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ABSTRACT

Germany's more compressed wage structure is taken by many analysts as the main cause of the German-US difference in job creation. We find that the US has a more dispersed level of skills than Germany but even adjusted for skills, Germany has a more compressed wage distribution than the US. The fact that jobless Germans have nearly the same skills as employed Germans and look more like average Americans than like low skilled Americans runs counter to the wage compression hypothesis. It suggests that the pay and employment experience of low skilled Americans is a poor counterfactual for assessing how reductions in pay might affect jobless Germans.

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Skill Compression, Wage Differentials and Employment: Germany vs the US

The most popular explanation for the smaller creation of jobs in Germany than in the US in the 1980s and 1990s is the "wage compression" hypothesis that institutionalized wage setting compressed the wage structure in Germany relative to the market determined wage structure in the US. Higher pay in the bottom rungs of the earnings distribution in Germany (and other EU countries), the argument goes, cut off low skill jobs, particularly in the service sector. The implication is that only by reducing pay and increasing inequality can Germany and the EU achieve US levels of employment and unemployment (Siebert 1997).

There is empirical plausibility to this argument. As table 1 shows, the distribution of earnings is much narrower in Germany than in the US and much of the difference between US and German employment per adult is found in the service sector. In addition, during the period when the employment-population rate fell in Germany relative to the US and when the German unemployment rate rose relative to the US unemployment rate, the dispersion of pay rose in the US but held steady in Germany. Thus the wage compression story seems to fit both the cross-section and time series evidence.

But there is another potential explanation for the difference between the US and German wage structures which runs counter to the wage dispersion explanation of joblessness. This is that the distribution of skills is itself more compressed in Germany than in the US (Nickell 1997, Nickell/ Bell 1996, Nickell 1998). If less skilled workers are more skilled in Germany than in the US while German and American skilled workers are similarly skilled, some of the narrow dispersion of wages in Germany would represent a compression of skills. Measured in "efficiency units", the German wage distribution would be *more* dispersed than nominal wages indicate, cutting the ground under the wage compression argument.

So, how different are the German and the US skill distributions overall and among types of workers? To what extent do skill differences explain the lower dispersion of wages and return to education in Germany than in the US? Are low-skilled workers better paid in Germany than in the US because they are more skilled or because Germany relies on institutions to set wages?

These are difficult questions to answer, in large part because we lack good measures of labor skill across countries. The most commonly used measure, years of schooling, is not directly comparable between the US and Germany because the two countries have very different educational systems. German education involves apprenticeships, which differ greatly from formal schooling in the US, so that it is necessary to develop some mapping between apprenticeships and formal schooling to make valid comparisons. The content or quality of German education and American education also differs. Even ideal measures of comparable education, moreover, may not fully capture the workplace competencies that underlie individual productivity and wages.

In this study we deal with these problems by developing equivalence classes between US and German schooling and by using scores on the quantitative part of an adult literacy test to contrast workplace competencies. We combine information on employment, wages, and schooling from the Comparable German American Sectoral (CGAS) Database with data on literacy skills, income, and schooling from the OECD's Adult Literacy Survey (IALS) for the two countries.

The CGAS is a two-country comparative study of employment and wages of workers in comparable industry and occupation cells for the period 1970 to 1995. It takes data from the US Census of Population, the Current Population Survey, and the German Mikrozensus and social security files (Beschaeftigtenstatistik) to develop employment and wages for workers in comparable detailed demographic, education, occupation, and industry cells. The CGAS lacks observations on individuals, but it has information on workers in enough cells (theoretically up to 1.2 million cells per year, though some cells are empty and others have too few observations to be useful) to provide substantial cross-section and time series variation in relevant variables (for more details see Freeman/Schettkat 1998).

The International Adult Literacy Survey is a multi-country study that measures the ability of adults to understand and use printed information through reading, writing, and numeracy, in their workplace and daily life. It is the first major international study focused on the workplace-related literacy skills that workers have. It includes data on employment, unemployment, income, and other socio-economic variables. Germany and the US were two of the countries in the initial seven-country study.

