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ABSTRACT

Is the German Apprenticeship System a Panacea for the US Labour Market?*

Advocates of apprenticeship programmes often argue as if it is simply a matter of historical accident that such investment by US firms has been hindered. This paper explores the structure of incentives underpinning the German system of apprenticeship training. First, we describe three characteristics of the German labour market that might lead firms to accept part of the cost of general training, even in the face of worker turnover. In the second part of the paper, we compare labour market outcomes for apprentices in Germany and high school graduates in the United States. Apprentices in Germany occupy a similar station within the German wage structure as that held by high school graduates in the US labour market. Finally, we provide evidence that the problem of forming labour market bonds is particularly acute for minority groups – in Germany as well as in the United States. We discuss some implications for the vocational training debate in the United States.

JEL Classification: J24, J31, O51, O52, P52
Keywords: labour market, employment, apprenticeship training, human capital

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NON-TECHNICAL SUMMARY

This paper studies the financing mechanisms that support the German apprenticeship system. Interest in the German system has been rising lately, and it has been discussed in a number of countries as a virtual panacea to several labour market problems. The discussion in the United States is a particular case in point. Somewhat surprisingly, there is no clear understanding – even in Germany – of how the system works in terms of its financing structure.

In our review of the German data, several points stand out. First, German employers – at least in larger, industrial firms – face large net costs in the training of apprentices. This seems to be true even after accounting for the low wages paid to apprentices. Second, retention rates of these apprentices are often quite low. Apprenticeships are certainly not the beginning of a lifelong relationship between apprentices and firms as the popular literature often suggests. Roughly 70% of graduating apprentices leave their training enterprise within five years. The departure rate is lower for large firms in the industrial sector (50%), but still higher than widely believed.

To the extent that the skills provided during the training period appear to be generally applicable, these facts provide a puzzle. We first describe three characteristics of German labour markets which may lead firms to be willing to accept part of the cost of general training even in the face of worker turnover.

The first mechanism has been suggested by Soskice (1993) who argues that through their influence over plant-level works councils, unions may limit poaching by other firms and thereby provide a market within which firms are willing to make loans to workers to finance general training. As mentioned above, there is considerable turnover among former apprentices, even within industrial firms. Unions may provide sufficient constraints on mobility to allow firms to be repaid, however. Indeed, apprentices who remain with the training firm earn less than the apprentices who leave. While it is impossible to determine if this wage differential reveals a 'wedge' between productivity and wages for those remaining with the training firm (or simply reflects differences in the characteristics of those who get better offers elsewhere), such evidence is at least consistent with the hypothesis that firms are repaid by the apprentices who remain.

A second potential explanation focuses on the possibility that a combination of industry-wide agreements specifying minimum wages for various jobs and high

firing costs bestows a high value on information regarding any particular worker's productivity. Apprenticeship training programmes may therefore serve as an extended employment test for which employers are willing to share part of the cost. Although this hypothesis may have explained part of the willingness to use apprentices in the past, much of that incentive may have been weakened by reforms in 1986 which allowed firms to hire workers for up to 18 months on fixed term contracts, not subject to the same firing costs.

Third, we argue that unobserved heterogeneity in worker costs of mobility may play a key role. In the presence of high mobility costs for some apprentices, workers who remain with the training firm may end up paying for the training of the apprentices who leave. This is a potentially important explanation for some firms, since 80% of all German workers report that they have never moved to take another job. Though the skills themselves may be generally applicable, the training may still be firm-specific to the extent that there are mobility costs in moving to other firms. Consistent with this hypothesis, we report evidence that, even within Germany, firms are more likely to engage in training if they are located outside of urban centres or within areas with fewer firms in a similar industry.

A fourth explanation, often mentioned in our interviews with human resource managers in Germany, but impossible to evaluate, is that a norm has developed within the business community to provide such training. To comply with these social expectations, many firms may be willing to provide such training, even though they could increase their own profits by eliminating their apprenticeship programmes and hiring apprentices trained elsewhere. The German system may, indeed, rest upon one or more of these explanations. Unfortunately, however, none of these conditions currently exist in the United States. Thus, a simple transfer of the German training model is unlikely to be successful.

In the second half of the paper, we survey the evidence on the merits of apprenticeship training relative to other forms of human capital investment by comparing educational and experience wage differentials in the United States and Germany. Contrary to the impression left by much of the popular discussion, German apprentices occupy roughly the same place relative to unskilled workers and college graduates as held by high school graduates in the United States. Further, the age-earnings profiles for German apprentices and US high school graduates are quite similar. These two facts are intriguing in the face of apparent differences in human capital investments for apprentices and high school graduates not going on to college. One possibility is that the differences in human capital investments have been overstated,

given the undercounting of informal on-the-job training in the United States. Alternatively, there may simply be a higher return to job search for young workers in the United States relative to human capital investments. We may simply be observing two different equilibria with similar outcomes – a high degree of search activities by workers combined with low human capital investments by employers in the United States and low search with higher human capital investment in Germany.

I. Introduction

Concern about rising wage inequality, particularly the decline in the labor market prospects for those without a college education, has renewed interest in policies to promote human capital investment in the United States. In the search for policy levers, the German apprenticeship system has served as a model for U.S. policy analysts.[1] However the primary obstacle to more widespread employer-based training in the United States has been the unwillingness of employers to shoulder the expense of training young workers who are likely to leave their firms. To fill this gap, some observers have called for new payroll tax (or "training tax") against which such training expenses might be deducted, to provide such incentives through the tax system. In considering any such policy, we should begin with a firm understanding of how the German system itself is financed. Unfortunately, despite its resiliency in the face of technological change and other labor market developments over the past few decades, the structure of incentives undergirding the German apprenticeship system itself is not well understood-- even in Germany.[2] In this paper, we will analyze alternative explanations of employers' willingness to finance apprenticeship training in Germany and draw implications for the U.S. debate.

In our review of the German data, several points stand out. First, German employers-- at least in larger, industrial firms-- face large net costs in the training of apprentices. This seems to be true even after accounting for the low wages paid to apprentices: In 1972 and 1980, national commissions in Germany generated similarly large estimates of net costs for these firms. Second, retention rates of these apprentices are often quite low. Apprenticeships are certainly not the beginning of a lifelong relationship between apprentices and firms as the popular literature often suggests. Roughly 70% of graduating apprentices leave their training enterprise within 5 years. The departure rate is lower for large firms in the industrial sector (50%), but still higher than widely believed.

To the extent that the skills provided appear to be generally applicable, these facts provide a puzzle. We first describe three characteristics of German labor markets which may lead firms to be willing to accept part of the cost of general training even in the face of worker turnover.

> Union Collusion and Restricted Mobility: Soskice (1993) suggests that through their influence over plant-level works councils, unions may limit poaching by

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1. For instance, see the Commission on the Skills of the American Workforce (1990), Baily, Burtless and Litan (1993) and Kinzer, New York Times, June 2, 1993.

2. See Kempf (1985) or Lehne (1991) for empirical studies of this issue. None of the studies we are aware of have attempted to look in detail at the retention rates of graduating apprentices which is a central element in our analysis.

other firms and thereby provide a market within which firms are willing to make loans to workers to finance general training.

