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EARNINGS INEQUALITY IN GERMANY

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ABSTRACT

Recent studies have documented the growth of earnings inequality in the United States during the 1980s. In contrast to these studies' findings, our analysis of micro data for the former West Germany yields virtually no evidence of growth in earnings inequality over the same period. Between 1978 and 1988, a reduction in the dispersion of earnings among workers in the bottom half of the earnings distribution led to a narrowing of the overall dispersion of earnings in Germany. Earnings differentials across education and age groups remained roughly stable, and there was no general widening of earnings differentials within either education or age groups.

Germany wage setting institutions tend to limit earnings differentials across groups of workers, but differences in wage setting institutions cannot fully explain the differences between trends in earnings inequality in Germany and those in the United States. Both the high quality of the training received by non-college-bound German youth and the fact that the growth of the highly-educated work force did not decelerate in Germany as it did in the United States seem likely to have contributed to these differences.

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I. Introduction

A number of recent studies have documented the growth of earnings inequality in the United States during the 1980s (see, for example, Juhn, Murphy and Pierce 1989; Katz and Murphy 1992; Blackburn, Bloom and Freeman 1990; and Bound and Johnson 1992). The most salient characteristics of the growth in earnings inequality in the United States are 1) the increase in the relative earnings of more educated workers; 2) the pronounced increase in the earnings of older workers relative to younger workers among those without college degrees; and 3) the increase in earnings inequality within education and age groups. Some recent studies have shown an increase in earnings inequality along similar dimensions in other industrialized countries (Gottschalk and Joyce 1992, Katz and Loveman 1992, Davis 1992, Green, Coder and Ryscavage 1992).

In this paper, we examine trends in earnings inequality in the former West Germany. Although we do not present new evidence on earnings trends in the United States, we make frequent reference to findings from other researchers' analyses of U.S. data in an effort to understand the notable differences between the trends we document for Germany and those that have been documented for the United States.

Most research by German scholars on the structure of wages has focused on intersectoral and interregional wage differentials, though there has been some analysis of earnings differentials across industrial workers in different broad occupational groups. There is clear evidence that wage differentials along all of these dimensions narrowed between 1950 and the mid-1960s, but that wage differentials generally remained stable or even increased slightly between the mid-1960s and the late 1970s or early 1980s (Thiehoff 1987; Franke 1983; Vogler-Ludwig 1987). Analyses of the relative incomes of workers with different qualifications include Blossfeld

(1984) and Bellman and Buttler (1989). Both postulated that the expansion of higher education in Germany beginning in the early 1970s might have led to a fall in the relative earnings of highly educated workers. Their findings concerning trends in the relative incomes of labor market entrants with different qualifications are generally consistent with this hypothesis.

Our study is modeled on the analyses that have documented the growing inequality of earnings in the United States during the 1980s and sought explanations for that growth. In contrast to recent trends in the United States, and in contrast to the conclusions drawn from much sketchier data by Davis (1992) and Green, Coder and Ryscavage (1992), we find virtually no evidence of growth in earnings inequality in Germany in recent years.[1] Our analysis of two micro data sets shows that the overall dispersion of earnings in Germany instead has narrowed somewhat, primarily because earnings differentials among workers in the bottom half of the earnings distribution have narrowed. We find little evidence of widening earnings differentials across skill groups; rough stability in the relative earnings of more and less educated workers; no evidence of a general widening of differentials across age groups; and no consistent evidence of widening differentials within either education or age groups.

In trying to explain the widely divergent trends in earnings inequality in Germany and the United States, we consider the effects that various factors may have had. Institutional differences between the German and the U.S. wage-setting processes may have contributed to the quite different trends in earnings inequality in the two countries. We conclude, however, that German wage setting institutions, which we suspect do tend to limit earnings differentials across groups of workers, cannot on their own explain the different pattern of wage changes in Germany compared with the United States. Different trends in the supply of more highly educated workers in the two countries may help to explain why the returns to

education grew dramatically in the United States during the 1980s but narrowed in Germany over that period. In addition, institutional differences in the two countries' educational systems may have contributed to the different trends in wage inequality in Germany and the United States. German youth who do not attend college arguably receive better general training than their U.S. counterparts, so that shifts in relative demand and supply produce smaller changes in relative marginal products, and thus relative wages, in Germany than in the United States.

The remainder of the paper is organized as follows. Section II presents evidence on trends in earnings inequality in Germany in recent years. Section III examines the potential influences of wage setting institutions, demand and supply factors, and the structure of the educational system on trends in earnings inequality in Germany. Our findings and conclusions are summarized in Section IV.

II. Trends in Earnings Inequality in Germany

We draw from several different data sources in our analysis of trends in wage inequality in Germany. The first is an establishment survey that collects information for the industrial sector on the compensation of workers in each of seven occupational groups. We also make extensive use of micro data from social security earnings records and from the German Socioeconomic Panel, both of which are described in greater detail below.

The Compensation Survey in Industry and Trade (Verdiensterhebung in Industrie und Handel) is of interest primarily because it provides the longest available time series on the relative earnings of workers in different skill groups. The survey yields data for blue- and white-collar workers employed at establishments with 10 or more employees in manufacturing, mining, construction and utilities. Employers responding to the survey report earnings separately for men and women in

each of three blue-collar and four white-collar job categories. The job categories for which data are reported and their approximate shares of covered employment in 1986 are as follows: (BC1) unskilled blue-collar jobs, 12 percent; (BC2) semi-skilled blue-collar jobs, 24 percent; (BC3) skilled blue-collar jobs, 35 percent; (WC1) white-collar positions requiring no vocational training, 1 percent; (WC2) junior supervisory staff positions, 5 percent; (WC3) foremen's or supervisory positions, 14 percent; and (WC4) middle-management positions, 10 percent (Fels and Gundlach 1990). Data for top executives are not reported and respondents are asked to report earnings in each of the included occupational categories only for full-time workers who are not apprentices.[2] We use tabulations of mean earnings by sex and occupational group from this survey published by the Statistiches Bundesamt.[3]

Figures 1a and 1b show trends in the relative earnings of blue- and white-collar workers by skill group over the 1964 to 1988 period. Figure 1a displays trends in relative earnings for men; Figure 1b displays trends for women.[4] Particularly for men, the ratio of white-collar to blue-collar earnings appears somewhat cyclically sensitive, rising during recessions and falling during upturns. This reflects the cyclical sensitiviy of blue-collar workers' weekly hours. Since the late 1970s, again particularly among men, the earnings of white-collar workers have increased somewhat relative to the earnings of blue-collar workers. These changes in relative earnings are, however, not large; only the earnings of the most skilled male white collar workers were notably higher relative to the earnings of men in other groups in 1989 than they had been in 1975.

A major limitation of the Verdiensterhebung in Industrie und Handel is that only average earnings for workers in broadly-defined occupational groups are collected. In order to draw a more detailed picture of recent trends in the distribution of earnings across individual workers in

Germany, we use two micro data sets. The first contains social security data housed with the Federal Employment Service (Bundesanstalt für Arbeit). The social security data cover all workers included in the social security system; the major exclusions are government workers and the self-employed. These exclusions are of some significance because a large share of highly educated Germans work in the public sector. The share of all dependent employees covered by the social security system is close to 90 percent, but comparisons between data from the German Mikrozensus (a household survey) and data from social security records reported by Clement, Tessaring, and Weisshuhn (1980) indicate that only about one-third of employed university (Hochschule) graduates and two-thirds of employed technical college (Fachhochschule) graduates were in covered employment in 1978. Social security records include information on gross earnings subject to the social security tax, gender, educational qualifications, and birth date. They also contain information on whether an individual worked full time or part time and on the share of the year that the individual worked.

The Bundesanstalt für Arbeit generally does not allow outside researchers direct access to the social security data. We were given special tabulations based on a longitudinal sample used by researchers there. This longitudinal data set was constructed by sampling randomly from the population of men who paid social security taxes in any year from 1976 through 1984 and includes a record for each selected man for each year in which he held a covered job.[5] Our tabulations report the number of persons with annualized social security earnings in 1000 deutsche mark (DM) increments for full-time (though not necessarily full-year) male workers, by education and age.[6] The sample size in each year is about 55,000 persons. These tabulations allow us to approximate earnings by education and age at various percentiles of the earnings distribution.[7]

The major limitation of the Social Security data is that reported earnings are truncated at the social security taxation threshold. The earnings cutoff varies from year to year. Except in 1976 and 1977, fewer than 10 percent of sampled workers have censored earnings, but censoring is more of a problem for the most educated and the oldest subgroups in the data set. In most years, more than half of Hochschule graduates had earnings in excess of the social security maximum, so that we were unable to approximate median earnings for this group. For the same reason, we were unable to approximate the 1976 median earnings of Fachhochschule graduates. In addition, it was impossible to construct an estimate of earnings at the 90th percentile of the earnings distribution for Fachhochschule graduates, Hochschule graduates, persons aged 40-49, persons aged 50-59 or persons aged 60 and older in any year.

