific skills.

The German labor market is widely recognized for its low youth unemployment rate. Data from the German Socio-Economic Panel (GSOEP) for Germany and the Panel Study for Income Dynamics for the United States indicate that five years after leaving secondary education, 1.9% of a cohort are unemployed in Germany, compared to 8.2% in the United States (Buechtemann et al. 1993). Although the German apprenticeship system is often credited with this orderly transition of young

people into work, few attempts have been made to confirm that relationship empirically. In this study I test the relationship between post-secondary training and the transition to work by analyzing data on individual schooling and employment histories drawn from the GSOEP.

The institutional literature has emphasized three features of the German apprenticeship system: it is company-based, it relies on voluntary participation by firms, and it generates portable, occupation-specific skills. Soskice (1994) argued that apprenticeships are part of an incentive structure designed to avoid the failures that

*Rainer Winkelmann is Senior Lecturer in Economics at the University of Canterbury. Most of this research was undertaken while the author was Visiting Assistant Professor at Dartmouth College. Financial support from the German Marshall Fund of the United States is gratefully acknowledged.

Registered users of the German Socio-Economic Panel may obtain the datasets used in this study from the author at Department of Economics, University of Canterbury, PB4800, Christchurch, New Zealand.

commonly bedevil efforts to generate marketable skills. Part of this structure is the coexistence of high-quality and low-quality apprenticeships. Young workers who pass through high-quality apprenticeship programs typically end up working in large firms in industry and commerce, characterized by well-functioning internal labor markets and high employment security. These firms use apprenticeship programs to screen prospective employees. If apprenticeship graduates working in one of these firms are displaced, their re-employment is assisted by the nationally recognized skill certificate earned during the apprenticeship. Most of those who pass through low-quality apprenticeships obtain work in the Handwerk (crafts) sector, where the programs often provide employment at a sub-minimum wage for those who might otherwise have difficulty finding employment.

Recent empirical research has investigated why firms invest in apprenticeships even though they face a risk of losing their investment (Franz and Soskice 1995; Harhoff and Kane 1994). In contrast, in this paper I analyze young individuals' incentives for participating in apprenticeship programs. I investigate the hypothesis that early attachment to the world of work reduces the risk of unemployment for apprenticeship graduates relative to university graduates, graduates from full-time vocational schools, and unskilled entrants. Furthermore, I estimate the duration of first employment for individuals with different post-secondary schooling background, and I examine the hypothesis that apprenticeship training generates portable, rather than firm-specific, skills. Finally, I test whether the type of apprenticeship training affects the transition of apprenticeship graduates into work.

The German Educational System

The German educational system rests on three pillars: general schooling, vocational training, and university education. General schooling follows four years of primary school and is offered through three school types: Hauptschule, which ends af-

Table 1. Education Levels in Germany.

Highest School Degree	Total Population	Leaving School in 1990
Secondary School (9 yrs.)	61.6	24.6
Secondary School (10 yrs.)	19.3	35.0
High-School (12 or 13 yrs.)	14.7	33.8
No Formal Degree and Other	4.4	2.6

Source: Datenreport 1992.

ter a total of nine years of schooling with or without a formal degree; Realschule, which leads to a formal degree after ten years; and Gymnasium, which yields the Abitur (Baccalaureate) after thirteen years. Usually, the track for general schooling is determined after primary school (around the age of 10), although in principle it may be changed later. Table 1 displays the distribution of schooling types for the German population as well as for the class leaving school in 1990. These figures reflect the shift toward more general schooling that took place over the 1970s and 1980s. In 1990, 33.8% of the school-age population acquired a level of education comparable to the high-school degree in the United States, while for the population as a whole, only 14.7% had reached this level.

After graduating from one of the three schools, a young person has three basic choices: to enter the labor market without further training, to pursue vocational training, or to enroll in a technical college or university. As can be seen from Table 2, the percentage of the labor force without a formal degree beyond the general school system is relatively low (16% in 1991). Thus, a sizable majority of the labor force has pursued either vocational or college training.

In the popular literature, vocational training in Germany is often equated with the apprenticeship system. This is an oversimplification, since in fact a variety of institutions provide vocational training. In terms of participation rates, however, the apprenticeship programs are clearly predominant. Seventy-two percent of the labor force in 1991 had participated in an apprenticeship

Table 2. Training of the Labor Force in 1991 (Total Population).

Type of Training	% of Population*
Apprenticeship (Dual System)	72
Specialized Vocational School	16
Technical College	4
University	8
No Formal Degree	16

*Multiple degrees are possible.

Source: Berufsbildungsbericht (1993:129).

(see Table 2). Other institutions providing vocational training are specialized vocational schools that exist for a variety of professions (health care, civil service, hotel employees) and preparatory vocational schools (Berufsvorbereitungsjahr/Berufsgrundbildungsjahr).