As mentioned above, there is considerable turnover among former apprentices, even within industrial firms. However, unions may provide sufficient constraints on mobility to allow firms to be repaid. Indeed, apprentices who remain with the training firm earn less than the apprentices who leave. While it is impossible to determine if this wage differential reveals a "wedge" between productivity and wages for those remaining with the training firm (or simply reflects differences in the characteristics of those who get better offers elsewhere), such evidence is at least consistent with the hypothesis that firms are repaid by the apprentices who remain.

Inflexible Wages, High Firing Costs and Option Value: The combination of industry-wide agreements specifying minimum wages for various jobs and high firing costs bestows a high value on information regarding any particular worker's productivity. Apprenticeship training programs may therefore serve as an extended employment test for which employers are willing to share part of the cost.

Although this hypothesis may have explained part of the willingness to use apprentices in the past, much of that incentive may have been weakened by reforms in 1986 which allowed firms to hire workers for up to 18 months on fixed term contracts, not subject to the same firing costs.

Unobserved Heterogeneity in Worker Costs of Mobility: In the presence of high mobility costs for some apprentices, a short-term equilibrium may be reached where the workers who remain with the training firm pay for the training of the apprentices who leave. This is a potentially important explanation for some firms, since 80% of all German workers report that they have never moved to take another job. Though the skills themselves may be generally applicable, the training may still be firm-specific to the extent that there are mobility costs in moving to other firms.

Consistent with this hypothesis, we report evidence that, even within Germany, firms are more likely to engage in training if they are located outside of urban centers or within areas with fewer firms in a similar industry.

A fourth explanation, often mentioned in our interviews with human resource managers in Germany, but impossible to evaluate, is that a norm has developed within the business community to provide such training. To comply with these social expectations, many firms may be willing to provide such training, even though they could increase their own profits by eliminating their apprenticeship programs and hiring apprentices trained elsewhere. The German system may, indeed, rest upon one or more of these explanations. Unfortunately, however, none of these conditions currently exist in the United States.

In the second half of the paper, we survey the evidence on the merits of apprenticeship training relative to other forms of human capital investment by comparing educational and experience wage differentials in the U.S. and Germany. Contrary to the impression left by much of the popular discussion, German apprentices occupy roughly the same place relative to unskilled workers and college graduates as held by high school graduates in the U.S.. Further, the age-earnings profiles for German apprentices and U.S. high school graduates are quite similar. These two facts are intriguing in the face of apparent differences in human capital investments for apprentices and high school graduates not going on to college. One possibility is that the differences in human capital investments have been overstated, given the undercounting of informal on-the-job training in the U.S.. Alternatively, there may simply be a higher return to job search for young workers in the U.S. relative to firm-specific human capital investments. We may simply be observing two different equilibria with similar outcomes-- active search with low firm-specific investments in the U.S. and low search with more specific investment in Germany.

Below, we provide some institutional detail on the German system in section II. In section III, we review the evidence regarding the employer's costs of providing apprenticeship training. In section IV, we evaluate each of the three potential reasons for firms' financing of investment in general skills. In section V, we compare the earnings and employment of U.S. high school graduates and German apprentices. In the final section, we briefly discuss current policy options for the United States.

II. Institutional Detail[3]

The German educational system is much more explicitly differentiated than the U.S. system. Though we will not provide a detailed explanation here, there are basically five paths that students follow:

Educational Attainment in Germany	Closest U.S. Equivalent
Terminal middle school degree	<=10 yrs school
Middle school degree plus one-year classroom training such as in health or public administration	11 yrs school
Apprenticeship training	HS Graduate
Terminal university/technical university preparatory school degree or Master certificate	Some College
Three-year technical university programs or Four-year (or longer) university training	College Graduate

Table 1 displays the educational background of three age cohorts of male German workers. The portion of the workforce without any post-secondary training has been declining steadily in Germany. While 17% of those turning 18 between 1955 and 1962 did not have any post-secondary training, this share had fallen below 10% in the Seventies. In contrast to the United States, however, very few of these students attended university: Academic or technical university graduates represented only 12% of 27-34 year-old workers in 1986. (University enrollment has grown rapidly during the Eighties.) However, the largest group-- about two-thirds of the workforce-- completed a 2-3.5 year apprenticeship in the dual system. It is this ability of the German system to provide training to the non-college-bound which has attracted the attention of U.S. policy-makers.[4]

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[3] We only provide a brief summary of important institutional aspects. For more detailed accounts see Franz and Soskice (1994), Streeck et al. (1987), and Winkelmann (1994).

[4] There has been some disagreement in the literature regarding the effect of compulsory schooling laws on the proportion of youth "choosing" to complete apprenticeships. Taken literally, state laws

Training which occurs at a firm is only one part of the expense involved in the German dual system of apprenticeship training. The adjective, "dual," is due to the fact that apprentices typically attend publicly-funded vocational schools 1-2 days a week in addition to working at the firms. Further, there are a host of coordinating activities performed by the federal Bundesinstitut für Berufsbildung (BiBB) and industry organizations or "chambers", the latter funded by membership taxes which all firms in an industry are legally required to pay. For instance, training firms have to demonstrate that their trainers fulfill certain minimum requirements and that the enterprise can provide the training for the respective occupations. Therefore, the vocational schools themselves and much of the coordinating functions are shared collectively through various taxes. However, in this paper, we will explore the financing of the portion of the dual system training occurring on employers' premises. [5]

III. Net Costs of Training to Firms: Do Apprentices Pay the Bill?

We first test whether the German system reflects the textbook example in which workers pay for their training by accepting wages below their productivity. [6] As Becker (1964) argues in his classic work, the party writing the trainer's check need not be paying for the training. Trainees could compensate their employers by accepting wages less than the value of the products they produce. Indeed, since an apprentice's wage is typically between one-half and one-third of that of a skilled worker, some have conjectured that net costs to firms of providing apprenticeship training may indeed be zero. In accordance with Soskice (1994) and Steedman (1993), however, we conclude that this hypothesis is only partially correct. Among smaller craft firms, the costs of apprenticeship training to employers have probably been overstated and may be close to zero, but many of the large, industrial firms continue to make substantial investments in apprenticeships which require explanation.

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seem to require youth to attend school through age 18. Since general schooling is usually completed at age 16, the "willingness" of youth to participate in apprenticeships has been attributed to these compulsory schooling requirements. In practice, though, the states allow youth to fulfill the further schooling requirement by attending one year of vocational college, usually between age 16 and 17. For more on this, see Steedman (1993).

[5] A few small industries, such as construction, have resorted to taxing members of industrial chambers to pay for the centralized training centers where apprentices are trained. This is the exception, however. See Timmermann (1993).

[6] For instance, see Heckman (1993).

Since 1970, there have been three major attempts to answer this question in Germany.[7] All of these studies have attempted to account for the various types of costs and benefits involved for firms.[8] Table 2 reports the estimated costs of such training by sector and category of cost for both 1970 and 1980.[9] Results from the third study are not complete as of now, but cost data by firm size and for the two major training sectors are available. In all of these studies, the net cost of training apprentices is estimated to be positive in all sectors, but highest in larger, industrial firms: In 1980, the estimated net cost to the firm for a year of apprenticeship training was roughly $5991 and $9381 in the craft and industrial/trade sectors respectively (1990 U.S. dollars). Further, these net costs represent a higher proportion of gross costs (before considering apprentices' productivity) in industry. It is also evident from Table 2 that training costs have risen substantially over the last 20 years.