The second micro data set that we use is the German Socioeconomic Panel (GSOEP), which is similar to the Panel Study of Income Dynamics. A 95 percent sample drawn from the data set is available to non-German researchers. The panel was begun in 1984 and covers about 5,000 households. Six waves of data (through interview year 1989) are currently available, containing average monthly earnings data for the years 1983 through 1988. The sample used for this paper covers only households in the former West Germany. Foreigners are over-sampled relative to their share of the population. We therefore used sample weights when calculating basic summary statistics with these data. The GSOEP includes information on average gross monthly earnings, other pay such as 13th and 14th month pay and holiday allowances,[8] gender, nationality, birth year, type of secondary education, and university or occupational qualification. The earnings measure we report for the GSOEP is average monthly earnings plus 1/12th of any 13th month pay, 14th month pay, or holiday allowances received during the calendar year preceding the survey

interview.[9] All of our analysis has been replicated using pay in the month prior to the survey interview in place of the earnings measure just described. None of our results are sensitive to the earnings measure used. Unlike the social security earnings measure, the GSOEP earnings measures are not truncated at an upper threshhold.

Table 1 presents trends in the overall distribution of German earnings from the social security and the GSOEP data. The reported numbers based upon the social security data, which appear in the table's top panel, show the ratios of the 90th/10th, the 90th/50th and the 50th/10th percentile levels of earnings for full-time male workers over the 1976-83 period. As already indicated, we were unable to calculate the 90th percentile level of earnings for either 1976 or 1977. The numbers in the table's bottom two panels are based upon the GSOEP data and show the same ratios for male full-time, full-year workers and for all full-time, full-year workers over the 1983-88 period.

The most striking finding to emerge from this table is the absence of increased dispersion in the overall distribution of earnings over either the 1978-83 or the 1983-88 time period. In the social security data for the 1978-83 time period, the ratio of the earnings of those at the 90th percentile of the earnings distribution to the earnings of those at the 50th percentile rose slightly and the ratio of the earnings of those at the 50th percentile to the earnings of those at the 10th percentile fell slightly, leaving the 90-10 differential essentially unchanged. The GSOEP numbers suggest that the 90-50 differential was roughly constant between 1983 and 1988, but that the 50-10 differential fell by about 10 percentage points so that the differential between the 90th and the 10th percentiles of the earnings distribution also fell.

Our finding of narrowing differentials at the bottom of the earnings distribution is similar to that reported for France in Katz and Loveman

(1992) and is in striking contrast to trends in the United States in the 1980s. In the United States, the earnings of those at the bottom of the distribution fell both in absolute real terms and relative to the rest of the work force. In Germany the real earnings of all groups were rising and the least-well-paid workers were gaining on the rest of the work force.

In the United States the dramatic rise in earnings differentials across education groups is an important part of the overall growth in earnings inequality. Before looking at trends in earnings differentials by educational group in Germany, we provide a brief description of the basic structure of the German educational system. As shown in Figure 2, German youth enter school at age six and typically spend four years at a Grundschule or neighborhood primary school. At age ten, they must choose to attend one of three types of secondary school: a Hauptschule, which prepares students for apprenticeships in the trades, semi-skilled office work, retail sales or domestic services; a Realschule, which prepares students either for further secondary schooling or for apprenticeships in higher-level occupations; or a Gymnasium, which prepares students for university education.

The Hauptschule curriculum generally takes about five years to complete. About half of those graduating from a Hauptschule go on to an apprenticeship. The typical apprenticeship lasts for three years, with apprentices spending roughly a day a week at a Berufschule or part-time vocational school. Those who complete the six-year Realschule curriculum are qualified to go on to a full-time vocational secondary school, which in turn may qualify them for attendance at a Fachhochschule. Fachhochschulen offer curricula similar to those in applied fields at U.S. universities. The Realschule curriculum takes about five years to complete. In addition to those who attend a full-time vocational secondary school, roughly a third of Realschule graduates go on to an apprenticeship. Those

who successfully complete the nine-year course of study and subsequent examinations at a Gymnasium receive an Abitur, a certificate that qualifies them for enrollment at a Hochschule or university. It is possible to obtain a Hochschule degree in as little as five years, though the typical student takes longer. While most of those who receive the Abitur enroll in post-secondary education, a significant and growing minority choose instead to enter an apprenticeship.

In the Social Security data that we use to examine trends in relative earnings over the 1976 to 1983 period, workers are classified into five qualification groups. Because of data limitations, we use earnings information for only three of these groups in our by-education-level analysis: (1) persons with no occupational qualification, a group that includes Hauptschule and Realschule graduates who did not complete an apprenticeship or graduate from a full-time vocational secondary school; (2) persons with an occupational qualification, which might be either a completed apprenticeship or graduation from a full-time vocational secondary school; and (3) Fachhochschule graduates.[10] Our tabulations of GSOEP data for the 1983 to 1988 period make use of earnings information for three groups: (1) persons with no occupational qualification; (2) persons with an occupational qualification, most typically completion of an apprenticeship; and (3) persons who graduated from either a Fachhochschule or a Hochschule.[11]

Table 2 presents trends in German earnings by education from the social security and GSOEP data. The ratios presented in this table were calculated using the median earnings for each education group. As already noted, we were unable to calculate the median earnings for Hochschule graduates for most years covered by the social security data and also were unable to compute 1976 median earnings for Fachhochschule graduates. Those with Hochschule and Fachhochschule degrees are grouped together in

the tabulations based upon the GSOEP data.

Table 2 shows no widening of earnings differentials across education groups since the mid-1970s. Instead, the data suggest that there has been either rough stability or a slight narrowing of the differentials between more and less educated workers over this period. The social security data in the top panel of the table indicate that, over the 1977 to 1983 period, the relative earnings of those with a Fachhochschule degree rose relative both to those with no qualification and to those with an occupational qualification, but the GSOEP data in the second and third panel indicate that this trend was reversed during the 1983 to 1988 period. The social security data suggest that there was a slight decline in the earnings of those with an occupational qualification relative to those with no qualification between 1976 and 1983 and the GSOEP data indicate that the relative earnings of workers in these two groups held roughly steady between 1983 and 1988.

Another prominent feature of the growth in earnings inequality in the United States has been the widening of experience- and age-related earnings differentials. The German figures reported in Table 3 show no comparable widening of differences in earnings across age groups. Although the social security data reveal some increase in the earnings of workers aged 40 and over relative to workers aged 20 to 29 over the 1976 to 1983 period, the GSOEP data suggest that this increase was largely reversed during the mid-1980s. The earnings of persons aged 30 to 39 rose at the same pace as the earnings of those aged 20 to 29 between 1976 and 1983, but the earnings advantage of 30 to 39 year olds was eroded between 1983 and 1988. Both the social security data and the GSOEP data show workers aged 15 to 19 gaining on those aged 20 to 29. If any general conclusion can be drawn from the evidence on median earnings by age group, it is that age-related earnings differentials in Germany have been

relatively stable or have narrowed since the mid-1970s.

While widening education and age differentials are important features of the growth in overall inequality observed in the United States, the dispersion of earnings within educational and age groups also has widened there. Perhaps not surprisingly, given the patterns of change in the distribution of German earnings that we have already documented, there does not appear to have been a comparable widening of within-group dispersion in earnings in Germany. Table 4a reports annual values of the 90-10 differential for selected educational groups; table 4b reports the same statistic for selected age groups. For the most part, these differentials appear to have remained roughly constant over the 1976-83 period and to have fallen during the 1983-88 period. With the possible exception of Hochschule and Fachhochschule graduates, for whom within-group dispersion statistics could not be computed for years prior to 1983, there is no group for which the within-group dispersion of earnings appears to have been greater in 1988 than it had been in 1976.

One question that might be raised about the figures presented thus far is whether the patterns they reveal are an artifact of changes in the composition of particular education or age groups. One way to address this question would be to prepare similar tabulations for groups defined using information on a larger number of characteristics (for example, both education and age). Our ability to do this is limited. We have, however, used the GSOEP to fit a set of standard earnings regressions, one for each year, that allow us to examine how the returns to various individual characteristics have changed over time. The results of this analysis are reported in Table 5. In these regressions, the dependent variable is the log of average monthly earnings (including 1/12th of 13th month, 14th month, and holiday pay). The models include two sets of education and training dummies, one intended to capture an individual's occupational preparation

and the second to capture his or her secondary school background. The first set of education and training measures includes dummy variables for Hochschule and Fachhochschule graduates, for those with an occupational qualification, and for those with some other educational qualification; the omitted category includes those with no occupational qualification. The second set includes dummies for completion of the Abitur, graduation from a vocational secondary school, graduation from a Realschule, graduation from a Hauptschule, and completion of some other secondary curriculum (mostly foreigners); the omitted category includes persons with no completed secondary education. The model also includes age and age squared, along with a dummy variable for females, interactions between the female dummy and the age terms, and a dummy variable for foreigners.