While the apprenticeship and specialized vocational schools lead to a professional degree, enrollment in preparatory vocational schools does not, and graduation from these schools usually is followed by further vocational training leading to a professional degree. Finally, there are post-vocational programs for individuals who have already accumulated some work experience. Examples include the master craftsman certification, which requires additional formal training (usually through evening courses). Master degrees also exist in the industrial sector. In 1990, 104,654 master degrees were awarded (Statistisches Jahrbuch 1992:419).

The German university system involves two types of institutions: universities proper and technical colleges (Fachhochschule). Technical colleges have a somewhat shorter curriculum (four as compared to an average of five to six years), and they concentrate on engineering courses, with some courses in the fields of economics, social studies, agriculture, and design. While entering a university requires the Abitur, technical colleges can be entered with "Fachabitur," which is awarded either after 12 years of Gymnasium or after finishing Realschule plus additional vocational training. Both vocational and university training

lead to a professional degree ("Berufsqualifizierender Abschluss").

The distinctive feature of the apprenticeship system is that it involves training both at the workplace and in a vocational school. For this reason, it is also referred to as the "dual system." Hamilton (1990) provided a good descriptive account of the system. More than 350 different apprenticeships exist. Detailed curricula are developed in cooperation with state institutions, employer organizations, and unions. The co-ordination and administration of the programs rests with regionally organized chambers of commerce and chambers of crafts. Firm participation is voluntary. Firms are entitled to participate in the program, that is, to offer training places, if they are able to provide an adequate environment for training.

The market for apprenticeship contracts works essentially the same way as the job market for any other job. Contracts either are brokered through the Federal Employment Agency or result from individual initiative. The contracts run for two to three years, depending on the program and previous general schooling. Some apprenticeship programs last as long as three and a half years. The apprentice spends three to four days a week at the work site, where he or she is trained on the job. One or two days a week, the apprentice visits a state-financed vocational school. For some occupations, on-the-job training and school training are scheduled sequentially rather than simultaneously.

How much of workplace experience involves training rather than productive work is an open question. The different programs vary considerably in their training contents, and while an apprentice in the crafts sector (say, a chimney sweep) will quickly do much of the work of a normal employee, many programs in the industrial sector maintain a high training component throughout the apprenticeship. Recent studies show that firms' net training costs are low or zero in the crafts sector, but substantial in the industry and commerce sectors (Berufsbildungsbericht 1994).

Apprentices' wages are paid by firms,

unlike other systems that use a payroll tax or direct funding through the government. Earnings during an apprenticeship vary considerably with occupation. Average gross earnings increased from DM 602 in 1984 to DM 750 in 1990 (Berufsbildungsbericht 1993). Post-apprenticeship earnings are between three and four times higher. In general, apprenticeship earnings are not taxed. However, mandatory social security contributions (that is, health insurance, unemployment insurance, and pension plan contributions) have to be paid (18.4% of gross earnings in 1991). One feature of the unemployment insurance (UI) system is that individuals who become unemployed following an apprenticeship immediately qualify for UI benefits that are at least as high as their apprenticeship compensation.

The fraction of apprentices with a *Gymnasium* degree, and thus with formal college access, steadily increased during the 1980s, reaching 14.6% in 1991. Most notably, 15.8% of the apprentices with a high school degree engaged in banking apprenticeships, and they constituted 58.2% of all apprentices in banks (Berufsbildungsbericht 1993:157). There are two explanations for this trend. First, the cohort-specific proportion of secondary school graduates with *Gymnasium* has increased. Thus, we would expect the fraction of apprentices with *Gymnasium* to increase even in the absence of any behavioral change. Second, the increasing number of individuals with university training has decreased the relative value of such an education. At the same time, personnel offices have looked with increasing favor on individuals who have both apprenticeship and university qualifications. Accordingly, in a survey of the cohort graduating from *Gymnasium* in 1992, 20% planned to start an apprenticeship, and among those, 39% expressed the intention of pursuing university training afterward (Berufsbildungsbericht 1993:60).

Apprenticeship Data in the GSOEP

The data used in this study (1984–90) are from the first seven waves of the GSOEP.

The survey covers approximately 6,000 households and 12,000 individuals. I use the GSOEP Public Usage File (See Wagner et al. 1993 for details). The GSOEP is a general household survey and is not specially designed for analysis of the labor market entrance of youth. However, it includes detailed monthly information that allows one to study employment transitions and durations. Young people (those aged 16–25) are included proportionate to their share of the total population.

There are two main drawbacks of using the GSOEP to analyze labor market transitions of narrowly defined sub-populations. The first is a relatively small sample size. The final apprenticeship sample includes 526 observations. The second is the shortness of the observed time period. Although observation periods of up to seven years are possible in principle, most individuals are observed for much shorter periods of time. A further restrictive feature of the GSOEP is that wage data are not collected monthly, but rather are collected once a year at a time arbitrarily determined by the interview date. In general, therefore, the reported wages will only imprecisely measure the actual wages immediately before and after job changes or labor market entrance. Finally, the GSOEP does not include information on the distinction between apprenticeships in the craft sector (*Handwerk*) and those in industry and commerce, a distinction that is important for an understanding of the system. Following Soskice (1994) and others, I will approximate this distinction through a classification by size of the training firm. Small firms are concentrated in the crafts sector, whereas medium-sized and large firms predominate in industry and commerce.