However, as Soskice (1994) conjectures, such estimates probably overstate training costs in craft firms. In smaller craft firms, master craftsmen have considerable flexibility in the scheduling of the training sessions. It would certainly be reasonable to expect that much of the training occurs during slack periods of the day when the opportunity costs of the trainers' time is lowest. For instance, a master plumber might be expected to instruct his/her apprentices on days when there are few calls to be made, on the way to a job or at the end of the day. Therefore, the average cost of a master craftsman's time probably overstates the actual costs of the periods of training. In contrast, industrial firms usually employ full-time training personnel, who often train apprentices in classroom settings away from the production line. The reported costs for these firms are more likely to approximate the true costs of the resources required for training.[10] This argument was pursued in a 1991 BIBB study.[11] Excluding

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[7] See *Sachverständigenkommission* (1974), Noll et. al. (1983) and Bardeleben (1994).

[8] The simplest component of costs to measure are materials costs and apprentices' wages. However, the remaining portion is much more difficult to capture. For instance, one must account for the wage costs of training personnel. This is a straightforward measurement at larger firms which often employ full-time training personnel. At smaller craft firms, however, it is a much more difficult task, since the apprentice may often be looking over the shoulder of the master craftsman engaged in productive work. Both studies simply asked supervisors to estimate how much time they spent instructing apprentices, which, when multiplied by the wage of such instructors, provided an estimate of the training personnel costs. Finally, investigators attempted to measure the value of apprentice production during the course of their training. Employers were asked to report the amount of time apprentices spent in production, the relative productivity of an apprentice to a skilled worker and the wage of skilled workers at the firm. The value of apprentice production was estimated as the product of these three.

[9] Wage and cost figures reported in this paper have been converted to 1990 U.S. dollars by first accounting for inflation with the German consumer price index through 1990 and then applying the average exchange rate of DM 1.62 per U.S. $.

[10] Data from the Eighties appear to be consistent with the assumption that net training costs are close to zero in the crafts sector. As Franz and Soskice (1994, Table 5) show, the crafts sector's demand

the wage costs for trainers who are not full-time, training costs in the crafts sector are on the order of $240 and thus negligible. In trade and industry, net costs to the firm for a year of apprenticeship training were approximately $5485 (1990 U.S. Dollars).

Though analysts in the U.S. have recently discovered the issue, the size of the net cost of apprenticeship training has been a matter of considerable debate in Germany for decades. For example, in the face of rising cohort sizes during the Seventies, the issues of financing and employer incentives were hotly debated. Labor representatives have sought to understate the costs in an attempt to pressure employers to provide more training slots for potential members. On the other side of the debate, employers have tried to overstate costs to promote a public image of social consciousness, to bargain for greater public subsidies for vocational schools and to obtain more flexibility in the type of training they provide to apprentices. It is of some importance, therefore, that the three studies commissioned by the government have concluded that the net costs of training are substantial, with the likely exception of the crafts sector.

IV. Evaluating Reasons Why German Firms Might Invest in General Human Capital

In the simplest Becker formulation, we would expect firms to share the costs of specific capital, but leave general investments to be paid by workers.[12] However, it is puzzling that much of the training in Germany appears to be generally applicable. Industrial chambers, which license firms seeking to hire apprentices, regulate the type of training which occurs in two ways. First, they develop the tests which apprentices must pass to receive their skilled worker certificate. These tests focus upon skills generally applicable in the industry. Firms with consistently low pass rates have their training licenses revoked. Second, the chambers not only regulate the output of apprenticeship training programs, but often regulate the content as well. For instance, they may list the skills which the training program must cover as well as, in some cases, the amount of time they are to receive in the curriculum.

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for apprentices was far more elastic than that of industry and trade in response to larger youth cohorts in the early Eighties.

[11] The difference between full and prime cost estimates is mostly due to the treatment of part-time trainers. In the full cost measurement, part-time trainers are included while they are excluded in the prime cost estimates.

[12] For a discussion of the use of deferred benefits packages in employment relationships, see Lazear (1981).

We first describe and evaluate three different characteristics of the German labor market institutions which may lead firms to provide general human capital skills which are not contemporaneously financed by worker productivity:

- Union Collusion, Works Councils and Restricted Mobility
- Unobserved Heterogeneity in Worker's Costs of Mobility
- Firing Costs, Uncertainty and Option Value

A. Union Collusion, Works Councils and Restricted Mobility

Soskice (1993) suggests that union influence over plant-level works councils plays a critical role in allowing firms to provide temporary financing to apprentices. As a result of German labor law, wage floors are set by region and industry through negotiations between industrial unions and employers' associations. However, individual employers and works councils negotiate supplements to these minima at the firm level. The works councils in each of the plants are elected by employees and typically have strong informal ties to local unions. Although employers maintain control of hiring decisions, Soskice argues that works councils effectively limit the "poaching" of skilled workers trained elsewhere through their influence over these wage agreements, setting pay scales for skilled workers trained internally and by other firms. According to Soskice, unions help to solve the borrowing constraint problem by limiting non-training firms' ability to attract workers and, thereby, allowing employers to make "loans" to apprentices for general human capital investments.

However, turnover rates are much higher than popularly believed, even within the industrial sector. Figure 1 portrays the proportion of apprentices leaving the firm where they were trained by year of apprenticeship completion and timing of departure. For instance, roughly 30% of all apprentices leave the firm where they were trained immediately upon completion of their training. Within 5 years of the end of training, 70% of the typical firms' apprentices have left. As evident in Figure 1, departure rates vary by sector, being highest within the crafts sector and lowest in industry. This is consistent with the notion that craft apprenticeships may have zero net costs for employers. However, even in industrial firms with more than 1000 employees, 50% of those completing apprenticeships leave the firm where they were trained within 5 years.

Two other facts are evident in Figure 1. Because retrospective data are available for workers of various ages, it is possible to study the trend in exit rates over time with a cross-section. First, despite understandably high departure rates in the years immediately following WWII, the leaving rates have been as high through the post-war period. These exit rates are not the result of high German unemployment rates

recently. Rather, high turnover has been a long-term feature of the German system. Second, at least in industry, exit rates seem to have begun falling during the Seventies.

Despite the high exit rates, apprentices may linger "long enough" to reimburse firms for subsidizing their training. This is impossible to answer directly, given that we do not actually observe any given workers' productivity. However, since we have data on the probability of retention and on the actual earnings of former apprentices, we can calculate the amount by which productivity would have to exceed wages to compensate firms for the cost of apprenticeship training.[13] Basend on our estimates of age-earnings profiles and retention rates using the 1985 data, we computed the necessary productivity differential for firms in industry and trade. Given the estimated cost to firms of training an apprentice in industry and trade, workers would have to be 24.5% more productive than their wages to compensate their employers.[14] As is well-known, indirect labor costs are fairly high in Germany, and gross wage payments will underestimate true labor costs.[15] For instance, if indirect labor expenditures were 50% of gross wages, the required wedge between productivity and labor costs would have to be only 16.4%.