While the coefficient on the dummy variable for Hochschule or Fachhochschule degree remains fairly constant over time, the coefficient on the dummy variable for those with a vocational qualification drops by almost 50 percent between 1983 and 1988. The implied decline in the return to having a vocational qualification is not apparent in the tabulations reported in Table 2, but is consistent with the narrowing of earnings differentials in the bottom half of the earnings distribution between 1983 and 1988 shown in Table 1.[12] The Table 5 results also imply, consistent with the findings reported in Table 3, that age-related earnings differences declined over this period.

III. Alternative Explanations

One possible explanation for why earnings differentials have not grown in Germany as they have in the United States is that the solidaristic wage policies pursued by German trade unions constrain the behavior of relative wages. A second hypothesis is that the very different evolution of relative earnings in the two countries reflects differences in demand and

supply conditions. Finally, the relative stability of earnings differentials in Germany might reflect the stronger general training received by German youth who do not attend college, which arguably makes workers with different levels of education and experience closer substitutes in Germany than in the United States. We consider these explanations in turn.

Wage Setting Institutions

Differences in German and U.S. wage-setting institutions offer an appealing potential explanation for the divergent trends in earnings inequality in the two countries.[13] German unions generally have pursued what has been termed a solidaristic wage policy. At times, they have sought to narrow the gap between highly paid and less highly paid workers. More typically, they have sought uniform percentage increases in wages for all workers. In a period when market forces would dictate growing differentials in wage rates by skill level, these policies seem likely to limit any increase in the dispersion of wages that would otherwise occur.

Because of the importance of the collective bargaining system in Germany, union wage policies are likely to have a substantial impact on the overall structure of German wages. Most German workers are covered by collective agreements. In contrast to the highly decentralized process by which U.S. workers' wages are determined, German wages are determined by fairly centralized collective bargaining between unions and employers' associations. Between 35 and 40 percent of German workers are union members. Unlike the situation in the United States, union representation in Germany has not fallen over the last two decades.[14] Moreover, roughly 90 percent of workers are employed by firms that belong to an employers' association. Collective agreements most typically cover workers in a particular industry and Land (state).[15]

Nonunion members employed in a company that belongs to an employers' association also are likely to benefit from collective bargaining.

Although the terms of a collective bargaining agreement between a union and an employers' association are binding only with respect to the wages and working conditions offered to union members employed by members of the employers' association, employers almost universally choose to treat union members and non-members alike.

Even workers in companies that do not belong to an employers' association may be covered by a collective agreement. If a contract covers at least half of the work force in a particular sector and region and if the Minister of Labor and Social Affairs determines that there is a compelling public interest that the contract be generally binding, the contract may be extended to cover employers who are not members of the employers' association. Although only about 4 percent of all pay agreements are extended,[16] virtually all employers choose to comply with the terms of the contract in their industry and region. This may reflect, in part, the threat of a formal contract extension.

Unlike collective bargaining agreements in the United States, German agreements set only a floor on wages and working conditions. Any employer is free to pay more than is specified in the contract and many choose to do so. Unfortunately, it is extremely difficult to measure the size of the gap between actual wages and contractual wages. Published statistics on actual and contractual wages are not comparable either conceptually or with respect to the skill groupings employed.[17] One recent employer survey that asked directly about this gap concluded that only about 15 percent of employers paid exactly the negotiated rate, while on average actual pay exceeded negotiated pay by 14 percent (Brandes, Meyer and Schudlich 1991).

The fact that many employers choose to pay in excess of the negotiated rate does not imply, of course, that the terms of the collective agreement have no effect on what these employers pay. At least some

employers deliberately choose to pay in excess of the negotiated rate as part of a "high wage" policy; increases in the negotiated rate of pay are likely to lead these employers to raise their pay rates as well, even though they are not bound to do so. Anecdotal evidence also suggests that payments in excess of the negotiated wage are much more common for highly skilled workers than for workers at the bottom of the skill ladder.

In light of the importance of collective bargaining coupled with the solidaristic wage policy of unions, we would expect that any pressures toward greater wage inequality would be muted in Germany. Our finding that wage inequality in Germany did not grow during the 1980s is thus consistent with what an examination of German wage setting institutions would have led one to expect. The finding that differences in earnings at the bottom of the wage distribution declined during this period, while differences in earnings at the top of the distribution were more stable, is also consistent with the structure of German wage setting institutions, insofar as contractual wage floors are more likely to have been binding for the less-skilled groups whose relative market wages we might have expected to have fallen.

Demand and Supply

Many researchers have suggested that shifts in the industrial composition of employment have contributed to the growth in earnings differentials across education groups in the United States. In particular, it is argued that the decline of manufacturing has resulted in the loss of many of high-paying jobs for low-skilled workers. Table 6 shows the distribution of employment by broad sector in 1969, 1979 and 1989 for Germany and the United States. Although the manufacturing sector is relatively more important in Germany than in the United States, the two countries have experienced comparable declines in the manufacturing sector's share of employment. Similarly, both countries have experienced large relative

increases in service sector employment, particularly employment in government; finance, insurance, and real estate; and business services.

To more formally assess the effects of changes in the industrial mix of employment on the demand for workers by education level, we constructed an index of demand using a shift-share analysis like that in Freeman (1975). Construction of this sort of index requires information both on the educational composition of employment by sector for some base period and on changes in the sectoral composition of employment over time. We used data from a special tabulation of the 1985 Mikrozensus on the share of workers in each of three educational categories--those who had graduated from a Hochschule or Fachhochschule, those with an occupational qualification and those in a residual category including both persons with no occupational qualification and persons not reporting their educational attainment--for each of 53 sectors of the economy. These proportions were then applied as weights to total annual employment in each of the 53 sectors over the 1960-87 period to construct a derived demand for each category of worker for each year. Specifically, demand for workers with education i in year t is calculated as

$$\sum_{j=1}^{53} w_{ij} E_{jt}$$

where j indexes the industry and w_{ij} is the proportion of workers in industry j with education i in the base year.[18]

The numbers reported in Table 7 represent the rate of growth in demand by education level attributable to changes in the sectoral composition of employment over the 1960-1987 period and various subperiods. In all periods, there has been much more rapid growth in demand stemming from industrial changes for Hochschule or

Fachhochschule graduates than for workers with an occupational qualification; demand for workers with no occupational qualification has actually fallen. The differences in the rate of demand growth for the most educated and the least educated workers appears to have fallen somewhat from the 1970s to the 1980s. Though these numbers should be taken as fairly rough approximations, a slowing of the relative growth in demand for more educated workers might help to explain why earnings differentials widened slightly along certain dimensions between 1976 and 1983, then narrowed between 1983 and 1988.

The demand index numbers in Table 7, of course, capture only shifts in demand stemming from shifts in the industrial composition of employment. Econometric work by some researchers suggests that the introduction of new technology biased toward more highly educated workers is an important factor underlying the widening earnings differentials in the United States (Bound and Johnson 1992, Katz and Murphy 1992). It is difficult to get hard evidence at an aggregate level on the labor market effects of new technology. There is no reason to believe, however, that either the rate of introduction of new technology or the nature of its bias has been significantly different in the German economy than in the U.S. economy.

Trends in relative wages by skill group are also likely to be affected by trends in the relative supply of workers of different types. There have been important changes in the German educational system over the past twenty years, with an increasing number of students attending the higher secondary school tracks and an increasing number going on to university. In the early 1950s, more than 70 percent of 14 year old students were enrolled in what would today be termed a Hauptschule; by the early 1980s, only about a half of secondary shool students attended a Hauptschule, with roughly a quarter attending a Realschule and a quarter

attending a Gymnasium. In addition, changes were introduced that made it easier for students in the Realschule track or even the Hauptschule track to switch to a Gymnasium or otherwise earn an Abitur (Hamilton 1990). Hochschule enrollments also grew dramatically during the 1970s and early 1980s, reflecting both an increase in the share of young persons choosing to enroll and the growth in the size of the youth population (Hamilton 1990; Teichler and Sanyal 1982). These changes have translated with some lag into increases in the level of educational attainment of the working age population.

Tables 8 and 9 present information on the supply of working age Germans by education level over the 1976-1989 period. Data on educational attainment for the entire population, the employed, the unemployed, and those not in the labor force are collected for selected years in the annual German Microzensus, a household survey, and published by the Statistisches Bundesamt.[19] Although Tables 8 and 9 report only figures for the population as a whole, the same basic trends are apparent in figures based on employment and the labor force.