Keeping these limitations in mind, the GSOEP provides a rich set of labor-related variables, as well as detailed employment histories. Not surprisingly, the GSOEP has been previously used for the study of issues related to education and training. These studies either take a labor force sample and use training and education variables as controls in regressions explaining earnings, mobility, and the like, or they follow the

Table 3. Macro-Economic Conditions in Germany.

Description	1984	1985	1986	1987	1988	1989	1990
Unemployment Rate	9.1	9.3	9.0	8.9	8.7	7.9	7.2
Number of Job Vacancies ^a	87.9	110.0	153.9	170.7	188.6	251.4	313.6
New Apprenticeships ^b	705.7	697.1	685.2	645.8	604.0	583.7	545.2
Supply of Apprenticeships Relative to Demand for Apprenticeships ^b	0.95	0.95	0.98	1.02	1.06	1.11	1.18
Number of Apprentices ^a	n.a.	1,831.5	n.a.	1,738.7	1,658.0	1,552.5	1,476.9

^aIn thousands.

^bFor instance, in 1984 employers offered 726,786 apprenticeship places and 764,078 young individuals applied for apprenticeship training.

Source: Berufsbildungsbericht (1994:16).

training and labor market experience, over time, of a particular age cohort—Buechtemann et al. (1993), for example, looked at those who left school in 1978 or 1979. Here, I follow a fundamentally different approach by selecting a cross-section of individuals at the moment of their labor market entry. This allows me to obtain a detailed picture of the type and nature of an intermittent non-employment spell (if any), and the characteristics of the first job, including its duration and any reason for termination. I am interested in the question of whether apprentices experience a smoother transition than labor market entrants who lack apprenticeship training, and whether there are distinctive transition patterns among apprentice subgroups.¹

The subsample of labor market entrants I analyze consists of individuals who switch from training to full-time employment in one of the observed years. As a matter of definition, I consider apprenticeship training not to be part of first employment.² To be included in the sample, an individual has to fulfill two basic selection criteria. First, the individual has to answer affirmatively the following question in one of the

survey years: "Since the beginning of the previous year have you finished school, vocational training, or university?" Second, the individual must experience full-time employment in the sample period. These criteria eliminate many of those who leave school to continue with further vocational or academic training, all individuals who drop out of the survey before taking up full-time employment, and those who dropped out of school or training (given the limited information in the GSOEP, attempts to identify the labor market experience of drop-outs would yield extremely unreliable results).

Although the primary focus of this study is on the labor market transition of apprentices, I include entrants from school and from university for the sake of comparison. Those who leave school can come either from a full-time vocational school (without apprenticeship) or from the secondary school system. The latter group might be labeled "unskilled" workers, since they receive no further post-secondary training of any type. Meeting the above selection criteria are 526 apprentices, 100 university graduates, and 161 school graduates (47 of whom come from a vocational school). These 787 individuals made the transition from school to work sometime between 1984 and 1990.

Pooling observations in this way raises the issue of labor market conditions over the seven-year period. Table 3 provides information on macro-economic condi-

¹For studies of the earnings effects of apprenticeship training, see Couch (1994) and Winkelmann (1996a, b).

²In government statistics apprentices are counted as part of the employed labor force.

tions. In the second half of the 1980s, the German labor market steadily improved. The aggregate unemployment rate decreased from 9.1% to 7.2%, and the number of vacancies increased from 88,000 to 314,000. More important, however, the mid-1980s witnessed the passing of strong baby-boomer cohorts through the apprenticeship system, which is reflected in excess demand for apprenticeship slots. For instance, in 1984 there were 95 openings for every 100 applicants. In a (successful) attempt to close this gap, the federal government strongly appealed to employers (with the unmistakable undertone that otherwise regulatory steps would be taken to ensure a sufficient supply of training slots) to take on apprentices in excess of their immediate expected demand. The subsequent increase in the supply of apprenticeship places, coupled with decreasing cohort sizes, resulted in excess supply of apprenticeship slots in the second half of the 1980s.

Since this study focuses on apprenticeships completed in the 1984–89 period, most of these apprenticeships started when there was excess demand for apprenticeship places. This environment might have allowed employers to be more selective in their hiring. As a result, we might expect the quality of apprentices in the 1984–90 sample to have been above-average. Since firms started during the period to increase the number of offered apprenticeship slots beyond anticipated demand for trained workers, we might expect a lower than normal retention rate of apprentices after passing their final training examinations. Simultaneously, those apprentices who were not retained faced steadily improving labor market conditions. In the regression analyses that follow, I account for potential macro-economic effects by including time dummies where appropriate.