Moreover, if those remaining with the training firm are being paid something less than their productivity, we would observe a wedge between the earnings of those who remained and of those who left the firm where they were trained. We estimated wage differentials for apprentices departing the training firm at different points in their careers. These are reported in Table 3 separately for apprentices trained in the

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[13] Let C denote the net cost of apprenticeship training. If r(t) is the expected rate of retention for an apprentice of experience t and W(t) is the respective wage. Suppose that workers' productivity was $(1+\gamma)*W(t)$. In other words, if γ is positive, then firms are recovering some of their investment by paying workers less than their productivity. Firms would expect to recoup their investments if the following condition were met:

$$C = \sum_{t=1}^{T} \gamma r(t) W(t) (1+d)^{-t}$$

For our calculations, we assumed a discount rate (d) of 6% and that apprentices remain with the company for a maximum of T=40 years. Estimates of the earnings profiles were obtained using a quartic in experience for stayers, controlling for firm size and field of apprenticeship training. Retention rates, r(t), were estimated from survey responses using a non-parametric life-table estimator. We assumed a duration of 3 years for apprenticeship training.

[14] The cost figures entering the computation are averages of the 1991 and 1980/81 estimates, $10,650 ($1990 U.S) per apprentice per year.

[15] Employers are legally bound to contribute 50% of their employees' social security, health and unemployment insurance payments. In many industries and in particular in large firms, additional benefits are negotiated between employers and unions. According to computations by the Federal Statistical Office (Statistisches Bundesamt 1992, p. 602), indirect labor costs for industrial firms with more than 50 employees amounted to 71.8% of direct costs in 1981 and 82.6% in 1988, respectively. In 1985, the average blue collar worker earned an income of DM 3000, but employers faced labor costs of roughly DM 5300 per worker.

industrial and crafts sector. As reported in column (1), those who left immediately at the end of their training earned 8.3 and 5.0% higher wages than the apprentices with similar years of experience who remained with the training firm. However, a large part of this seems to be due to attendance of further schooling. As reported in column (2), these differentials are eliminated for former craft apprentices once one controls for years of schooling completed. However, industrial apprentices leaving during the first year still earned 6.6% more than those who remained. This was true even after controlling for employing firm size and industry effects in column (3).

Unfortunately, we cannot identify in our data whether the skilled workers are joining "free-riding" firms which do no training. However, it seems that a number of firms, particularly medium-sized firms, provide little or no apprenticeship training.[16] Data from the 1987 Census of Establishments show that about 84% of all establishments with more than 500 employees provide apprenticeship training. For establishments with 100 to 500 employees, the respective share is about 70%, and for firms with 50 to 100 employees it is only 60%.[17] As we show in the next section, there is also considerable variation in the extent of training among training firms. Firms appear to adjust their training decisions to local labor market conditions in a way that is consistent with the poaching hypothesis.

B. Some Advantages of Residential Inertia: German Workers' Unwillingness to Move

In 1986, 80% of the German workforce reported that they had never moved to take another job. This fact may indeed have some significance for the provision of training. In a simple model sketched below, firms may be willing to invest when there are initially unobserved differences in worker tastes for mobility. As long as there are "enough" workers with high costs of mobility willing to work for the local employer, one might observe firms continuing to provide training in the presence of considerable turnover and poaching by other employers. In expectation, there must simply be enough "trapped" employees from whom the employer can extract payment. This is another form of skill specificity: though the skills themselves seem to be generally applicable, there may be few employment opportunities within a geographically acceptable range.

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[16] Soskice (1993) reports data from a survey of employers regarding apprenticeship training programs. However, response rates were quite low in that survey. Since the survey was explicitly focused upon training issues, one might have expected training firms to be more likely to respond.

[17] These data are tabulated in greater detail in Henniges (1994, Table 27a).

Empirical Evidence

We test the relationship between potential mobility and training incentives using data on regional variation in firms' training decisions in Germany.[18] Using data on training decisions for a sample of 1461 firms in 1992, we find that the number of similar firms in the surrounding labor market has a negative effect on firms' training decisions. In the top panel of Table 4, we report probit coefficients from a specification with apprenticeship training (0 or 1) as the dependent variable; the bottom panel contains the results of tobit specifications with apprentices per employee as the dependent variable. (Roughly one-quarter (25%) of the firms in the panel do no training.) As reported in the first column of Table 4, those located in counties categorized as urban or suburban were significantly less likely to train apprentices and, among those who trained, trained fewer apprentices per employee.[19] The results in column (2) add the size of the county workforce. Not only are those in cities less likely to train, but size of city has a negative effect on the presence and extent of apprenticeship training. Based on regional planning data[20], we also calculated the size of the workforce within 45 minutes by car or train of each county. As reported in column (3), firms in counties near other large counties are also less likely to train and train fewer apprentices. Each of these specifications also includes 6 dummies for firm size, 10 states and 30 dummies for two-digit industries. In the final column, we include a measure of the number of other firms in the same industry in the same county, which has a marginally significant negative effect on the extent of apprenticeship training. Therefore, even in Germany, firms are much more willing to train when there are fewer firms around to poach their trainees.

C. Firing Costs, Uncertainty and Option Value

The combination of high firing costs and binding wage minima in the German labor market confers value upon any information employers can gather regarding a particular employee's productivity before hiring them. Since an employer can decide not to hire an apprentice, but faces considerable costs when firing a regular employee, the firm may be willing to subsidize apprenticeship training. Therefore, regardless of any human capital which may be developed along the way, such apprenticeship programs may serve as an expensive employment test for which employers (and apprentices) may be willing to pay. However, unlike a simple employment test, observing an apprentice provides more information than just their current productivity. It also allows an employer to observe a worker's capacity for learning new skills. Since wage bargaining in Germany often regulates not only the level of

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[18] The data originate with a survey commissioned by the Ministry of Research and Technology. For details on sampling frame and questionnaire design see Harhoff and Licht (1994).

[19] There are 328 West German counties, of which 92 were categorized as "urban" and 122 as "urban fringe".

[20] The data were supplied by the *Bundesanstalt für Regionalkunde und Raumplanung* (BfLR 1992).

earnings, but the returns to tenure as well, this information on an employee's human capital production function would have value.

If employers could completely observe a worker's potential at initial selection, however, there would be little option value offered by apprenticeships, since the less productive workers could be identified without the apprenticeship programs. Some information appears to be generated in the process of training, though, since 10% of former apprentices (or roughly 1/7 of those who leave the training firm) in 1985 reported that they had left the training firm because they were not offered a contract by their employer at the end of the training.

However, German employers have alternatives to apprenticeship training programs to evaluate the skills of workers. Until 1985, employers could hire workers on fixed term contracts of 6 months. During this period, such employees are not covered by the laws requiring prior notification or the negotiation of severance packages. In 1986, this limit was raised to 18 months. The use of such contracts has increased somewhat in recent years.[21] Therefore, while we find the employment test explanation intriguing, much of that incentive may have been weakened by the legal reforms of the Eighties.

As Abraham and Houseman (1993) suggest, high firing costs make apprenticeship programs valuable for a second reason. A German firm may more flexibly adjust apprentice employment than the regular workforce. Apprentices, then, become a buffer for adjusting employment levels with short-term demand fluctuations. Therefore, even if there were no information gathered during the course of the training, having a reserve pool of apprentices may be valuable, again due to the high firing costs in Germany.