Table 8 shows trends in the percent of the German population age 20-60 and age 25-30 that followed each of the most important secondary educational tracks. Because schooling tends to last longer in Germany than in the United States, and German university or college students often do not graduate until they are aged 25 years or older, we selected 25-30 year olds to represent new entrants to the labor force.[20] Both for the population as a whole and for the new entrants, the percent who have attended Hauptschule, the lowest secondary school track, has fallen dramatically between 1976 and 1989 from 74.2 percent to 58.5 percent of the German population age 20-60 and from 68.4 percent to 44.1 percent for the population age 25-30. At the same time the proportion of the population completing both Realschule, the technical vocational high school, and the

Abitur, the entrance exams required for university attendance, has risen dramatically. The growth in the proportion of the population with an Abitur reflects both the growing share of German youth in the Gymnasium track and institutional changes in the German educational system made in the 1970s that make this qualification more accessible to students in other tracks. From 1976 to 1989 the proportion of the working age population as well as the population age 25-30 with an Abitur roughly doubled.

Table 9 shows trends in the population classified by their highest occupational qualification. The omitted category in this table includes those with no occupational qualification as well as those who did not respond to the question, though the percentage of nonrespondents is relatively small.[21] The percentage of the population in almost all of the occupational educational categories has grown. Particularly notable is the expansion of the percentage receiving vocational training (typically an apprenticeship).

Overall trends in the supply of workers by education level have been similar in Germany and the United States, in the sense that in both countries the supply of more educated workers has risen dramatically relative to the supply of workers without any occupational qualification (in Germany) or with twelve or fewer years of schooling (in the United States). Katz and Murphy (1992), however, have argued that the deceleration in the growth of the highly educated labor supply in the United States in the 1980s may explain the rise in returns to education in the 1980s. If, as Katz and Murphy hypothesize, the relative demand for more highly educated workers has shifted out steadily over time, this deceleration in the growth of the highly educated labor supply may explain why returns to education fell during the 1970s in the United States but grew during the 1980s.

Tables 8 and 9 also present rates of growth of the German population by educational attainment over the 1976-1989 period, and over the 1976-82 and 1982-1989 subperiods. Looking first at the trends in

secondary education reported in Table 8, one can see that the growth in the relative supply of workers graduating from the higher tracks has accelerated over time, in contrast to the situation in the United States. Because the type of secondary school a person attends is imperfectly related to the occupational qualification ultimately obtained, figures on occupational qualifications arguably are more relevant. These figures, which are reported in Table 9, tell a somewhat different story. There was an acceleration in the growth of the relative supply of persons with certain vocational qualifications, but a deceleration in the growth of persons with others. The last column in Table 9 shows the percent of the population with any vocational qualification. For the working age population overall there has been no change in the rate of growth of the relative supply of workers with some vocational qualification.

Clearly, differences in the trends in educational earnings differentials in Germany and the United States may be consistent with a simple demand and supply story, if the magnitudes of the shifts in the relative demand and supply of more highly educated workers in the two countries differ in the appropriate fashion. One hypothesis concerning the different trends in educational differentials in the two countries during the 1980s is that relatively more rapid growth in the supply of more educated workers in Germany, together with slower or comparable growth in the demand for more highly educated individuals, has resulted in some narrowing of earnings differentials there, while slower supply growth and comparable or more rapid demand growth in the United States has resulted in a widening of earnings differentials. Although this hypothesis seems generally consistent with the available evidence, we cannot conclusively identify differences in the magnitude of the relevant demand and supply shifts.

It is more difficult to tell a similar story concerning the contrasting

trends in by-age-group differentials in Germany and the United States. Given that the share of young workers was falling in the United States during the 1980s, it seems reasonable to interpret the increases in age-related earnings differentials there as the consequence of growing demand for more experienced workers. The German baby boom lagged that in the United States by almost a decade. Table 10 reports the share of the German population by age group for the years 1970 through 1989. The share of the German population aged 20-29 rose steadily during this whole period, with most of the growth observed in the mid- to late-1980s. A similar pattern is observed in data for the labor force. One would think that this growth in the relative supply of young workers should have reinforced the effects of any relative demand shifts favoring more experienced workers, leading to large increases in age-related earnings differentials during the 1980s. Instead, as was documented earlier, age-related earnings differentials appear if anything to have narrowed during this period.

Education and Training of Non-college-bound Youth

A final possible explanation for the stability of relative wages in Germany lies with that country's unique system of apprenticeship training, which is widely credited with providing German industry with a highly skilled and flexible work force. Companies recruit apprentices at age 16 or 17 and train them for two to three years. About two-thirds of all teenagers participate in the system (Münch 1991, p. 41). Apprenticeships are offered in all sectors of the economy, in white-collar as well as blue-collar jobs.

Apprenticeship training in Germany often is referred to as the dual system because apprentices receive both on-the-job and classroom training. The system is jointly managed by the employers' associations, the unions and the government. Apprentices must pass written and oral examinations. To maintain uniform standards, the curriculum for a particular

apprenticeship is set at the federal level and examinations are conducted by local industry chambers. The dual system emphasizes general training that is intended to provide the foundation for a career in an occupation. Observers of the system also have stressed that it socializes teenagers to a working environment, teaching them the importance of punctuality and reliability.

The cost of apprenticeship training is shared by companies and by the state and federal governments. Large companies often supplement apprenticeship training in state-supported vocational schools with their own classroom training. State governments typically help support the cost of in-class training provided by companies. Smaller companies often send apprentices to training centers that are jointly funded by local chambers of commerce and the Federal Ministry of Education and Science. The relatively high degree of coordination between employers and the goverment associated with the apprenticeship system makes it possible to adjust the mix of apprenticeships offered as the relative demand for different types of workers changes.

There is a consensus among German trade unions and employers that the apprenticeship system is important for maintaining German industry's competitiveness in world markets. Germany is highly dependent upon exports; during the early 1980s, about a third of output in the manufacturing sector was exported. Because its work force is highly paid, Germany relies on "quality rather than price-competitive products, and...[thus needs] a highly skilled and reliable work force as well as a cooperative relationship between management and labour on the shop floor" (Streeck, 1987, p. 5).

Some observers also have argued that, because apprenticeship programs are designed to provide a work force that possesses a broad set of skills, they provide an important degree of labor flexibility to employers,

facilitating the redeployment of workers within the company to accommodate changes in demand. By the same token, the broad general training received by the majority of German workers should facilitate the substitutability of different groups of workers. Because workers lacking a college degree nonetheless have received extensive general training, they may be more readily substitutable for college graduates in the production process than is true of U.S. workers who lack a college education. In addition, because new entrants to the labor market typically have received intensive on-the-job training during their first two to three years of work, they may be better substitutes for more experienced workers than is true of new entrants to the U.S. labor market. The German apprenticeship system thus might well have the effect of muting the effects of shifts in relative demand on relative wages across both education and age groups.

Distinguishing Among the Competing Explanations

Unfortunately, it is difficult to draw a firm conclusion concerning the relative importance of each of the influences just described. Data on relative unemployment rates by education and age group should be of some value for this purpose. If German wage-setting insitutions have compressed wage differentials and limited their responsiveness to changes in the relative demand for workers of different types, one would expect to observe an increase in the relative unemployment rates of less-educated and younger workers. In contrast, if relative wages have been fairly stable in Germany either because demand and supply for workers of different types have moved in tandem or because workers of different types are readily substituted for one another, we would not expect the relative unemployment rates of less-educated or younger workers to have risen disproportionately during the 1980s.[22]

Table 11 presents evidence on whether less skilled workers have experienced a disproportionate increase in their unemployment rates. The

table shows the evolution of unemployment rates for workers in five educational categories over the period from 1976 to 1989, constructed from the Mikrozensus data on employment and unemployment by level of educational attainment described earlier in the paper. The period covered by these data was generally one of rising unemployment. While unemployment rates for all groups rose, those for the least well qualified rose substantially more in absolute terms and typically somewhat more in relative terms as well. Between 1976 and 1987, for example, the unemployment rate for Hauptschule graduates rose by 5.6 percentage points (a 250 percent increase), while that for persons with an Abitur rose by only 3.0 percentage points (a 207 percent increase). Over the same period, the unemployment rate of persons in the no qualification/no response group grew by 7.6 points (a 249 percent increase), while that for all persons with an occupational or educational credential rose by 3.6 percentage points (a 233 percent increase).

The data in Table 11 are consistent with the hypothesis that the German wage setting process prevented the relative wages of the least skilled workers from falling to the level that would have been dictated by market forces, thereby increasing the gap between their unemployment rates and those of more highly skilled workers. Examination of trends in relative unemployment rates in the United States, however, casts some doubt upon this interpretation of the German data. Relative wages in the United States generally are considered to be highly responsive to changes in market conditions, yet a very similar increase in the relative unemployment rates of less-educated workers has been observed there as well. Overall, unemployment in the United States was roughly comparable in 1977 and 1987 (5.8 percent versus 5.7 percent). Over this period, the unemployment rate for persons with less than a high school education rose from 9.0 percent to 11.1 percent, while that for persons with some college fell from

5.0 percent to 4.5 percent and that for college graduates fell from 2.8 percent to 2.3 percent.[23] The similarity of movements in relative unemployment rates in Germany and the United States, leads us to believe that the stability of the German wage structure reflects a better matching of demand and supply and/or the more ready substitution of different types of workers in the production process in addition to any constraints imposed by the German wage setting process.