We find that:

1. Measured in equivalent skill units or in literacy scores, Germany has a more skilled work force than the US, with a more compressed distribution of skill. This contrasts with the picture found in nominal years of schooling, which show that Germany has fewer years of education and a more dispersed distribution of those years.

2. The principal difference in skills between American and German workers is in the bottom rungs of the skill or education distribution, where Americans have much lower literacy skills than Germans. While about half of this difference is due to low skilled-immigrants to the US, many native-born Americans still have very low skills.

3. The widespread belief that American schools do not work well notwithstanding, each year of schooling in the US adds more in literacy skills than a year of schooling in Germany. But the US trails Germany by so much in skills at the lowest levels that it does not attain equality in skills until the 15^{th} year of education.

4. The narrower dispersion of skills in Germany than in the US explains only a modest proportion of the lower dispersion of wages in Germany, leaving a considerable role for institutional factors in compressing the German wage distribution.

5. Jobless Germans have comparable skills to employed Germans and to Americans in the middle of the US skill distribution, while jobless Americans have lower skills than employed Americans.

In short, comparisons of the dispersion of wages and relative wages based on measured wages exaggerate US-German differences in the distribution of earnings in "efficiency units". But even skill adjusted, Germany has a more compressed wage distribution than the US. What casts most doubt on the wage compression hypothesis is the fact that jobless Germans have about the same skills as employed Germans and look more like average Americans than like low skilled Americans. In the skill dimension, German joblessness has little of the structure that one would expect if it were due to a distorted wage structure.

Skill Distributions Measured by Equivalence Groups

The most readily available measure of skills across countries is years of schooling attained. If all school systems operated more or less similarly, years of schooling would be a reasonable indicator of the skills obtained from the formal educational system. The United Nation's International Standard Classification of Education (ISCED) would measure accurately skill attainment across countries.

But schooling systems differ greatly across countries in such things as: the length of the school year and school day, amount of homework, class size, quality of teachers, and curriculum. As a result a year of schooling in one country does not produce the same human capital as a year of schooling in another. Differences in the skills young persons obtain from their home and social environment also produce differences in workplace competencies. Young persons with nominally the same schooling score differently on standardized international tests of attainment.

Because Germany relies on apprenticeships to teach young persons work relevant skills, it fits poorly into standard international classifications. Apprenticeships combine part-time schooling and part-time on-the-job training. If one compares Germans and Americans with the same number of years of full-time schooling, the Germans will have superior skills because their apprenticeships give them additional schooling. Thus, our first task for comparing US and German distributions of skills is to develop an equivalency between Germany's skill creation through apprenticeships and years of schooling and American skill creation through formal schooling.

Figure 1 shows the equivalence scale that we have established. Most analysts will probably agree with our setting Americans with master's degrees or more and Germans with university degrees as equivalent; and setting US bachelor's graduates and Germans with Fachhochschule Arbitur + Fachhochschule as equivalent. By these scales, Germans have a higher proportion of workers in the highest skill category while Americans have a higher proportion in the second highest group. Taking these two groups together, the US has relatively more highly skilled workers than Germany.

In the least skilled groups we have put Germans with no certificate and Americans who have not graduated high school. The difficult question is how to treat Germans with some completed form of apprenticeship and Americans with high school degrees or with some post-secondary education but no bachelor's degree. Apprenticeship gives Germans more skills than American high school graduates with no additional training. We categorize those with Hauptschule and Apprenticeship as comparable to US high school graduates; those with Realschule + Apprenticeship; Abitur as having 13 years of schooling; those with Hauptschule + Meister as having 14 years; and those with Realschule + Meister as having 15 years of schooling.