The School-to-Work Transition for Apprentices

The first column of Table 4 contains descriptive statistics for apprentices in the

1984–90 sample. Sampling weights have been used to compute the means.³

Forty-eight percent of the apprentices in the sample are female. Apprentices in the sample have received an average of 10 years of general schooling (corresponding to the degree of "Realschule") and have an average age of 20 years in the final year of their apprenticeship. While the population share of foreigners in the labor force is around 10%, they only account for 4.5% of all apprentices in the sample. Published aggregate statistics document that foreigners participated increasingly in apprenticeships, raising the foreigner share of apprentices from 2.8% in 1985 to 6.7% in 1990 (Berufsbildungsbericht 1993:72).

Apprentices in the sample receive, on average, a monthly compensation of DM 647 (in 1985 prices). Most of the apprentices (40%) get their training in very small firms with less than 20 employees, 29% are trained in firms with between 20 and 200 employees, and the remaining 31% are trained in large and very large firms. Eighteen percent of the sampled apprentices complete an apprenticeship in the public sector. The typical starting salary in the first job taken after apprenticeship completion is DM 2068, more than three times the average apprenticeship salary. As expected, starting wages of apprenticeship graduates are higher than starting wages of unskilled workers (DM 1983), and lower than starting wages of both university (DM 3114) and vocational school graduates (DM 2315). Thirty-one percent of the apprenticeship graduates are employed in small firms, 9% less than are trained in such firms—that is, small firms are "net exporters" of apprentices, as is the public sector. This finding is consistent with the observation that small firms are concentrated in the crafts sector, where firms may use apprentice programs as a means to reduce labor costs rather than to satisfy their demand for skilled workers.

What do apprentices do when their train-

³The primary source of non-representativeness in the GSOEP is oversampling of the foreign population.

Table 4. Labor Market Entrants: Descriptive Statistics for the 1984–90 Sample.

Characteristic	Apprentice Graduates	University Graduates	Vocational School Graduates	Unskilled Entrants
Percent Female	0.483	0.337	0.665	0.536
Years of General Schooling	9.8	12.7	11.1	10.2
Age	19.9	28.8	23.4	21.4
Percent of German Nationality	0.955	0.973	0.975	0.820
<i>Apprenticeship:</i>				
Monthly Earnings (in 1985 DM)	646			
Percent in Very Small Firm	0.399			
Percent in Small Firm	0.290			
Percent in Large Firm	0.159			
Percent in Very Large Firm	0.152			
Percent in Public Sector	0.174			
<i>School-to-Work Transition:</i>				
Percent Who Moved Directly to New Firm	0.163			
Percent Unemployed	0.130	0.178	0.295	0.409
Duration of Unemployment in Months	7.4	5.9	6.2	16.4
Percent Who Were Non-Employed	0.145	0.362	0.325	0.494
Duration of Non-Employment in Months	7.2	5.7	6.1	14.7
<i>First Employment:</i>				
Monthly Earnings (in 1985 DM)	2,069	3,114	2,316	1,983
Percent in Very Small Firm	0.313	0.242	0.454	0.511
Percent in Small Firm	0.334	0.237	0.242	0.223
Percent in Large Firm	0.174	0.273	0.214	0.119
Percent in Very Large Firm	0.179	0.248	0.090	0.147
Percent in Public Sector	0.146	0.379	0.251	0.331
Percent in White-Collar Job	0.467	0.667	0.717	0.298
Sample Size	526	100	47	114

Sources: German Socio-Economic Panel; own calculations.

ing contract expires? There are four distinct possibilities for apprenticeship graduates, two of which lead directly into full-time employment: 69% of apprenticeship graduates continue working with the training firm under a regular work contract—this is what might be called the “immediate retention rate” of trainees in their training firm—while 16.3% of apprenticeship graduates change immediately to a new employer.⁴ 14.5% of apprenticeship graduates experience “non-employment,” which either involves unemployment (13%) or leaving the labor force (1.5%). The average duration of any unemployment spell experienced

directly after completion of an apprenticeship is 7.4 months. These unemployment flows translate into an average unemployment stock of 8% ($= 0.13 \times 7.4/12$). This apprenticeship-specific unemployment rate is slightly lower than the overall unemployment rate during the 1984–90 period, providing evidence that the apprenticeship system genuinely contributes to the widely cited low youth unemployment rates in Germany. (An alternative hypothesis is that the low unemployment rates are caused by relatively long training periods that keep youth out of the labor market.)

The other three columns of Table 4 provide descriptive statistics for labor market entrants with a university degree, those with a full-time vocational school degree (Voced), and those without a post-secondary degree (Unskilled), respectively. The three groups share the lack of a work-based

⁴Buechtemann (1989) reported that immediate retention varied from 56% in small firms to 87% in large firms. He used data from a 1985 establishment survey.

training component in their education. University graduates are mostly male (66%), whereas most Voced graduates are women (67%). Foreigners constitute a low share of university graduates (2.7%) and Voced graduates (2.5%), but a high share of unskilled entrants (18%). Foreigners in this sample are not labor migrants, but rather individuals who went to school in Germany (most likely second-generation foreigners). Although I am not aware of any formal barriers that would bar foreigners from access to post-secondary education, such an underrepresentation of foreigners may reflect both intergenerational rigidities in training patterns and some informal barriers through discriminatory behavior on the part of training firms.