Firms' ability to layoff groups of workers has been regulated under German law, although such regulations were loosened in 1986. From 1972 to 1986, employers laying off more than 10% of their workforce or more than 30 workers were required to negotiate a severance package for the employees.[22] Firms unable to reach such agreements were required to submit to arbitration. As part of the "Employment Promotion Act of 1985", the limits on group-layoffs were loosened somewhat, to apply only to layoffs involving 20% of the workforce or 60 workers. Hemmer (1988, p. 60) estimates from a sample of 145 such compensation plans that the median settlement was equal to 5.8 months of earnings in the chemical industry and 3.8 and 1.6 months of earnings in the metal-working and textiles industries. Employers are

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[21] Büchteman (1990) discusses the empirical evidence and concludes that fixed-term contracts were used primarily for screening purposes prior and after the 1985 reform. He concludes that a lack of screening opportunities has not been a constraint in German employers' hiring decisions.

[22] See Abraham and Houseman (1993) for a more detailed description.

also required to provide minimum amounts of advance notice depending upon the tenure of the employee.

The extent of regulation is less clear for dismissals not covered by any Sozialplan (compensation plan). The works council must be consulted before any dismissal of a regular employee. Although the employer need not receive the approval of the works council to fire an employee, the works council's finding may be used by the former employee in any subsequent legal challenge. However, the severance payments typically agreed upon in such court proceedings or in settlements between firms and employees are small in comparison to the net training costs. The most comprehensive study, conducted from 1978 to 1980, is based on an analysis of 800 court proceedings. The median severance payment was found to be around $1750 (1990).[23] An upper bound on the value of the information generated by an apprenticeships would be the probability that a firm will find an unsuitable employee (1/7 of workers reported that they were not offered a contract by the training firms), multiplied by the expected severance payment. Thus, the option value derived from apprenticeships is fairly low in the case of individual dismissals.

Summary

Any policy to develop school-to-work programs in the U.S. must be based upon a clear understanding of employer incentives. We outlined three possible explanations of German employers' willingness to provide such training in the face of worker turnover. The German human resource managers we interviewed often offered a fourth explanation which is difficult to evaluate: history may have led to the development of a norm among German employers to provide such training. Even if individual firms could increase their profits by simply hiring the apprentices trained elsewhere, it may be too "shameful" to do so.

Unfortunately, it is clear that none of these conditions exist in the U.S.. With unions representing only 15% of the workforce and enjoying much weaker legal standing, they could hardly be counted upon to limit employer poaching. Further, as the experience of the Eighties has demonstrated, wages are relatively flexible in the U.S.. This fact, along with low firing costs, suggests that U.S. employers may be less willing to invest in apprentices for the sole purpose of finding the most productive workers. There may also be many too few workers with high mobility costs to sustain an equilibrium such as the one sketched above. Finally, to the extent that the German system is bolstered by the social expectation that employers provide such training, no such norm exists in the U.S.. As a result, we conclude that any such program will depend upon other inducements, such as a "training tax" or similar public subsidy to survive. However, before endorsing such a measure, we attempt to evaluate the

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[23] The study was conducted by the Max-Planck Institute for International Law in Hamburg. The results of the study are described in some detail in *Bundesarbeitsblatt* 5/1981, pp. 18-22.

payoffs to such training by comparing the employment and earnings of U.S. high school graduates and German apprentices below.

V. Do German Apprentices Fare Better than U.S. High School Graduates?

The German apprenticeship has been held up as a model for improving the life prospects of the non-college-bound. While there have been a number of questions about how one could implement such a system in the U.S., the presumed merits of apprenticeship programs have gone unquestioned in the current debate. We compare differences in the payoff to education and training in the U.S. and Germany and take a closer look at differences in youth unemployment in the two countries.

Educational Earnings Differentials in the U.S. and the FRG

The top panel reports the proportion of the U.S. and German male, full-time, non-self-employed workforce by level of education. A majority of German workers (63%) have completed an apprenticeship. Because the two groups complete a similar number of years of education and training before entering the labor market, we compare the earnings of German apprentices to those of high school graduates in the U.S.. (The typical route to completing an apprenticeship is to complete 9-10 years of schooling and, later, to spend an additional 2-3.5 years in an apprenticeship program.) One fifth of U.S. workers report completing some college and 30% completed 4 or more years of college, as compared with 8% and 11% respectively, of German workers. (Master certificate recipients and abitur holders without a college degree are included in the "some college" category in the German data. Graduates of both universities and technical universities are counted as college graduates in Germany.)

As reported in the second panel of Table 5, the log weekly earnings differential per year of formal education or training is similar in the U.S. and Germany: 8.1 versus 7.3%. The third panel of Table 5 reports the results of a second specification, estimating log weekly earnings differentials for each of the other educational groups relative to high school graduates in the U.S. and apprentices in Germany, while continuing to allow for a quadratic in experience. Again, the results are remarkably similar in the U.S. and Germany: apprentices earn roughly 19% more than those completing 10 or fewer years of schooling; high school graduates earn 23% more than a similar group in the U.S.. Similarly, apprentices earn 47% less than German college graduates, a figure quite similar to the college-high school differential in the U.S. (42%).

Therefore, relative to unskilled workers and college graduates, German apprentices occupy essentially the same position in the German wage structure as held by high school graduates in the U.S.. Further, this seems to be true on average as well as over the life-cycle. Figure 2 reports age-earnings profiles for each of the three groups in the U.S. and Germany in 1979. The slope of these profiles is a potential indicator of

additions to a group's stock of human capital. Average earnings were fit to a cubic in age separately for each group. To avoid the vagaries of currency comparisons, earnings within each country are reported relative to those of a 30-year-old German apprentice or U.S. high school graduate in that year. Both relative earnings and the slope of the profiles are similar in the two countries. Between ages 21 and 30, the earnings growth of U.S. high school graduates and German apprentices are estimated to be virtually identical. Between age 30 and 40, the slope of the profile is actually steeper for U.S. high school graduates. Similar profiles are reported in Figure 3 for 1985. Among the apprentices/high school graduates and middle school graduates/high school drop-outs, the age earnings profiles became steeper. Further, there was a dramatic increase in the relative earnings of young U.S. college graduates. However, the age-earnings profile of U.S. high school graduates continued to be quite similar to that of German apprentices.

Differences in Youth Unemployment in the U.S. and Germany

In the previous section, we focused upon earnings differentials among those who were employed full-time. Table 6 provides a closer look at differences in youth unemployment in the U.S. and Germany, using data from the U.S. Current Population Survey in 1989 and the German Mikrocensus in 1991.[24] (The most recent data available for Germany were from 1991. We chose 1989 for the U.S. in order to find a similar point in the business cycle.)

As has often been reported in the U.S. debate over apprenticeship training, the youth unemployment rate is higher in the U.S. than in Germany. Among 16-19 year-old males, the U. S. and German unemployment rates were 15.7 and 4.5 percentage points respectively. However, this oft-cited comparison overstates the difference in school and labor force attachment between the two countries, simply because it is more common to mix part-time schooling with labor force participation in the U.S. For instance, 59% of unemployed 16-19 year-olds and 15% of unemployed 20-24 year-olds in the U.S. were also enrolled in school. German university students are required to be enrolled "full-time" to receive free tuition. Accordingly, only 8% of unemployed German 20-24 year-olds were enrolled in school. Limiting our attention to the proportion of the population that is both out-of-school and unemployed, the magnitude of the problem in the U.S. appears smaller and differences between the U.S. and Germany are less glaring. Among 20-24 year olds, the proportion of the population that was not-in-school and unemployed was 5.7% in the U.S.. The similar rate in Germany was 3.1 percent. (Among 16-19 year olds, the rates were 3.5% in the U.S. and 1.1% in Germany.)