The resultant distribution of workers by level of skill differs greatly between the two countries. The vast bulk of Germans are in the second skill category while Americans are more widely dispersed across groups, with 45 percent falling into the lowest skill category. Overall, Germans are somewhat more skilled, due to the large fraction of Americans in the lowest category, and have a more compressed distribution of skills, due to the concentration of Germans in the second skill category.[1]

If our equivalency scales are roughly correct, Americans with just a high school degree should have literacy scores roughly equal to those of Germans with less than upper secondary education, whereas Germans with less than upper secondary education should have scores roughly equal to the mean score for the US. This turns out to be the case (Freeman and Schettkat, 1999). Fifty percent of Germans who have not completed upper secondary education scored in the upper levels of the document scale (t levels 3 and 4/5, by the OECD classification) compared to only 17.1% Americans who did not graduate from high school (OECD 1997, Literacy Skills 156). Thus, placing Germans with less than upper secondary education on a par with American high school graduates, and Germans with more education on a par with Americans with some post-high school education fits the distribution of literacy scores. Although we did not create the equivalence scales to equate literacy scores, the quantitative literacy scores in figure 1 show that three of our four groups have similar scores for Americans and Germans, though the lowest skilled Americans have lower scores than the lowest skilled Germans.

How much of the narrower distribution of earnings in Germany than in the US might be attributable to differences in the distribution of skills?

To answer this question, we performed a two-part analysis. First we regressed ln wages on dummy variables for our measures of skill from figure 1

$$(1)\quad \ln W = a + b_2 D_2 + b_3 D_3 + b_4 D_4 + \sigma v$$

[1] The comparison of levels of schooling depends on the units we attach to the four categories. Using US years as a guide, we give 11 years to the first group 14 years to the 2nd category, 16 to the 3rd category and 19 years to the 4th category. Then we get 13.4 for the US and 14.1 for Germany. The comparison of the distributions is more transparent. The squared deviation of the difference between the proportion of persons in each category and the 0.25 that would be in a category in a uniform distribution for the US is 0.08 compared to a comparable statistic of 0.26 for Germany.

where the lowest skill group is the deleted group and where Di reflects the ith skill group and bi is its estimated effect on earnings relative to the deleted group. Then we used the resultant regression coefficients to examine the impact of the difference between the US and German distributions among the groups on the standard deviation of ln earnings of workers in the two countries.

Line 1 of table 2 shows the "raw" standard deviation of ln wages in Germany and the US across cells in the CGAS: one measure of the phenomenon to explain.[2] By this metric, the dispersion in the US is 0.13 ln points higher than in Germany. Line 2 records standard deviations of residual earnings from the simple regression of ln wages on dummy variables for skill groups. The standard deviation in the US falls by 0.07 ln points while that in Germany falls by 0.05 points, reducing the difference in standard deviations by just 0.02 ln points or 15% of the initial difference.

But the standard deviation in residual earnings differ not only because the distribution of skills differs between the two countries but also because returns to skill differ, potentially for reasons independent of the actual skills. Taking the variance of equation (1) we get:

$$(2)\ \sigma^2 \ln W = b_2{}^2 \sigma^2 D_2 + b_3{}^2 \sigma^2 D_3 + b_4{}^2 \sigma^2 D_4 + 2b_2b_3 \sigma^2 D_2D_3 + 2b_2b_4 \sigma^2 D_2D_4 + 2b_3b_4 \sigma^2 D_3D_4 + \sigma^2{}_v$$

Line 3 of table 2 records the b coefficients on our three skill equivalence groups from the ln earnings equation. Being in the 2nd skill category rather than the first (omitted) group has a larger impact on earnings in Germany than in the US, implying a **greater** skill differential in Germany than in the US among workers in these groups. The differential between the 3rd and 2nd skill groups and between the 4th and 3rd skill groups is, on the other hand, larger in the US. The biggest difference in the structure of earnings occurs at the upper end of the skill distribution, where Germans earn a smaller premium than Americans.[3]

Line 4 of table 2 computes the dispersion in earnings that each country would have if it had its own returns to skill, reflected in the b coefficients, but the distribution of skills of the other country, and its own residual variance of earnings. That is, we replace the σ^2 Ds in equation (2) with the σ^2 Ds from the other country. Since so many Germans are in the 2nd skill category, giving the US the German distribution of skills reduces the dispersion of earnings in the US, while giving Germany the US distribution of skills raises the dispersion of earnings in Germany. The standard deviation of ln wages in the US would be 0.02 points lower if the US had the German skill distribution while the standard deviation of wages in Germany would be 0.05 points higher if

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[2] These figures are based on cells that vary by years of schooling, age groups, industry, occupation, and gender, immigration status. Since they give all persons within a cell the same wage, they understate the standard deviation in ln wages in both countries.