University, Voced, and unskilled labor market entrants experience three types of transition: direct transition to work, transition with an unemployment spell, or transition with a "non-employment" spell (unemployment, out-of-the labor force, or minor non-regular employment). University graduates have the lowest unemployment incidence (17.8%), followed by Voced graduates (29.5%) and unskilled workers (40.9%). Unemployment rates for all three populations are higher than the corresponding rate for apprentices. Such a comparison might even understate the true differential, since the formal definition of unemployment in Germany, as well as the definition of unemployment in the GSOEP questionnaire, only includes those unemployed who are registered at the local unemployment authority (*Arbeitsamt*). The incentive for registration largely depends on the individual's eligibility for unemployment benefits, which, in turn, depends on whether the individual has been previously employed (and thus has contributed to the unemployment insurance fund). While apprentices pay UI contributions and thus are eligible for UI benefits, the same is not generally true for university students and school graduates. Thus, a more accurate comparison would add up unemployment and the "out of labor force" responses, which would account for hidden unemployment.

With this broader unemployment measure ("non-employment"), the differences in the non-employment incidence become larger: upon leaving school, university and Voced graduates experience non-employment more than twice as frequently (36.2% and 32.5%, respectively) as do apprentices (14.5%). Note, however, that university and Voced graduates have slightly shorter average durations of unemployment than apprenticeship graduates. While there is no information on the nature of unemployment, the predominance of short spells for university and Voced leavers suggests that many of these spells may be voluntary breaks after graduation. In contrast, unskilled entrants have both the highest incidence (49.4%) and by far the highest average duration (14.7 months) of non-employment, suggesting genuine difficulties in making the transition to work.

Table 5 presents probit estimates of the probability that an individual experienced a non-employment spell prior to his or her first full-time employment. The probit model is used because the dependent variable is binary with 1 if the individual experienced unemployment, out-of-the labor force, or minor non-regular employment, and 0 otherwise. The regression coefficients measure the specific effects of post-secondary vocational training on the probability of non-employment with controls for other potential factors such as sex, age, and nationality.

The first column of Table 5 gives the results for a model with three categorical variables for post-secondary schooling (apprenticeship is the reference group). This model essentially repeats the descriptive analysis of Table 4. The effects of university education, vocational education, and no post-secondary education are positive and significant, indicating that apprenticeship graduates have a lower probability of non-employment than any of the alternative populations.⁵ The second column of Table

⁵Formally, $\text{Prob}(Y = 1) = \text{Prob}(x_i\beta + \varepsilon_i > 0) = \Phi(x_i\beta)$, where Φ is the cumulative density function of the standard normal distribution.

Table 5. Probability of Non-Employment: Probit Estimates.^a
(Standard Errors in Parentheses)

Variable	(1)	(2)
Constant	-0.898 (0.063)	-0.606 (0.457)
Female		0.204* (0.103)
Age		-0.005 (0.022)
German		-0.355* (0.114)
University Graduate ^b	0.540* (0.143)	0.689* (0.247)
Vocational School Graduate ^b	0.544* (0.197)	0.549* (0.215)
Unskilled Entrant ^b	0.766* (0.133)	0.676* (0.139)
1986		-0.015 (0.174)
1987		-0.050 (0.180)
1988		0.090 (0.172)
1989		-0.081 (0.170)
1990		-0.204 (0.191)
Log-Likelihood	-425.9	-418.5
Sample Size	787	787

^aThe dependent variable is 1 if the individual experienced unemployment or another form of non-employment before first full-time employment and 0 otherwise. See text for independent variable definitions.

^bApprenticeship Graduates are the reference category.

*Statistically significant at the 0.05 level.

5 shows that both women and foreigners have a significantly higher risk of non-employment. Since foreigners are often unskilled workers when they enter the work force, they clearly are disadvantaged.

The second column of Table 5 reveals that the effects of post-secondary training persist after gender, nationality, age, and time effects are taken into account. The coefficients on the education variables (university and vocational schooling) are positive and statistically significant, which means that apprenticeship graduates have a lower

probability of unemployment than otherwise identical non-apprenticeship graduates. The magnitudes of the effects of education variables on the probability of non-employment are not readily apparent from the estimated coefficients. In the probit model, the predicted effect of a categorical variable is calculated as the probability of non-employment when the variable of interest is set to 1 minus the probability of non-employment when the variable of interest is set to 0 (with other variables evaluated at their means). For instance, based on the estimates in column 2 of Table 5, the estimated probability of unemployment is 24 percentage points higher for unskilled entrants, and 23 percentage points higher for university graduates, than it is for apprenticeship graduates.

There are several potential explanations for why apprenticeship graduates experience a smoother transition to work. The apprentices' early attachment to the labor force may provide workplace experience that promotes efficient search. More important, however, for most apprenticeship graduates the search issue does not arise in the first place. Sixty-nine percent of apprenticeship graduates stay with their training firm, and the end of the apprenticeship brings a de-facto continuation of employment with a substantial increase in pay. In this sense, apprenticeship definitely facilitates the transition to work. However, an immediate and fast transition is not an end in itself. Those who search longer first might end up with better and more stable jobs. The next section presents evidence on the relationship between training and tenure in the first job, thereby extending the horizon beyond the immediate transition to work.