A similar comment can be made concerning the trends in relative unemployment rates by age group reported in Table 12. While young German workers have experienced substantial increases in unemployment, older German workers have experienced larger relative -- and in some cases larger absolute -- unemployment increases. This pattern is difficult to reconcile with the view that unresponsive wage setting institutions are the principle reason for the absence of growing differentials in earnings across age groups in Germany.

IV. Conclusion

Since the mid-1970s earnings inequality has fallen in Germany. Evidence from German social security data and the German Socioeconomic Panel data show that earnings differentials overall have narrowed, particularly in the bottom half of the distribution. While skill differentials have risen slightly, differentials across education groups have remained relatively constant and differentials in earnings by age group generally have remained stable or narrowed.

These trends in Germany stand in striking contrast to trends in earnings inequality in the United States. One potential explanation for the different trends in the two countries rests on differences in the wage setting institutions in the two countries. German wage setting is far more centralized than that in the United States. Moreover, German unions have

fought for a narrowing of wage differentials or at least for uniform percentage wage increases for all workers. Thus, even during periods when there were market pressures to widen wage differentials, one might still observe stable or even narrowing earnings differentials in Germany. The growing relative unemployment rate of workers with no occupational qualification is consistent with this interpretation, but the fact that similar increases in the relative unemployment rates of less-educated workers have been observed in the United States weakens the force of this evidence. There is in addition no strong indication that the unemployment rates of younger German workers have risen especially rapidly.

A second potential explanation for the different German and U.S. trends in earnings inequality is that demand and supply conditions in the two countries have differed. In both countries, the demand for more educated workers has been increasing over time, but so too has the supply of more educated workers. In Germany, however, the increase in the relative supply of more educated workers accelerated or at least remained stable during the 1980s, while the growth in the relative supply of more educated workers in the United States slowed considerably. Assuming that the relative demand for more educated workers has not grown more rapidly in Germany, these differences in the relative supply of more educated workers may help to explain the widely divergent trends in earnings inequality in Germany and the United States. The timing of the German baby boom, however, makes it more difficult to tell a demand and supply story about the behavior of age-related earnings differentials in Germany during the 1980s.

A final, and related, explanation for the stability of the German earnings distribution is that the German education and training system simply does a better job of supplying workers with an appropriate mix of skills. This might be true both because employers have more direct

influence over the kind of training received by new entrants to the labor market and because apprenticeship training gives German workers a good general foundation that makes it easier for them to learn new tasks so that workers with different backgrounds are more easily substitutable for one another.

On the whole, the development of wage inequality in Germany seems easiest to reconcile with the view that German education and training institutions do a better job of preventing mismatch between skills demanded and skills supplied than does the U.S. education and training system, though we should stress that the evidence on this point is far from conclusive.

1. The numbers reported for Germany by both Davis (1992) and Green, Coder and Ryscavage (1992) come from the Luxembourg Income Study (LIS) and refer only to 1981 and 1984. Different surveys underlie the 1981 and 1984 LIS numbers. In addition, it turns out to be misleading to extrapolate from changes in the distribution of income observed over the 1981-84 period.

2. Data from another survey, the 1978 Wage and Salary Structure Survey (Gehalts- und Lohnstrukturerhebung 1978) indicates that the excluded top management category accounts for only about one percent of industrial employment. Part-timers account for about five percent of industrial employment.

3. The individual establishment reports from this survey are not available for use by researchers. Data on blue-collar workers come from Statistiches Bundesamt, Fachserie 16: Löhne und Gehälter, Reihe 2.1: Arbeiterverdienste in der Industrie and data on white-collar workers from Fachserie 16: Löhne und Gehälter, Reihe 2.2: Angestelltenverdienste in Industrie und Handel.

4. To calculate the reported white-collar/blue-collar ratios, the weekly earnings of blue-collar workers were multiplied by 4.3 to make them comparable to the monthly white-collar earnings.

5. The method used to construct the longitudinal data file is such that the sample of records for each year should be representative of all men in covered employment in that year. Because of an unspecified problem with the 1984 earnings data, we were not sent tabulations for that year.

6. Annualized earnings were created by dividing a person's total social security earnings during a year by his days of employment in that year, calculated as the last date of employment minus the first date of employment during the year, then multiplying the resulting daily earnings figure by 365.

7. We approximated the median by interpolation as:

$$E1 + \frac{(0.50 - P1)}{(P2 - P1)} (E2 - E1)$$

where E1 is the level of earnings at the lower boundary of the cell containing the median, E2 is the level of earnings at the upper boundary of the cell containing the median, P1 is the share of persons with earnings in cells below the cell containing the median, and P2 is the share of persons with earnings either in the cell containing the median or in a lower cell. Similar calculations were made to identify the 90th percentile and the 10th percentile of earnings.

8. It is common practice for German employers to give their employees a lump sum payment in the amount of one to two months' pay at the end of the calendar year. This pay is termed 13th month or 14th month pay, as appropriate. The amount of such pay is commonly specified in the applicable collective bargaining agreement.

9. Persons with implausibly low earnings (less than 500 DM per month) or implausibly high earnings (anyone in the upper tail of the earnings distribution whose average monthly earnings were grossly out of line with the average monthly earnings reported by the same individual in other years) were excluded from the sample. In all years, these exclusions reduced the size of our sample by less than one percent.

10. The remaining two groups were Hochschule graduates and persons holding an Abitur but having no other qualification. The earnings of Hochschule graduates frequently exceeded the social security maximum and thus were truncated; the number of people holding an Abitur but possessing no other qualification is small.

11. The survey questionnaire contains more detailed questions concerning respondents' educational and training background, but sample sizes for more disaggregated groups were too small to support meaningful analyses. Persons with an Abitur but no other qualification were assigned to a fourth category that does not appear in our by-education-level tabulations.

12. The coefficient on the "other occupational training" dummy variable also drops dramatically, though it is hard to interpret this finding. The sample in this category is small, and the drop may be due to a change in the composition of workers in it.

13. The following discussion of German wage setting institutions draws heavily on both Brandes, Meyer and Schudlich (1991) and Paque (undated), both of which provide further details. The interpretation of the likely consequences of these institutions that we offer is ours, not theirs.

14. See Freeman (1989).

15. Contracts in some industries are national in scope while others cover geographic areas smaller than a Land. In addition, there are many single-employer bargaining units, though most are small and these units together account for only about six percent of covered workers.

16. See Lindena and Hoehmann (1989).

17. The most important conceptual difference between the two sorts of numbers is that the actual pay statistics include payments for overtime as well as other special payments, whereas the contractual pay statistics refer only to the hourly rate for a set of jobs.

18. Data on the proportion of workers by education level by industry came from Statistiches Bundesamt "Bruttolöhne und -gehälter 1975 bis 1985" Wirtschaft und Statistik November 1986, p. 868. Data on employment by industry came from Statistiches Bundesamt, Fachserie 18: Volkswirtschaftliche Gesamtrechnungen, Reihe S9: Ergebnisse für Wirtschaftsbereiche. We would have liked to have had information on the proportion of industry employment by education for a year closer to the mid-point of our period, but were unable to locate this information for any year other than 1985.

19. Statistiches Bundesamt, Fachserie 1: Bevölkerung und Erwerbstätigkeit, Reihe 4.4.2: Beruf, Ausbildung und Arbeitsbedingungen der Erwerbstatigen. Data on a consistent basis are not available prior to 1976.

20. Even among 25-30 year olds, a significant share of those who have chosen to attend Fachhochschulen or Hochschulen have not yet completed their degrees. In 1980, for example, 10.2 percent of 25-30 year olds had completed one of these degrees; by 1985, the percentage of the same cohort, now aged 30-35, that had completed one of the two degrees had risen to 14.2 percent. None of our qualitative conclusions concerning trends in educational attainment is, however, affected by the decision to treat 25-30 year olds, rather than 30-35 year olds, as the new entrant group.

21. According to numbers presented in Clement, Tessaring, and Weisshuhn (1980), nonrespondents represented about 20 percent of the residual category in 1976.

22. Soltwedel et al. (1990) are among those advancing the argument that relative wage rigidities have contributed to excessive unemployment in Germany, though others, such as Franz (1987), have argued that the structure of relative wages is unlikely to be responsible for the growth in unemployment in Germany during the 1980s.