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[24] We have attempted to use a similar definition of unemployment in the two countries, using similar questions on specific job search methods to qualify for unemployed status. Apprentices were counted as having been in school and employed.

Further, such weak labor force attachment is much more common among racial minorities-- in Germany as well as the U.S.. As reported in Table 6, 9% of 20-24 year-old African American and Hispanic males were out-of-school and unsuccessfully looking for work. The problem was no less acute in Germany, where 8.1% of 20-24 year-olds of foreign descent (primarily Turks) were in a similar predicament. Therefore, in both countries, minority youth face a more difficult challenge in establishing solid labor force attachments. In the U.S., "hiring audits," in which matched pairs of minority and white youth apply for the same jobs, have suggested discrimination in hiring for entry-level jobs. (Turner, Fix and Struyk (1991) and Fix and Struyk (1993)) Presumably, any such discrimination would affect decisions regarding the provision of apprenticeship training. Apparently, the German system is no more successful in providing those links than U.S. institutions.

Interpretation

Despite the apparent differences in human capital investment in the U.S. and Germany, we do not observe differences in wage growth or employment over the life-cycle of German apprentices and U.S. high school graduates. There are at least two possible explanations for this fact. First, because of undercounting of informal on-the-job training by U.S. high school graduates, we may be overstating the difference in human capital investment in the two countries. But second, as Jovanovic(1979) argues, there may be a trade-off between firm-specific investments and job search. With industry-wide wage agreements, there may simply be a lower payoff to job search in Germany. Indeed, as reflected in the R2 in Table 5, there is less residual wage variation in Germany than the U.S. To the extent that this variation reflects realizable differences in job match quality rather than worker heterogeneity, there may be a higher payoff to search in the U.S. Figure 4 reports the mean tenure in one's current job for male high school graduates in the U.S. and apprentices in Germany.[25] Although turnover rates are higher than believed in Germany, they are apparently lower than in the United States. Topel and Ward (1992) estimate that at least one-third of the wage growth achieved by U.S. workers between the ages of 18 and 34 occurs at job transitions, rather than within jobs. Therefore, American workers may be investing heavily in job search at young ages because it pays to do so. In contrast, due to industry-wide wage agreements, which limit match-specific payments, German workers may invest more heavily in firm-specific skills. We may simply be observing two different equilibria-- high specific investment with little job search in Germany and low investment, high job search in the U.S.-- which yield similar wage profiles.

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[25] The data for the U.S. were drawn from the January 1987 Current Population Survey.

IV. Discussion

In this paper, we first described three possible reasons for German employers' willingness to invest in training. Unfortunately, none of these conditions currently exist in the U.S.. Therefore, it may not be an historical accident or lack of imagination which has led U.S. firms and workers to invest less in some form of apprenticeship training. Rather, the reason may lie in the many other differences between the two labor markets.

One method for "creating" such incentives for employers would be to establish a payroll tax against which training expenses can be deducted.[26] Such a tax could be tailored to subsidize training of particular groups of workers, but at the price of encouraging a number of potentially offsetting inefficiencies.[27]

Before advocating such a drastic step, the institutional advantages of the German system should be examined more closely. The tabulations reported above would suggest that German apprentices have relative earnings and earnings growth similar to U.S. high school graduates. Further, the differences in labor force attachment are much less striking when one recognizes that, many unemployed youth in the U.S. are in school. Minority youth in the U.S. have the most difficulty making attachments to the labor market and it is not at all clear that an apprenticeship system dependent upon the hiring decisions of employers would be well targeted toward this group. Minority youth in Germany have similar rates of detachment as observed in the U.S..

There may be alternative policies to generate human capital investment which are more consistent with U.S. labor market institutions and more easily targeted. The underlying market failure is the inability of youth to borrow against future earnings. Youth themselves will always have an incentive to make worthwhile investments, given that their foregone earnings represent a large share of the costs of attendance. Many of these marginal youth presumably enter at community colleges, where Kane and Rouse (1995) have estimated payoffs per year of education similar to those observed for 4-year college students. Public tuition levels increased more than 50%

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[26] In fact, a similar measure (*Berufsbildungsabgabe*) was enacted in Germany in 1976 in the face of mushrooming cohorts of 16-19 year-olds. The measure permitted the German government to impose a training tax whenever the supply of apprenticeship positions did not exceed demand by at least 12.5%. However, although the supply/demand criterion was satisfied during some years in the 80s, the government never imposed the *Berufsbildungsabgabe* due to employer opposition. Moreover, in 1980 the *Bundesverfassungsgericht* (Supreme Court) declared the law void for a number of formal legal considerations. Faced with a notable reduction in the supply of apprenticeship positions, German observers of the vocational training system have just started a new discussion on appropriate financing mechanisms, including a training levy (see the contributions in Liesering et al. 1994).

[27] For a discussion of the potential inefficiencies introduced by a payroll tax, see Heckman, Roselius and Smith (1993).

and federal grants to disadvantaged students have fallen in real value. If we are concerned about the availability of training for disadvantaged youth, loosening these bottlenecks, rather than subsidizing apprenticeship programs, may indeed have a greater pay-off in the long-run.

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Table 1
Educational Background
German Male Workers by Cohort

Educational Background by Age Cohort

	Year Turned 18:		
Educational Attainment:	1955-1962	1963-1970	1971-1978
10 Years of Schooling or less	17.0%	12.8%	9.4%
11-13 Years of Schooling	1.0%	1.3%	2.2%
Apprenticeship Training:			
Apprenticeship Only	61.9%	63.0%	66.3%
Apprenticeship + Master Certificate	8.3%	7.4%	5.1%
Technical University (3-year program)	4.6%	3.8%	5.4%
University (4-year program)	5.8%	9.6%	8.5%
Other Postsecondary	1.4%	2.1%	3.3%
	100.0%	100.0%	100.0%
N:	2952	3144	3387

Note: Derived from authors' tabulations of the *Qualifikation und Berufsverlauf* Survey 1985/86. The data do not include non-German nationals working in Germany.

Table 2
Costs of Apprenticeship Training by Training Sector
1971/72 and 1980 Estimates

1971/72 Estimates: (Per apprentice and year.)

Training Sector	Gross Costs	Apprentice's Productivity	Net Costs	Net Costs as % of Gross Costs
All Sectors*	$7,774	$3,518	$4,255	55%
Industry and Trade*	9,971	3,046	6,123	67
>=1000 employees	10,600	2,640	7,959	75
< 1000 employees	9,080	3,072	6,006	66
Crafts	6,233	3,163	3,071	49
Consultancy Professions	7,869	5,979	1,890	24
Public Service	n.a.	n.a.	n.a.	n.a.
Agriculture	6,360	5,906	453	7
Health Sector	6,299	6,197	102	2

Source: Sachverständigenkommission (1974). *Weighted averages computed by the authors.
Note: All cost figures in 1990$. The 1971/72 figures were deflated and then converted to US$ at a rate of $1.62/DM.

1980 Estimates: (Per apprentice and year.)

Training Sector	Gross Costs	Apprentice's Productivity	Net Costs	Net Costs as % of Gross Costs
All Sectors	$12,845	$5,091	$7,755	60%
Industry and Trade*	14,654	5,272	9,381	64
>=1000 employees	n.a.	n.a.	n.a.	n.a.
< 1000 employees	n.a.	n.a.	n.a.	n.a.
Crafts	10,939	4,947	5,991	55
Consultancy Professions	13,199	4,700	8,499	64
Public Service	17,855	814	15,041	84
Agriculture	10,420	7,673	2,746	26
Health Sector	n.a.	n.a.	n.a.	n.a.