Duration of the First Job

With these data, I can follow individual labor market entrants for up to five years into their work careers and estimate job survivor functions for specific categories of labor market entrants. The analysis will reveal whether or not the factors that influ-

Table 6. Duration of First Job for Workers with Different Post-Secondary Training: Estimated Survival Rates.

Group	Proportion of Workers with First Job Tenure of at Least				Sample Size
	3 Months	6 Months	1 Year	5 Years	
Apprenticeship Graduates	0.959	0.904	0.791	0.437	526
Stayers	0.956	0.907	0.801	0.434	344
Direct Movers	0.988	0.944	0.806	0.472	85
Unemployed	0.942	0.855	0.732	0.448	89
University Graduates	0.979	0.946	0.906	0.402	100
Vocational School Graduates	0.977	0.929	0.792	0.361	47
Unskilled Entrants	0.945	0.867	0.743	0.323	114

Notes: The survivor rate at point t gives the percentage of individuals whose first-employment spells lasted for at least a period of t . See footnote 6 for estimation method.

ence labor market entrance carry over to the early work career experience. In particular, the first job duration of apprentices sheds light on Heckman's (1994) conjecture that the apprenticeship system just postpones the "job-shopping" behavior of youth.

Table 6 displays the job survivor rates from three months up to five years. The job survivor rate at point t gives the percentage of individuals whose first-employment spells lasted for at least a period of t (measured here in months).⁶ The estimated job survivor rates are displayed separately for those entering employment from apprenticeship, from university, and from school. The estimated proportion of jobs that are terminated within the first three months is 4.1% for apprentices, 2.1% for university graduates, and 5.4% for unskilled entrants. The job survivor rates after 5 years are 43.7% for apprentices, 40.2% for university graduates, and 32.3% for unskilled entrants. The fact that apprenticeship graduates have

higher long-run survivor rates in their first job than university or Voked graduates is evidence against Heckman's job-shopping conjecture. Apprentices do at least as well in their first job as labor market starters of different post-secondary background.

Differentiating the group of apprentices by transition type, I find that the estimated five-year job survivor rate is 43.4% for apprentices who stay with their training firm. Since 69.2% of all apprenticeship graduates stay in the training firm, the five-year retention rate of trainees is 30%. In other words, 7 out of 10 apprentices leave their training firm by the end of the fifth year. This rate is very similar to rates found in previous studies. For instance, Harhoff and Kane (1994) found that 36% of those who completed their training were still employed in the training firm five years later. It is fair to conclude that, although apprenticeship training enables a smoother transition into work than alternative training choices, it is not necessarily the start of lifelong employment in the training firm.

Interestingly, the five-year job survivor rate is higher for apprentices who directly switch to a new employer after apprenticeship graduation than it is for those who stay in their training firm. If the skills acquired during the apprenticeship training were useful only for the training firm, then we would expect that apprentices who stay with their training firm after graduation would have a more secure job than apprentices

⁶Since many observations are right censored (that is, the actual time of employment termination is not observed), the job survivor function is estimated using the Kaplan-Meier method. Formally, $\hat{S}(T) = \prod_{t \leq T} (1 - \theta_t)$ for $\theta_t = n_t/r_t$, where $\hat{S}(T)$ is the estimated proportion of job survivors at time T , n_t is the number of people observed to leave at t , and r_t is the number of people in the risk set—that is, the number of job survivors—the instant before t . t runs over the distinct times at which exits from the jobs are observed.

Table 7. Training Firm Size and the Transition of Apprentice Graduates into the Labor Market: Descriptive Statistics, 1984-90 Sample.

Variable	Size of Training Firm			
	Very Small (1)	Small (2)	Large (3)	Very Large (4)
Percent Female	0.558	0.450	0.452	0.379
Years of General Schooling	9.591	9.760	10.351	9.754
Percent of German Nationality	0.945	0.942	0.988	0.971
<i>Apprenticeship:</i>				
Wage (in 1985 DM)	589	654	725	699
Percent in Public Sector	0.018	0.126	0.487	0.348
<i>First Job:</i>				
Wage (in 1985 DM)	1,896	2,048	2,391	2,224
<i>Firm Size:</i>				
Percent in Very Small Firms	0.633	0.171	0.057	0.015
Percent in Small Firms	0.200	0.726	0.187	0.093
Percent in Large Firms	0.093	0.062	0.646	0.104
Percent in Very Large Firms	0.074	0.041	0.110	0.788
Percent in Public Sector	0.075	0.108	0.312	0.233
<i>Type of Transition into Work:</i>				
Percent Who Stayed in Training Firm	0.568	0.746	0.852	0.750
Percent Who Moved Directly to New Firm	0.268	0.136	0.089	0.113
Percent Unemployed ^b	0.164	0.118	0.059	0.137
Sample Size	240	139	61	86

^aThe size categories are defined as follows. Very small: < 20 employees. Small: 20-200 employees. Large: 201-2,000 employees. Very large: > 2,000 employees.