3 The original source for wages in the CGAS is the Beschäftigtenstatistik, which is censored at the high wage end because of the ceiling for social security contributions (see Möller for a discussion). Therefore, we underestimate wage dispersion in Germany. Whether this leads to overestimation of German-US difference in wage dispersion is not clear because fringe benefits (not measured as wages) are more important among high-income Americans.

Germany had the US distribution of skills. Thus, from 10**%** to 17% of the US-German difference in the standard deviations of earnings across cells can be attributed to differences in the distribution of skills.[4]

That taking account of skills in this fashion eliminates only a modest proportion of the difference in the dispersion of pay between the US and Germany can be demonstrated in another way. Line 5 of table 2 gives the standard deviation of ln wages within skill categories for the countries. There is surprisingly little difference in the standard deviations for the lowest skill group, but the US has 0.12 ln units higher standard deviation of pay in the key 2nd skill group and even higher standard deviations of ln pay in the next two categories. Again, the greatest difference in the dispersion of pay between the US and Germany occurs in the upper part of the skill distribution, not in the lower part.

schooling tells a different story

What if we use reported years of schooling rather than our skill equivalence groups in the analysis, treating years of schooling as comparable between the countries?

In this case, the quantity measures of skill would contravene the skill compression story. Figure 2 shows that the distribution of years of schooling for Americans is higher on average and more concentrated about the mean than the distribution of years of schooling for Germans.

But if the actual skill of workers with the same years of schooling in the two countries differs, comparing the distribution of years does not properly test the skill compression claim. Indeed, the skill compression hypothesis would predict that with such a metric, wages by skill group would differ between the countries. Skill compression would show up in lower returns to schooling in Germany than in the US, reducing the overall dispersion of pay by an amount roughly comparable to the amount that of reduction in dispersion that we obtained in table 1.

In part, the CGAS data bear out this prediction. We regressed ln wages on years of schooling across CGAS cells in 1995 and then decomposed the variances of ln wages into the parts due to: the variance in educational attainment; the square of the coefficient on schooling in an ln earnings equation; and the variance of the residual in earnings from the equation:

$$(3)\quad \sigma^2 \ln W = b^2 \sigma^2 S + \sigma^2_v$$

The standard deviation of the residuals from these regressions, $\sigma^2 v$ measure the dispersion of wages within a country for workers conditional on the value of a year of schooling, b, and the dispersion of years of schooling, $\sigma^2 S$. Differences in overall dispersion of wages between the US and Germany can be attributed to differences in the three components.

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[4] This is without taking account of how the different distribution of skills might affect the return to skills.

Line 1 of table 3 shows again the "raw" standard deviation of ln wages in Germany and the US across cells in the CGAS. Line 2 records standard deviations of residual earnings from the simple regression of ln wages on years of schooling. The standard deviation in the US falls by .08 ln points while that in Germany falls by .05 points. As a result the dispersion in schooling and in its returns explains 18 percent of the greater standard deviation in ln wages in the US than in Germany.

Lines 3 to 5 show that it is the higher returns to schooling in the US that explains the reduction in the difference of standard deviations of ln wages. Line 3 records coefficients on years of schooling in the earnings equation: it is 0.11 across cells in the US compared to 0.07 across cells in Germany. By contrast, line 4 documents that the standard deviation in years of schooling is lower in the US than in Germany, which by itself would make dispersion of wages less in the US. Line 5 shows that the standard deviation of ln wages in the US would fall by .04 points to 0.42 if schooling had the same return in the US as in Germany. Conversely, the standard deviation of ln wages would rise by 0.05 points in Germany if it combined the US return to schooling, the German dispersion of schooling, and the German residual variance. Using the other countries distribution of schooling but the own returns to education only change the standard deviation of ln wages by 1% (line 6). While these results are roughly consistent with the skill compression hypothesis **if** we interpret the lower coefficient on years of schooling in Germany as reflecting smaller differences in "real skills" by level of schooling in Germany, most of the difference in standard deviations occurs among workers with similar years of schooling.