Source: Noll et al. (1983), Tables 1 and 2
Note: All cost figures in 1990$. The 1980 figures were deflated and then converted to US$ at a rate of $1.62/DM.

1991 Estimates: (Per apprentice and year.)

Training Sector	Gross Costs	Apprentice's Productivity	Net Costs	Net Costs as % of Gross Costs
All Sectors	$17,645	$6,987	$10,657	60%
1-9 employees	16,392	7,292	9,100	56
10-49 employees	16,811	6,841	9,971	59
50-499 employees	18,105	7,219	10,886	60
>=500 employees	21,296	6,152	15,144	71
Industry and Trade*	18,988	6,751	12,237	64
Crafts	14,850	7,480	7,370	50

Source: Bardeleben (1994, p. 287/288)
Note: Disaggregated data for other sectors are not available at this point. All cost figures in 1990$. The 1991 figures were deflated and then converted to US$ at a rate of $1.62/DM.

Table 3
Log Monthly Income Differentials for Male Apprentices by Length of Time with Training Firm in 1985
(Standard Errors)

	Apprentices trained in Industry Firms			Apprentices trained in Craft Firms		
Time of Departure:	(1)	(2)	(3)	(1)	(2)	(3)
Immediate	.082	.019	.028	.050	.025	.029
	(.023)	(.023)	(.023)	(.021)	(.020)	(.021)
≤ 1 year	.094	.066	.065	.027	.013	.015
	(.013)	(.012)	(.013)	(.011)	(.011)	(.012)
1-2 years	.025	.011	.016	.010	.005	.005
	(.009)	(.008)	(.008)	(.009)	(.008)	(.009)
2-5 years	.010	.002	.006	.004	.002	.004
	(.006)	(.006)	(.006)	(.006)	(.006)	(.006)
5+ years	-.001	-.003	.001	.006	.005	.005
	(.005)	(.005)	(.005)	(.005)	(.005)	(.005)
Schooling?		yes	yes		yes	yes
Employing Firm Size & Industry Dummies?			yes			yes
$\overline{R}^2$	.095	.166	.252	.053	.104	.1406
N:	2302	2302	2302	3711	3711	3711

Note: Regression results using the 1985 *Qualifikation und Berufsverlauf* survey described in the text. The estimates were obtained using a FIML estimator, assuming log-normality of the monthly income variable. All specifications include dummies for size of training firm and a quartic in experience. Only males with more than 5 years of work experience were included. There were 9 dummies for training firm size and 42 dummies for the industry of the employing firm. The reported values of $\overline{R}^2$ were computed as $1-(\sigma^2/\sigma_0^2)$ where σ and σ_0 are the errors of the estimate in the unrestricted and restricted (i.e., with a constant as the only RHS variable) regressions, respectively.

Table 4

Incidence and Extent of Apprenticeship Training in West German Enterprises
Probit and Tobit Regression Results
(Standard Errors)

Probit Estimates Dependent Variable: Apprenticeship Training				
Independent Variable	(1)	(2)	(3)	(4)
City	-.392 (.132)	-.001 (.158)	.221 (.175)	.215 (.176)
Urban Fringe	-.382 (.118)	-.269 (.121)	-.161 (.127)	-.161 (.127)
County Work Force		-.357 (.075)	-.239 (.085)	-.227 (.088)
Out of County Work Force Within Commuting Distance			-.243 (.085)	-.242 (.084)
Number of Other County Industry Firms (/100)				-.017 (.030)
log L	-545.76	-534.26	-530.00	-529.84
Tobit Estimates Dependent Variable: 10*Number of Apprentices per Employee				
Independent Variable	(1)	(2)	(3)	(4)
City	-.161 (.044)	-.047 (.051)	-.033 (.057)	-.028 (.057)
Urban Fringe	-.156 (.040)	-.119 (.041)	-.084 (.042)	-.084 (.042)
County Work Force		-.106 (.025)	-.065 (.028)	-.053 (.029)
Out of County Work Force Within Commuting Distance			-.089 (.027)	-.087 (.027)
Number of Other County Industry Firms (/100)				-0.020 (0.013)
log L	1349.05	1358.23	1363.40	1364.58
Total No. of Observations	1461	1461	1461	1461
No. of Censored Obs. (No Apprenticeship Training)	356	356	356	356

Note: Regression results using the 1992 cross-section of the *Mannheim Innovation Panel* described in the text. All regressions include 6 dummy variables for firm size, 10 state dummy variables and 30 dummy variables for industries at the two-digit NACE level.

Table 5

Payoff to Schooling and Training in the U.S. and Germany, 1986

Proportion of of Full-Time, Not Self-Employed Male Labor Force:		U.S.	Germany
<=10 Yrs School	<=10 Yrs School	.089	.098
11 Yrs School	11 Yrs School	.027	.083
HS Graduate	Apprentice	.379	.632
Some College	Some College	.202	.076
College Graduate	College Graduate	.302	.111
Ln Weekly Earnings Differential Per Year of Schooling (25-64 yr olds):		.0811 (.0008)	.0717 (.0011)
Ln Weekly Earnings Differential relative to HS Graduates and Apprentices (25-64 yr olds):			
<=10 Yrs School	<=10 Yrs School	-.229 (.007)	-0.177 (.008)
11 Yrs School	11 Yrs School	-.116 (.012)	-0.135 (.008)
HS Graduate	Apprentice	---	---
Some College	Some College	.156 (.005)	.210 (.013)
College Graduate	College Graduate	.422 (.005)	.459 (.007)
$\overline{R}^2$:		.203	.257
N:		51,437	12,506

Note: Weekly earnings differentials were estimated while including a quadratic in experience. U.S. data on white non-hispanic full-time, non-self-employed male workers were drawn from the NBER merged outgoing rotation group files from the Current Population Survey. German data on full-time, non-self-employed male workers were drawn from *Qualifikation und Berufsverlauf* Survey 1985/86. Since earnings data for German workers were reported as bracketed variables, the estimates for Germany were obtained using a FIML estimator assuming log-normality of the income variable. The reported value of $\overline{R}^2$ for Germany was computed as $1-(\sigma^2/\sigma_0^2)$ where σ and σ_0 are the errors of the estimate in the unrestricted and restricted (i.e., with a constant as the only RHS variable) regressions, respectively.

Table 6

Comparing Labor Market Outcomes in the U.S. and Germany
by Age and Racial and Ethnic Group

	Total		Majority		Minority	
	US	FRG	US (Wh, NH)	FRG (German)	US (Bl, Hsp)	FRG (Foreign)
16-19 Yr Old Males						
Unemployment Rate	15.7%	4.5%	12.6%	3.6%	27.2%	9.2%
% of Unemployed in School	58.9	46.7	57.8	46.5	56.5	47.2
% Not in School & Unemployed	3.5	1.1	3.1	1.0	5.5	2.4
20-24 Yr Old Males						
Unemployment Rate	10.4%	4.5%	6.8%	3.8%	12.3%	10.9%
% of Unemployed in School	14.7	8.0	21.5	9.1	13.9	4.9
% Not in School & Unemployed	5.7	3.1	4.5	2.6	9.0	8.1

Note: The data for the U.S. were calculated using the Merged Outgoing Rotation groups in 1989 for the academic year months (September through December and January through May). To be consistent with the German data, these data were supplemented with data from the Defense Manpower Data Center on the number of active duty military personnel by age, race and gender. Military personnel were counted as employed and out-of-school in both the U.S. and Germany. The German data refer to residents in former West Germany and were calculated using the 1991 Mikrocensus. German apprentices were counted as being in school and employed.