23. U.S. Department of Labor, Bureau of Labor Statistics, Handbook of Labor Statistics, 1989, pp. 284-285.

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Table 1

Trends in the Distribution of Earnings in Germany

Earnings Ratios for Male Full-Time Workers[a]

	90th/10th percentile	90th/50th percentile	50th/10th percentile
1976	--	--	1.49
1977	--	--	1.52
1978	2.24	1.48	1.51
1979	2.19	1.46	1.50
1980	2.18	1.46	1.49
1981	2.18	1.46	1.50
1982	2.19	1.50	1.46
1983	2.23	1.52	1.47

Earnings Ratios for Male Full-Time, Full-Year Workers[b]

	90th/10th percentile	90th/50th percentile	50th/10th percentile
1983	2.62	1.72	1.52
1984	2.61	1.72	1.52
1985	2.51	1.73	1.45
1986	2.52	1.73	1.46
1987	2.49	1.76	1.42
1988	2.41	1.70	1.42

Earnings Ratios for All Full-Time, Full-Year Workers[b]

	90th/10th percentile	90th/50th percentile	50th/10th percentile
1983	2.80	1.72	1.63
1984	3.00	1.73	1.73
1985	2.72	1.73	1.58
1986	2.68	1.73	1.55
1987	2.67	1.76	1.52
1988	2.60	1.71	1.52

[a] Authors' calculations using Social Security earnings data. The underlying numbers are annualized earnings for all men who worked full-time for any part of the year. In both 1976 and 1977, the 90th percentile of the distribution of annualized earnings distribution fell above the maximum earnings subject to social security tax and thus was not observed in these data.

[b] Authors' calculations using German Socioeconomic Panel data. The underlying numbers are average monthly earnings for either the male or the total population of full-time, full-year workers.

Table 2

Trends in Earnings by Education in Germany

Earnings Ratios for Male Full-Time Workers[a]

	Fachhochschule/ No Qualification	Occupational Qualification/ No Qualification	Fachhochschule/ Occupational Qualification
1976	--	1.18	--
1977	1.67	1.18	1.42
1978	1.70	1.17	1.45
1979	1.66	1.17	1.42
1980	1.68	1.17	1.44
1981	1.68	1.17	1.44
1982	1.70	1.15	1.48
1983	1.73	1.15	1.50

Earnings Ratios for Male Full-Time, Full-Year Workers[b]

	Fachhochschule/ No Qualification	Occupational Qualification/ No Qualification	Hochschule or Fachhochschule/ Occupational Qualification
1983	2.00	1.20	1.67
1984	2.00	1.22	1.64
1985	1.94	1.17	1.65
1986	1.97	1.19	1.65
1987	2.00	1.20	1.66
1988	1.94	1.18	1.64

Earnings Ratios for All Full-Time, Full-Year Workers[b]

	Hochschule or Fachhochschule/ No Qualification	Occupational Qualification/ No Qualification	Hochschule or Fachhochschule/ Occupational Qualification
1983	2.09	1.26	1.66
1984	2.08	1.29	1.61
1985	2.03	1.24	1.64
1986	2.09	1.26	1.66
1987	1.99	1.26	1.58
1988	2.00	1.25	1.60

[a] Ratios of median earnings for each of the two indicated education groups, based upon authors' calculations using Social Security earnings data. The underlying numbers are annualized earnings for all men who worked full-time for any part of the year. In 1976, the median of the distribution of annualized earnings for Fachhochschule graduates exceeded the maximum earnings subject to social security tax and thus was not observed in these data.

[b] Ratios of median earnings for each of the two indicated education groups, based upon authors' calculations using German Socioeconomic Panel data. The underlying numbers are average monthly earnings for either the male or the total population of full-time, full-year workers.

Table 3

Trends in Earnings by Age Group in Germany

Earnings Ratios for Male Full-Time Workers[a]

	15-19 / 20-29	30-39 / 20-29	40-49 / 20-29	50-59 / 20-29	60+ / 20-29
1976	0.61	1.24	1.22	1.20	1.09
1977	0.60	1.23	1.21	1.19	1.08
1978	0.64	1.26	1.24	1.20	1.10
1979	0.62	1.24	1.23	1.19	1.13
1980	0.63	1.25	1.25	1.20	1.13
1981	0.63	1.25	1.26	1.20	1.16
1982	0.64	1.25	1.27	1.21	1.21
1983	0.65	1.25	1.29	1.23	1.19

Earnings Ratios for Male Full-Time, Full-Year Workers[b]

	15-19 / 20-29	30-39 / 20-29	40-49 / 20-29	50-59 / 20-29	60+ / 20-29
1983	0.36	1.35	1.45	1.34	1.35
1984	0.29	1.31	1.42	1.31	1.30
1985	0.27	1.31	1.39	1.28	1.37
1986	0.24	1.30	1.36	1.29	1.36
1987	0.58	1.29	1.43	1.27	1.30
1988	0.46	1.27	1.42	1.27	1.29

Earnings Ratios for All Full-Time, Full-Year Workers[b]

	15-19 / 20-29	30-39 / 20-29	40-49 / 20-29	50-59 / 20-29	60+ / 20-29
1983	0.39	1.36	1.43	1.39	1.36
1984	0.32	1.37	1.42	1.38	1.38
1985	0.29	1.33	1.39	1.33	1.47
1986	0.53	1.36	1.43	1.36	1.45
1987	0.48	1.31	1.43	1.29	1.36
1988	0.49	1.29	1.45	1.30	1.32

[a] Ratios of median earnings for each of the two indicated age groups, based upon authors' calculations using Social Security earnings data. The underlying numbers are annualized earnings for all men who worked full-time for any part of the year.

[b] Ratios of median earnings for each of the two indicated age groups, based upon authors' calculations using German Socioeconomic Panel data. The underlying numbers are average monthly earnings for either the male or the total population of full-time, full-year workers.

Table 4a

Trends in the Distribution of Earnings for Selected Education Groups in Germany

Ratios of the 90th to the 10th Percentile of Earnings for Male Full-Time Workers[a]

	No Qualification	Occupational Qualification	Fachhochschule
1976	2.05	1.98	--
1977	2.07	2.00	--
1978	2.06	2.04	--
1979	2.06	2.03	--
1980	2.02	1.99	--
1981	2.00	2.02	--
1982	1.94	2.03	--
1983	1.95	2.04	--

Ratios of the 90th to the 10th Percentile of Earnings for Male Full-Time, Full-Year Workers[b]

	No Qualification	Occupational Qualification	Hochschule or Fachhochschule
1983	2.15	2.24	2.03
1984	3.67	2.20	2.13
1985	2.04	2.15	2.44
1986	2.19	2.16	2.08
1987	2.10	2.10	2.26
1988	2.00	2.03	2.17

Ratios of the 90th to the 10th Percentile of Earnings for All Full-Time, Full-Year Workers[b]

	No Qualification	Occupational Qualification	Hochschule or Fachhochschule
1983	2.42	2.43	2.29
1984	3.45	2.39	2.17
1985	2.39	2.34	2.30
1986	2.30	2.29	2.10
1987	2.14	2.24	2.24
1988	2.09	2.13	2.24

[a] The reported ratios are based upon authors' calculations using Social Security earnings data. The underlying numbers are annualized earnings for all men who worked full-time for any part of the year. Ratios are not reported for cases in which earnings at the 90th percentile of the earnings distribution exceeded the maximum earnings subject to social security tax and thus was not observed in these data.

[b] The reported ratios are based upon authors' calculations using German Socioeconomic Panel data. The underlying numbers are average monthly earnings for either the male or the total population of full-time, full-year workers.

Table 4b

Trends in the Distribution of Earnings for Selected Age Groups in Germany

Ratios of the 90th to the 10th Percentile of Earnings for Male Full-Time Workers[a]

	Aged 20-29	Aged 30-39	Aged 40-49
1976	1.91	--	--
1977	1.91	--	--
1978	1.94	1.97	--
1979	1.95	1.96	--
1980	1.90	1.91	--
1981	1.95	1.90	--
1982	1.96	1.94	--
1983	1.97	1.98	--

Ratios of the 90th to the 10th Percentile of Earnings for Male Full-Time, Full-Year Workers[b]

	Aged 20-29	Aged 30-39	Aged 40-49
1983	2.26	2.21	2.31
1984	2.17	2.20	2.36
1985	1.89	2.14	2.51
1986	1.88	2.20	2.41
1987	1.92	2.12	2.33
1988	1.79	2.16	2.18

Ratios of the 90th to the 10th Percentile of Earnings for All Full-Time, Full-Year Workers[b]

	Aged 20-29	Aged 30-39	Aged 40-49
1983	2.29	2.33	2.61
1984	2.42	2.39	2.62
1985	2.15	2.26	2.67
1986	2.01	2.29	2.60
1987	2.00	2.25	2.44
1988	1.96	2.24	2.31

[a] The reported ratios are based upon authors' calculations using Social Security earnings data. The underlying numbers are annualized earnings for all men who worked full-time for any part of the year. Ratios are not reported for cases in which earnings at the 90th percentile of the earnings distribution exceeded the maximum earnings subject to social security tax and thus was not observed in these data.

[b] The reported ratios are based upon authors' calculations using German Socioeconomic Panel data. The underlying numbers are average monthly earnings for either the male or the total population of full-time, full-year workers.