In sum, our measure of equivalency scales of skill lends some support to the skill compression story, but if we use years of schooling as our measure of skill, we must assume that differences in returns to schooling are due to differences in skills to interpret the relation between years of education and wages in a similar fashion. If we had no other measure of skills, it would be hard to convince the skeptic that skill compression is that important. But we have one additional way to compare skills between Americans and Germans: in terms of literacy scores on the OECD's adult literacy survey.

Skill Distributions Measured by Literacy Scores

In the early 1990s the OECD developed the International Adult Literacy Survey (IALS), which used the same survey instrument to measure the ability of adults to understand and use printed information through reading, writing, and numeracy, in their workplace and daily life. It is the first major international study focused on the literacy skills that workers have and use at workplace. Although the IALS paper-and-pencil tests do not fully reflect workplace productivity -- a diligent pleasant employee may do more in trade or services than someone who fills out forms -- they offer a potentially better measure of skills in Germany and the US than years of educational attainment.

Figure 3 shows the distribution of literacy scores in Germany and the US. By inspection, the German skill distribution is more symmetrical and concentrated around the mean than the US skill

distribution. The standard deviation of the scores is nearly twice as large in the US (0.30) as in Germany (0.16). The main reason for this is that a substantial number of American workers but virtually no Germans have exceptionally low scores. Indeed, while the mean and median of the skill distributions differ by just 7-8 points, at the 25th percentile Americans score 29 points lower than Germans, while at the 5th percentile, they score an amazing 77 points lower.

One reason why the US has so many workers with exceptionally low scores is that about 13 percent of Americans in the IALS are immigrants. Immigrants averaged 217 on the literacy score – 60 points below non-immigrant Americans, and were disproportionately represented among those with exceptionally low literacy scores. By contrast, just 8% of Germans taking the IALS were immigrants (age group 20-64 years), and these immigrants averaged 271 on their literacy score, just 24 points below non-immigrant German citizens. If we eliminate immigrants from the sample, the standard deviation in literacy scores among Americans falls sharply, from 0.30 to 0.23 while the standard deviation in literacy scores among Germans is unchanged at 0.15. Thus nearly half of the difference in the dispersion of literacy skills between the US and Germany is due to the low literacy skills of US immigrants. Even so, there remains a sizable 0.08 difference in the standard deviation of skills of the native born between the two countries, again concentrated in the lower tail of the distribution.

Figure 4 shows starkly the difference in the skill distributions between the two countries for native born persons (panel A). It records the ratio of the literacy scores of Germans to Americans at the same percentiles for each distribution. Ratios greater than 1 indicate that Germans have higher literacy at that point in the distribution, while ratios less than 1 indicate that Americans have higher literacy. The line for all workers, including immigrants shows a huge German advantage in skills in the lowest percentiles, falling to near equality around the middle of the distribution, and then falling to a slight disadvantage in the highest percentiles. But the graph for immigrants shows an even more stark difference (panel B): German immigrants are much more skilled in the lower rungs of the skill distribution and somewhat more skilled in the upper rungs. The line for non-immigrants is the closest to 1.0 in the figure, though even here, low skill Americans do more poorly than low skill Germans.

How should we interpret the exceptionally low literacy scores of low skilled American immigrants? Given the huge immigration into the US of persons with very limited schooling, largely from Mexican and Latin America, the scores arguably represent a true measure of skills. But to some extent, the scores reflect the fact that the native language of immigrants is not English,. By concentrating in immigrant enclaves, many persons largely illiterate in English can function in their own language. From this perspective, the low scores exaggerate the poor skills of these workers.

Schooling and literacy scores: the skill formation of schooling

Thus far we have looked at schooling and literacy scores as separate measures of skill. But these two measures are highly positively correlated. Education produces higher levels of literacy;

persons with high "innate" literacy scores invest in education more than others. Does the link between schooling and literacy differ between the US and Germany?

To analyze the link between schooling and literacy scores, we turn to the IALS. The raw IALS data show that Germans have relatively few years of schooling but reasonably high quantitative (other) literacy scores. In part, however, this is due to the fact that IALS counts formal schooling only, ignoring the years of apprenticeship, which Germans obtain. To correct for this we compared years of schooling in the CGAS, inclusive of apprenticeship, and years of formal schooling in the IALS and developed an adjustment procedure for correcting the IALS observations to take account of apprenticeship. The procedure is described in appendix A. We use this corrected years of schooling measure throughout this study.