^bApprentices who experience an unemployment spell between apprenticeship completion and first full-time employment.

who move to a new employer.⁷ Since the opposite is observed in the data, the evidence suggests that apprenticeships in fact generate non-specific and universally recognized skills that are portable across firms. This point has been previously made in much of the institutional literature on apprenticeship training in Germany (see, for instance, Soskice 1994).

Firm Size and Post-Apprenticeship Mobility

Up to this point, I have treated apprenticeship training as a homogeneous entity. In reality, apprenticeship programs differ widely in scope, quality, and, obviously,

contents. In this section, I address the question whether these programmatic differences lead to measurable differences in the early labor market experiences of apprenticeship graduates—in other words, does the type of apprenticeship matter?

It is a common perception that "better" apprenticeships are offered in industry and commerce while "worse" apprenticeships are offered in the crafts sector, where firms' net investment in training may often be zero (see *Berufsbildungsbericht 1994*, Chapter 3.7). It is to be expected that firms undertaking a large investment in trainees will be more interested in retention and will pay higher post-apprenticeship wages than firms making little or no investment in trainees. This should affect the post-apprenticeship transition to work. Complicating the analysis, however, is the fact that the quality of apprentices is heterogeneous as well. Better apprentices are typically

⁷Strictly speaking, this argument holds only *ceteris paribus*, that is, if there are controls for the quality of the first job.

Table 8. Firm Size Mobility Tables for Apprentices Who Are Not Retained in the Training Firm.

Size of Training Firm	Size of Firm of First Job				Total
	Very Small	Small	Large	Very Large	
Very Small	49	27	18	11	105
Small	9	23	5	6	43
Large	4	2	2	2	10
Very Large	2	6	5	11	24
	64	58	30	30	182

Notes: Numbers are counts of individuals in the data sample of each cell type. For definitions of firm size categories, see note to Table 7.

matched with better apprenticeships and vice versa. The following analysis attempts to establish what portion of the individual differences in the transition into work can be attributed to variability in training firm quality and what portion to variability in apprentices' ability.

The GSOEP has no direct information on the nature of the training site, industry, and commerce of crafts. I use training firm size as a proxy for the quality of the apprenticeship. Generally, the larger the training firm, the greater the amount spent on the training of apprentices on a per-capita basis (see Berufsbildungsbericht 1994, Table 73). Table 7 provides descriptive statistics for apprentices in training firms of different sizes. Firms are categorized by the number of employees. The firm size categories are very small (fewer than 20 employees), small (20–200 employees), large (201–2,000 employees), and very large (more than 2,000 employees).

The cross-tabulations show that larger firms have a lower percentage of female trainees and a higher percentage of German trainees. Apprentices in larger firms have, on average, a higher secondary schooling degree and receive higher compensation in their apprenticeship. Interestingly, the relation between firm size and apprenticeship wages is non-monotonic, reaching a maximum for large firms.⁸ Part of this

effect might be due to the predominance of public sector employers in this firm size group. Also, export-oriented capital-intensive manufacturing firms ("Mittelstand" firms) are part of this firm size group.

Table 7 shows that the vast majority of apprentices, across all firms, find their first job at the company they trained in. As conjectured above, large firms have the highest retention rates (85%) and their apprenticeship graduates have the lowest unemployment incidence (5.9%). Very large firms retain fewer apprenticeship graduates (75%), and unemployment incidence among these graduates is more than twice as high as that among graduates at large firms. Very small firms have the lowest retention rates (57%), and their apprenticeship graduates have the highest unemployment incidence (16.4%). Note, however, that this is still much lower than the unemployment incidence experienced by university and Voced graduates and, in particular, unskilled entrants. Overall, apprentices in large firms appear to be better off than other apprentices; they are paid higher wages and experience a smoother transition into work.

The transition matrix in Table 8 shows what happens to those apprenticeship graduates who are not retained in their firm. More than half of those graduates from very small firms who are not retained find their first employment in a larger firm. Very small firms have comparatively low retention rates both for individual apprentices and in the aggregate: they are "net exporters" of apprenticeship graduates.

⁸A non-monotonic relationship also appears between firm size and starting salaries.

Table 9. Multinomial Logit Estimates for the Post-Apprenticeship Transition into Work. (Standard Errors in Parentheses)

Independent Variable	Direct Move to New Firm ^a	Move into Unemployment ^a
Years of Schooling	-0.005 (0.124)	-0.046 (0.117)
Female	0.081 (0.261)	0.172 (0.252)
Age	-0.049 (0.065)	0.052 (0.059)
German	-0.081 (0.300)	-0.867* (0.266)
Apprenticeship Wage	-0.001 (0.001)	-0.002* (0.001)
Training in Public Sector	0.279 (0.423)	0.248 (0.392)
Small Training Firm ^b	-0.446 (0.307)	-0.382 (0.303)
Large Training Firm ^b	-1.476* (0.588)	-1.024* (0.515)
Very Large Training Firm ^b	-0.650 (0.434)	-0.347 (0.398)
1986	0.520 (0.522)	-0.078 (0.395)
1987	0.974* (0.503)	-0.261 (0.424)
1988	0.788 (0.519)	0.468 (0.378)
1989	1.317* (0.481)	-0.134 (0.400)
1990	1.023* (0.513)	-0.722 (0.497)
Log-Likelihood	-435.6	
Sample Size	526	

^aStaying with the training firm is the omitted choice. Formally, the estimated coefficients measure the change in the log of the probability of either transition relative to the probability of staying with the training firm that is caused by a unit increase of the independent variable.