Table 5

Trends in the Returns to Education and Age in Germany[a]

Dependent Variable = log (avg. monthly earnings)

	1983	1984	1985	1986	1987	1988
HOCHSCHULE/FACHHOCHSCHULE DEGREE (Yes = 1)	0.287	0.330	0.309	0.298	0.295	0.301
	(0.027)	(0.028)	(0.027)	(0.026)	(0.027)	(0.026)
VOCATIONAL QUALIFICATION (Yes = 1)	0.117	0.152	0.109	0.081	0.091	0.073
	(0.012)	(0.013)	(0.013)	(0.013)	(0.012)	(0.012)
OTHER OCCUPATIONAL TRAINING (Yes = 1)	0.179	0.140	0.112	0.011	0.041	0.004
	(0.040)	(0.044)	(0.045)	(0.043)	(0.043)	(0.042)
GYMNASIUM/ABITUR (Yes = 1)	0.265	0.248	0.252	0.276	0.292	0.287
	(0.031)	(0.033)	(0.030)	(0.030)	(0.030)	(0.028)
VOCATIONAL SECONDARY SCHOOL (Yes = 1)	0.247	0.203	0.220	0.278	0.265	0.235
	(0.036)	(0.036)	(0.034)	(0.034)	(0.033)	(0.032)
REALSCHULE (Yes =1)	0.108	0.096	0.132	0.165	0.161	0.140
	(0.020)	(0.022)	(0.021)	(0.021)	(0.021)	(0.020)
HAUPTSCHULE (Yes = 1)	-0.017	-0.038	-0.006	0.022	0.010	0.010
	(0.016)	(0.019)	(0.018)	(0.018)	(0.017)	(0.017)
OTHER SECONDARY EDUCATION (Yes = 1)	0.014	0.007	0.116	0.109	0.132	0.125
	(0.065)	(0.074)	(0.065)	(0.062)	(0.066)	(0.065)
AGE	0.076	0.072	0.059	0.054	0.054	0.044
	(0.003)	(0.004)	(0.004)	(0.004)	(0.004)	(0.004)
AGE SQUARED[b]	-0.082	-0.076	-0.062	-0.056	-0.057	-0.045
	(0.004)	(0.005)	(0.005)	(0.005)	(0.048)	(0.005)
FEMALE	0.075	-0.028	-0.128	-0.064	-0.372	-0.374
	(0.120)	(0.131)	(0.129)	(0.129)	(0.129)	(0.127)
FEMALE * AGE	-0.015	-0.010	-0.004	-0.009	0.006	0.008
	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)	(0.007)
FEMALE * AGE SQUARED[b]	0.013	0.007	0.000	0.009	-0.009	-.013
	(0.008)	(0.009)	(0.009)	(0.000)	(0.009)	(0.009)
FOREIGN	-0.090	-0.081	-0.085	-0.087	-0.076	-0.092
	(0.012)	(0.014)	(0.013)	(0.013)	(0.013)	(0.012)
Intercept	6.315	6.364	6.691	6.837	6.882	7.111
	(0.069)	(0.079)	(0.076)	(0.076)	(0.077)	(0.076)

[a] Standard errors are in parentheses.
[b] Coefficients and standard errors are multiplied by 100.

Table 6

Distribution of Employment by Industry[1]
(in Percent)

Germany

	1969	1979	1989
Agriculture	1.4	1.1	0.9
Mining	1.6	1.5	0.8
Manufacturing	44.6	37.8	34.0
Utilities	0.9	1.1	1.0
Construction	8.8	7.8	6.6
Trade, Restaurants and Hotels	12.9	13.6	14.7
Transport, Storage and Communication	6.5	6.5	6.2
FIRE, Business Services	4.2	5.7	7.4
Community, Social and Personal Services	19.0	25.0	28.2

United States

	1969	1979	1989
Agriculture	4.7	3.6	2.9
Mining	0.7	0.9	0.6
Manufacturing	27.3	22.7	18.5
Utilities	1.2	1.1	1.1
Construction	6.2	6.5	6.5
Trade, Restaurants and Hotels	19.8	21.5	22.1
Transport, Storage and Communication	6.0	5.7	5.4
FIRE, Business Services	6.5	8.2	11.3
Community, Social and Personal Services	27.5	29.7	31.6

[1] OECD, Labour Force Statistics, 1969-1989, Paris 1991.

Table 7

Indices of Demand Growth by Education
Due to Changes in the Industrial Mix of Employment[a]

	Hochschule & Fachhochschule Graduates	Occupational Qualification	No Occupational Qualification
1960-1987	1.43	0.18	-0.30
1960-1970	1.65	0.23	-0.40
1970-1980	1.55	0.22	-0.28
1980-1987	0.97	0.05	-0.20
1970-1987	1.31	0.15	-0.25

[a] The numbers reported are annual rates of growth in the demand for workers of the specified types attributable to changes in employment by industry using a shift-share analysis. Details are given in the text.

Table 8

Percent of the German Working Age Population
by General Education Track Completed[a]

	Hauptschule	Realschule	Gymnasium/ Abitur
		Ages 20 - 60	
1976	74.2	15.4	9.7
1977	73.0	15.6	10.2
1980	71.9	15.5	12.1
1982	69.2	17.3	12.8
1985	64.1	19.1	15.6
1987	62.0	20.2	16.6
1989	58.5	21.7	18.7
Relative Changes[b]			
1976-1989	-1.8	2.6	5.0
1976-1982	-1.2	1.9	4.6
1982-1989	-2.3	3.2	5.4
		Ages 25 - 30	
1976	68.4	17.4	13.5
1978	66.0	17.8	14.8
1980	62.8	18.2	18.6
1982	57.5	21.0	20.9
1985	50.9	23.6	24.5
1987	48.3	25.9	24.9
1989	44.1	27.9	27.1
Relative Changes[b]			
1976-1989	-3.4	3.6	5.4
1976-1982	-2.9	3.1	7.3
1982-1989	-3.8	4.1	3.7

[a] Authors' calculations based on German Microzensus data.
[b] Calculated as the log difference in the percentages (multiplied by 100) divided by the number of years in the period. This number equals the rate of growth in the population with a particular educational attainment less the rate of growth in the population.

Table 9

Percent of the German Working Age Population
by Vocational or University Training[a]

	Vocational Training (a)	Technical School Degree (b)	Fachhochschule Degree (c)	Hochschule Degree (d)	Sum (a-d)
			Ages 20 - 60		
1976	49.7	5.3	1.9	4.1	61.0
1978	50.7	5.3	2.1	4.4	62.5
1980	--	5.9	2.5	4.8	--
1982	52.8	5.6	2.4	5.0	65.8
1985	53.3	6.2	2.9	5.4	67.8
1987	54.5	6.0	3.1	5.6	69.2
1989	56.3	6.5	3.2	6.2	72.2
Relative Changes[b]					
1976-1989	1.0	1.6	4.0	3.2	1.3
1976-1982	1.0	0.9	3.9	3.3	1.3
1982-1989	0.9	2.1	4.1	3.1	1.3
			Ages 25 - 30		
1976	55.8	4.8	2.5	5.7	68.8
1978	56.5	5.0	2.6	6.2	70.3
1980	--	5.8	3.2	7.0	--
1982	58.3	4.9	3.3	6.9	73.4
1985	58.8	5.6	3.7	6.1	74.2
1987	60.3	5.2	3.7	5.4	74.6
1989	61.6	5.7	3.5	5.4	76.2
Relative Changes[b]					
1976-1989	0.8	1.3	2.6	-0.4	0.8
1976-1982	0.7	0.3	4.6	3.2	1.1
1982-1989	0.8	2.2	0.8	-3.5	0.5

[a] Authors' calculations based on German Microzensus data.
[b] Calculated as the log difference in the percentages (multiplied by 100) divided by the number of years in the period. This number equals the rate of growth in the population with a particular educational attainment less the rate of growth in the population.

Table 10

Percent of the German Working Age Population by Age Group*

	<20	20-29	30-39	40-49	50-65
1970	10.5	19.8	22.9	20.4	26.4
1972	10.6	19.8	23.8	20.0	25.8
1974	11.1	19.7	24.0	19.7	25.5
1976	11.9	20.3	22.5	20.3	25.0
1978	12.5	20.5	21.4	20.9	24.6
1980	13.0	20.6	20.1	21.8	24.5
1982	12.9	20.8	18.8	22.3	25.1
1984	12.0	21.7	18.3	22.0	25.8
1986	11.0	23.4	19.6	20.0	26.7
1988	9.4	23.9	19.9	19.6	27.2
1989	8.6	24.0	20.3	19.5	27.5

* Authors' calculations based on German Mikrozensus data.