Table 4 records the quantitative literacy scores of non-immigrants with different years of schooling. We exclude immigrants because most of them have received schooling elsewhere and because the scores of US immigrants arguably understate their skills. The table gives the mean quantitative score in each group, the score of the 5^{th} 50^{th} and 95^{th} percentile and the standard deviation of the scores. There is a clear association between schooling and literacy scores in the table: the mean level of quantitative literacy rises monotonically with years of schooling in both countries. In the underlying observations for individuals the correlation between years of schooling and the literacy score is .57 for the US and .35 for Germany.

There are two noticeable differences in the relation between schooling and literacy between Americans and Germans. First, at the lowest levels of schooling, Germans have much higher quantitative scores than Americans, while at higher levels of schooling, Americans have modestly higher scores than Germans. The big difference in skills occurs at the bottom of the education distribution. Second, the standard deviations in the table shows a much wider dispersion in literacy scores within schooling categories in the US than in Germany, concentrated also among low education groups.

The concentration of US-German differences in literacy scores at the lower rungs of the education ladder suggests that years of schooling in the US are more effective in producing skills than years of schooling in Germany. To examine this, we take years of schooling as given and regress literacy skills on years and other demographic factors:

$$(4) QUANT = a + b\,S + c\,AGE + v,$$

where QUANT is the measure of quantitative literacy, S is the years of equivalent schooling; AGE is the age of the person.

Table 5 gives the results of this regression. The most striking finding is that years of schooling have a greater effect on QUANT in the US than in Germany. An extra year of schooling adds about 12 score points in the US compared to only about 4 points in Germany. German workers are on average more skilled because of the larger constant term in the regressions. One interpretation is that this reflects more effective primary schooling (which everyone in both countries receive) in

Germany. This is confirmed by dummy regressions in columns IV. We included a 'drop-out' dummy, which has a significant negative coefficient in the US but is insignificant in Germany.5 Another is that German families or culture gives students more literacy skills, schooling aside. The difference in the constant terms is sufficiently large that the US passes the German skill level on average only at about 15.years of schooling.

Age coefficients are negative but small in both countries When we include an interaction term for age and education the age coefficient becomes significantly positive in the US. Since we cannot distinguish between age and cohort effects, this difference also allows for alternative interpretations. It could be that Americans start with less skills and catch up as they age. Or it could be that older generations of Americans are more literate than comparably educated younger cohorts. To the extent that literacy scores in fact measure workplace competency, the high age coefficient in the US fits with the high age-earnings profile that developed in the 1980s and 1990s.

Columns III in the table pursues the impact of age and education on skills by adding an interaction term to the regression. The interaction is negative for both countries, suggesting that age and education are substitute ways of acquiring skills or, alternatively, that education has improved its effectiveness over time, so that the education of older cohorts was less productive in raising skills. The interaction is also larger in the US than in Germany, implying that whatever underlies this pattern – age or cohort effects – has been more powerful in the US.

What are the implications of these findings for the skill compression hypothesis?

The narrower dispersion of quantitative literacy scores in Germany than in the US supports the implication of our equivalence scales: that Germany has a narrower distribution of skills than the US. The evidence that US schooling adds more to literacy than German schooling supports the skill compression interpretation of the lower return to schooling in Germany. At least in part, Germany has a smaller return to years of schooling because skills are more weakly associated with years of schooling than in the US.

But these calculations also highlight problems with the skill compression story. The dispersion of wages but not the dispersion of skills differs most between the US and Germany among persons in the highest skill categories. If we use the equivalent skill categories of figure 1, we obtain a comparable pattern. In Germany the standard deviation of ln wages and of ln skills falls from the least to the most skilled group, consistent with the skill compression story. But in the US the four skill groups have similar standard deviations of ln wages (around 0.40) but very different standard deviations of ln skills, which fall between the lowest group (0.33) to the highest group (0.16). The higher dispersion of wages among the most skilled/educated Americans compared to the most skilled/educated Germans does not seem to reflect differences in the distribution of skills among those two groups.