^bThe reference category is very small firm. See notes to Table 7 for definitions of firm size categories.

*Statistically significant at the 0.05 level.

The fact that very small firms are net exporters of apprenticeship graduates supports the hypothesis that very small firms do not invest in apprentices, but rather use apprenticeship programs to employ workers at sub-minimum wages. In contrast,

small, large, and very large firms eventually employ more apprenticeship graduates than they trained. For instance, of the 61 apprentices trained in large firms, 10 are not retained. The large firms also hired 30 apprenticeship graduates trained in different-sized firms. Hence, 81 apprenticeship graduates, or 33% more than were trained, were eventually employed in large firms.

The above evidence suggests that firm size is important in explaining differences in the labor market entry of apprenticeship graduates. However, it is not yet clear how much of these differences can be attributed to differences in the training firms and how much to differences in the apprentices. To this end I turn to a multiple regression analysis in which I analyze transitions to work while controlling for individual differences in schooling (years of schooling prior to apprenticeship), gender, age, and nationality, as well as several characteristics of the training firm. The dependent variable in this analysis is the transition type experienced by the apprenticeship graduate: (1) immediate employment in a new firm; (2) unemployment; (3) retention in the training firm. Since the dependent variable has three unordered categories, I use a multinomial logit specification.⁹

The regression estimates are given in Table 9. After I control for ability differences of apprentices (as approximated by their years of schooling), the firm size effect persists for both those apprenticeship graduates who directly move into work and

⁹Formally,

$$\text{Prob}(Y=1) = \frac{e^{\alpha\beta_1}}{1 + e^{\alpha\beta_1} + e^{\alpha\beta_2}}$$

$$\text{Prob}(Y=2) = \frac{e^{\alpha\beta_2}}{1 + e^{\alpha\beta_1} + e^{\alpha\beta_2}}$$

$$\text{Prob}(Y=3) = \frac{1}{1 + e^{\alpha\beta_1} + e^{\alpha\beta_2}}$$

The estimated coefficients measure the change in the log of the probability of either transition relative to the probability of being retained in the training firm.

those graduates who move into unemployment. Apprentices from large firms have a significantly lower risk of unemployment or non-retention than do apprentices from very small firms (the reference group). This result is compatible with the view that large firms have both the highest training intensity and the most able trainees.

The only other statistically significant coefficient in the direct move regression is the year of entry into the labor market—later entrants have a higher propensity to change employer. This increased mobility coincides with the improving labor market conditions as indicated, for instance, by the number of vacancies (see Table 3). In the unemployment regression, foreigners have a statistically significantly higher likelihood of unemployment than non-foreigners, and higher apprenticeship wages reduce the likelihood of unemployment. Training wages may measure additional quality differences in training not accounted for by firm size, and the risk of unemployment is lower for better-paid apprentices. However, the training wage effect is small relative to the firm size effect. A trainee in a very small firm would need DM 500 more in training wages to reach the same unemployment risk as an otherwise identical trainee in a large firm. Moreover, since firm size and training wages are positively correlated, the overall effect of firm size is even larger.

There is thus substantial evidence that the size of the firm providing apprenticeship has an important influence on apprenticeship graduates' likelihood of experiencing unemployment. Training firm size apparently captures variations in both trainees' abilities and training intensities and

thereby provides valuable information on the quality of the apprenticeship.

Conclusions

The main feature of the German apprenticeship system is its voluntary training contract between training firms and apprentices. Thus, in contrast to enrollees in full-time school-based training, apprentices obtain their training in close contact with the world of work. I have used German Socio-Economic Panel data to analyze the transition patterns of labor market entrants in Germany. I find that, compared to university or full-time school graduates, apprentices transitioned into employment more directly and faster. Their transition-specific unemployment rate was lower than that of graduates from universities or vocational schools.

The duration of the first job did not depend on the type of previous post-secondary education. That is, once the transition to work was made, apprenticeship graduates were not in more stable employment than non-apprenticeship graduates. An important factor influencing employment duration was firm size. Surprisingly, it did not matter whether apprenticeship graduates switched to a new employer upon completing their training. Among both those who did and those who did not, job changes were frequent and contributed to a retention rate of apprenticeship graduates of about 30% after five years. Both findings suggest that firm-specific training plays a subordinate role during an apprenticeship and lend support to the view that apprentices acquire portable professional skills.

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