Figure 1

Proportion of Apprentices Leaving the Training Firm
by Year of Apprenticeship Completion and Timing of Departure

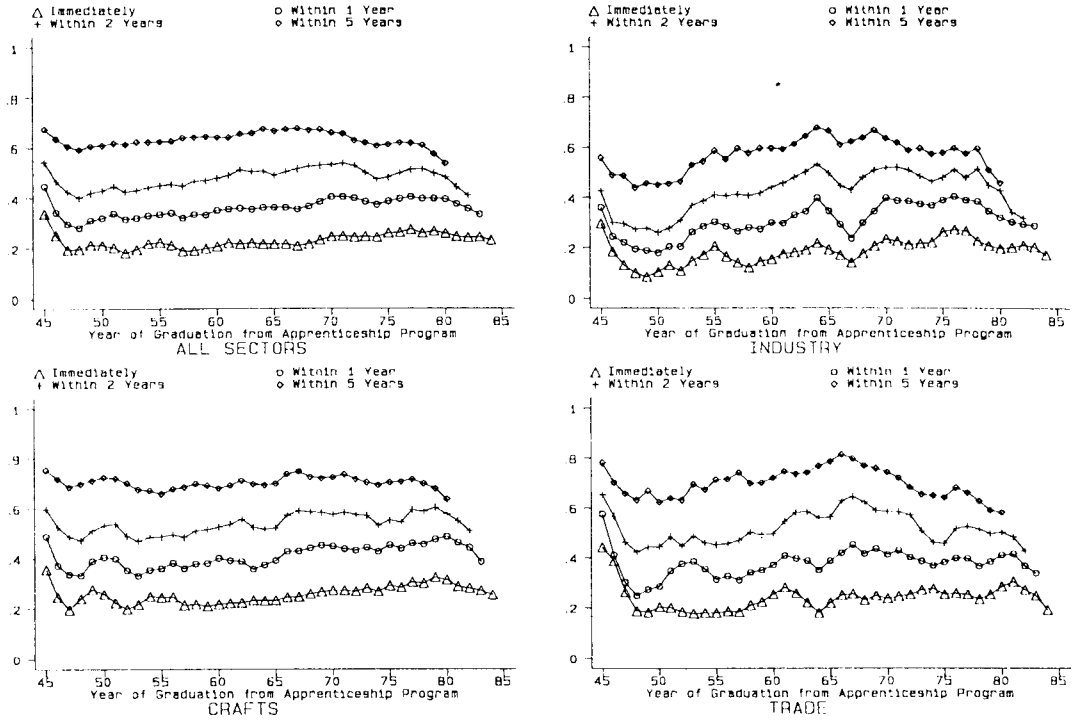

Figure 2

Age-Earnings Profiles 1979 for German and U.S. Comparison Groups

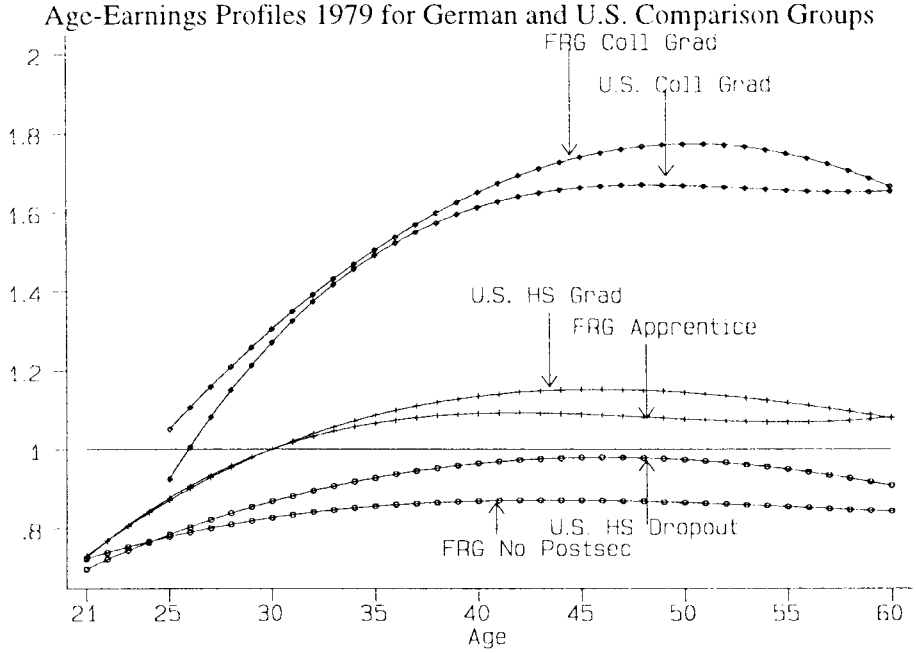

Figure 3

Age-Earnings-Profiles 1985 for U.S. and German Comparison Groups

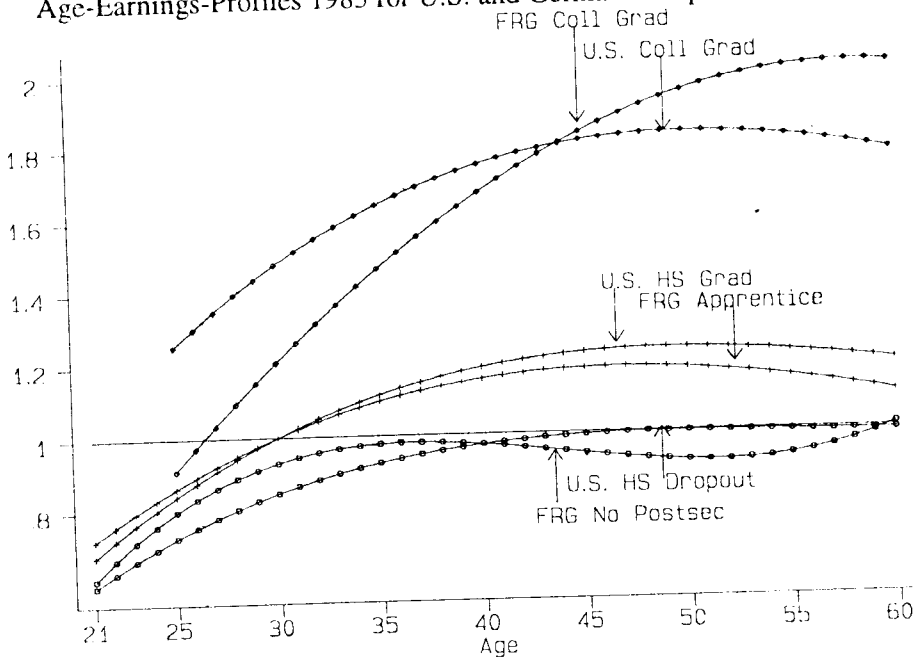

Figure 4

Job Tenure of Male U.S. Highschool Graduates and German Apprentics