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5 We defined as 'drop-outs' those with 11 or less years of schooling in the US. For Germany we defined as 'drop-outs' those with 9 or less years of schooling.

From Compressed Skills to Compressed Wages

To what extent does the compression of skills in Germany than in the US contribute to the lower dispersion of wages and return to education in Germany than in the US?

We analyze this question by regressing the ln income on literacy scores and education in the IALS. The IALS records personal income after taxes, which necessarily differs from the hourly earnings in the CGAS. It differs between Germany and the US because the tax system differs between the countries, and because time worked differs on average and across individuals in the two countries. In addition, the IALS records the position of workers in the German income distribution in 20 percentile categories, rather than actual earnings. To analyze incomes, we transformed the percentile measures in the German distribution into incomes at that point in the distribution, and used those numbers as our dependent variable for Germany. For comparability, we grouped the incomes of individual Americans in a similar fashion. Thus, each worker in both countries is assigned one of twenty income numbers, depending on where that worker fit in the national distribution.

There are three ways to model the link between wages and skills when we have both literacy scores and years of schooling as potential indicators of human capital.

First, assume that schooling and other factors determine literacy skills which in turn affect wages: Schooling → Literacy Skills → Wages. This suggest that we regress ln wages on skills (with other covariates) but not on schooling, and use the resultant b coefficient to assess the contribution of the compression of skills in Germany on the standard deviation of ln wages.

Second, assume that schooling and other factors determine wages, and that literacy skill is a background factor that affects schooling: Literacy Skills → Schooling → Wages. This is the standard human capital model with schooling dependent on skills.

Third, assume that schooling and literacy scores are equally valid indicators of human capital, so that the appropriate regression is ln wages on both measures (with other covariates). This model is likely to attribute a smaller fraction of the dispersion of wages to skills since schooling is more compressed in US.

Table 6 presents the results of estimating these models.

The two columns under model I give the results of estimating the model in which wages depend on the quantitative literacy score and covariates but not on schooling. The standard deviations in ln incomes given at the bottom of the table are higher than the standard deviations in ln wages in table 2 because incomes vary with time worked as well as hourly wages. The dispersion for all employees is 0.27 ln points higher in the US than in Germany. We experimented with limiting the sample to non-immigrants, but this did not reduce the standard deviations for either country -- in striking contrast to the huge effect of removing immigrants from the skill distribution in the US. This

reflects the fact that almost any well-defined group of workers in the US has a wide distribution of earnings. The estimated coefficients on the ln of the quantitative literacy score shows that literacy pays off more in the US than in Germany with an elasticity that is more than twice as large among Americans than among Germans. Because the regression fits the US data better than the German data, the difference between the residual standard deviations is reduced to .21 (.778-.572) Finally, if we replace the distribution of scores in Germany with the US distribution and the distribution of scores in the US with the German distribution, but keep each country's coefficients on ln scores, we obtain the results in the bottom line. Increasing the dispersion of scores in Germany to the level in the US has virtually no effect on the standard deviation of earnings because the coefficient on ln score in the earnings equation is small. Reducing the dispersion of scores in the US to the German level has a small effect in reducing the US dispersion. The only way one can get noticeable effects of changing the contribution of scores to the country dispersions in ln income is if we were to postulate that Germany/the US had both the other country's dispersion of scores and estimated impact of scores on ln income. In this case, we would get a rise in dispersion of ln incomes in Germany of .06 points and a fall in the dispersion of ln incomes in the US of .05 points.

The estimates of models II and III tell much the same story, with regard to the effects of changing the distributions of years of schooling (model II) or years of schooling and test scores (Model III) on the dispersion of ln incomes. Because years of schooling is less dispersed in the US than in Germany, there is a slight increase in the US dispersion of ln incomes and a slight decrease in the German dispersion when we switch the dispersion of scores. With the dispersion of scores and the dispersion of years of schooling working in the opposite direction, we get very little impact in Model III.