Table 11

Unemployment Rates by Educational Group[a]

Year	Hauptschule	Realschule	Gymnasium/ Abitur
1976	3.7	2.7	2.8
1977	3.6	2.4	2.6
1980	2.9	1.9	2.2
1982	5.9	3.8	4.6
1985	9.0	6.1	6.9
1987	9.3	5.5	5.8
1989	8.3	5.1	5.7

Year	No Qual/ No Answer[b]	Vocational Training	Technical School Degree	Fachhochschule Degree	Hochschule Degree
1976	5.1	2.9	1.9	2.8	1.7
1977	5.3	2.8	1.4	2.1	1.4
1980	8.2	2.1	1.4	1.5	1.6
1982	8.5	4.5	2.3	3.0	3.0
1985	13.1	6.9	3.3	4.4	4.9
1987	12.7	7.0	3.6	4.2	4.3
1989	11.6	6.2	3.6	4.0	4.8

[a] All unemployment rates were calculated using information on employment and unemployment by level of educational attainment based on the German Mikrozensus and published by the Statistisches Bundesamt.

[b] The "no qualification" category includes persons who did not answer the Mikrozensus question concerning their level of educational attainment.

Table 12

Unemployment Rates by Age Group

	15-20	20-29	30-39	40-49	50-59	60+
1970	2.0	0.6	0.4	0.4	0.5	0.5
1972	1.0	0.8	0.6	0.6	0.8	1.1
1974	2.3	1.8	1.2	1.1	1.3	0.9
1976	7.1	4.7	2.9	2.6	2.9	2.0
1978	6.4	4.5	3.0	2.5	2.9	1.8
1980	4.9	3.6	2.4	1.9	2.5	2.5
1982	9.1	7.6	5.0	3.8	4.5	3.9
1984	14.1	10.0	7.4	5.5	6.0	2.7
1986	10.4	9.3	7.9	6.1	7.5	4.6
1988	9.3	8.6	7.7	6.1	8.6	6.0
1989	8.1	7.4	7.3	5.8	8.3	6.0

Figure 1

Relative Earnings Trends

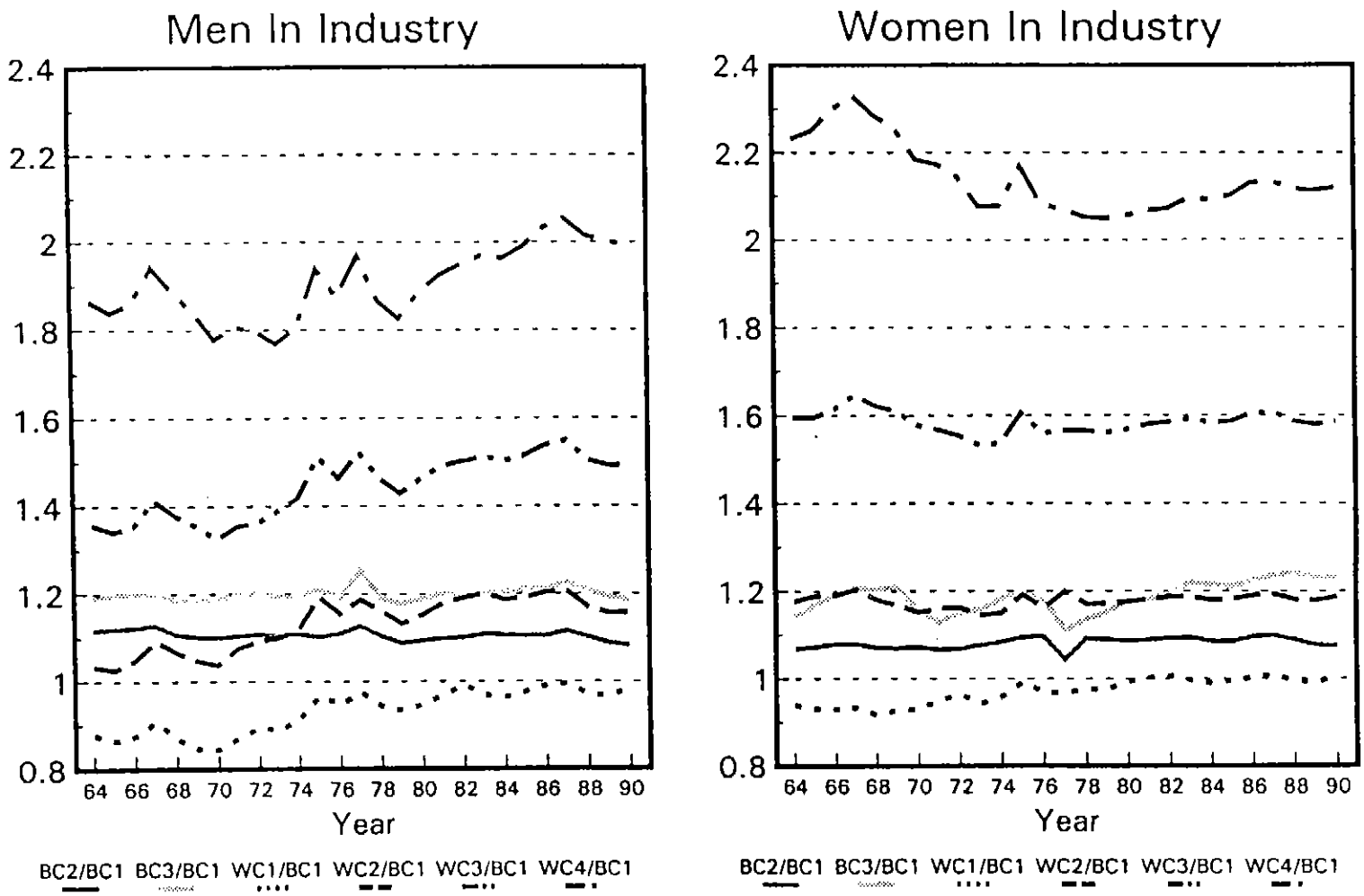
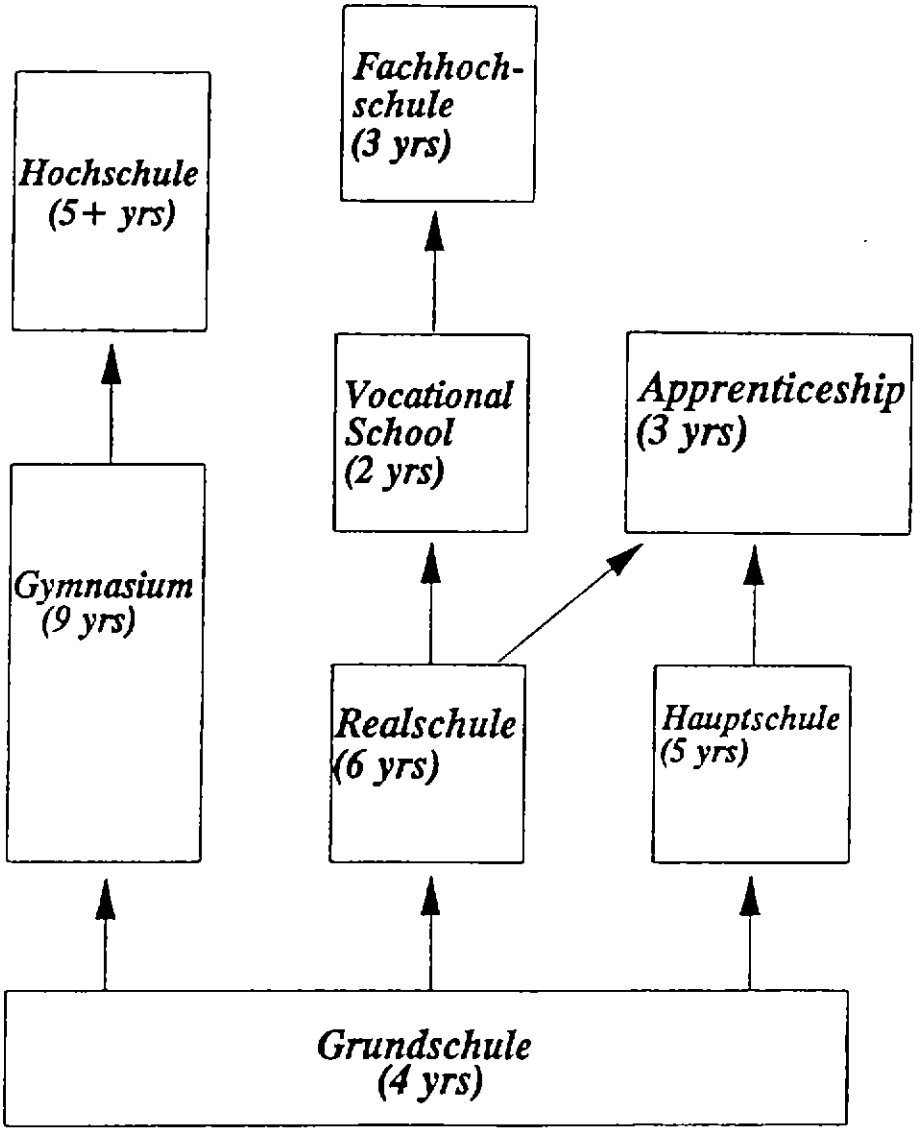


Figure 2: The German Educational System [a]



[a] *Adapted from Teichler and Sanyal (1982).*