Still, taking account of the difference in literacy scores does have a substantial effect on one German-US difference in ln income. In the regression of ln income on years of schooling alone (with covariates), we obtain coefficients of 0.103 in the US and 0.043 in Germany. Inclusion of literacy skills reduces the effect of schooling on earnings in the US by 0.027 points and reduces the effect of earnings in Germany by 0.003 points. Thus, .024 points of an initial .060 difference in the effects of schooling on earnings is attributable to the intervening effect of scores. Put differently, 40% of the difference in the impact of schooling on incomes between the countries is attributable to the differential pattern of skills across schooling groups.

In short, the narrower distribution of skills in Germany than in the US does not account for the bulk of the difference in dispersion of income between the two countries. There remains a sizeable difference in the distribution of incomes that presumably represents the effects of Germany's institutional wage setting vs the US's market wage-setting. The next question to ask is whether this difference is associated with the composition of joblessness in the two countries.

Skills and Joblessness

If the institutionally determined compressed wage structure in Germany cut off labor demand for low-skilled workers while the flexible wage structure in the US allowed low skilled persons to find work we would expect that a larger proportion of the jobless would be unskilled in Germany compared to the US.

Table 7 shows the distribution by literacy scores of the employed and unemployed and of persons out of the labor force in Germany and the US in the IALS data. What stands out in the table is the greater difference in quantitative literacy scores among the groups in the US than in Germany. The mean score for the unemployed and out of the labor force groups in the US are substantially below the score of the employed; whereas German unemployed and out of the labor force persons have scores only modestly below those of employed Germans. Hence, unemployed Germans have skills much greater than unemployed Americans – indeed scores comparable to those of employed Americans. And virtually no unemployed Germans have scores as low as those of unemployed Americans. Among the unemployed the 5th percentile of the German unemployed scores as high as the 40th percentile of the American unemployed. For the employees, the gap is smaller the score of the 5th percentile of the German employees is only reached by the 20th percentile of the American employees.

This pattern is inconsistent with the wage-compression hypothesis. In Germany, where the wage structure is supposedly so compressed as to price out low skill workers, they are reasonably highly skilled, whereas in the US where flexible wages are supposed to reduce structural unemployment problems, the unemployed are much lower skilled than the employed.

This does not, however, mean that the less skilled are not more likely to be jobless in Germany than the more skilled. Figure 5 rearranges the literacy-job status data to show the rates of employment for persons with given levels of literacy skills. In Germany as in the US those with greater literacy scores have higher employment rates (and lower unemployment). Indeed, the gap between the least skilled and more skilled is somewhat steeper in Germany than in the US, as the wage compression hypothesis would predict. But there are exceedingly few Germans in those low skill categories. In this sense, the data support the Nickel-Bell argument that Germany does not have many low skill jobs because it lacks truly low skill workers.

CONCLUSION

Analysis of the difference between German and US employment rates and dispersion of wages has generated two competing explanations of why Germany has lower employment: the wage compression hypothesis and the skill compression hypothesis. Our examination of the distribution of skills in Germany and the US has shown that Germany does indeed have a more compressed distribution of skills than the US, due to the absence of a lower tail of less skilled workers, as is

found in the US. But the compression of skills explains only a modest proportion of the compression of wages in Germany compared to the US. Adjusted for skill, the German distribution of wages remains more compressed than the American distribution. But the skills of the German unemployed are too high for unemployment to be generated by the compressed wage structure and are sufficiently higher than those of low skill Americans to raise doubts about inferring what might happen to German employment were Germany to increase the dispersion of pay to US levels.

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Table 1: Wage Dispersion, Employment-Population Rates and Unemployment Rates, Germany and US, 1973-1995

	Ratio of Earnings Male Workers D9/D1		Employment-Population rates (x 100) Total		Services		Rate of unemployment	
	Germany	**USA**	**Germany**	**USA**	**Germany**	**USA**	**Germany**	**USA**
1973-79	2.4	3.2	66.5	65.2	31.4	41.3	2.7	6.5
1979-89	2.3	4.0	63.8	68.6	33.6	46.1	5.6	7.2
1989-95	2.3	4.1	65.9	72.2	37.0	51.3	5.7	6.2
Change `73/`79 to `89/`95	-0.1	0.9	-0.6	7.0	5.6	10.0	3.0	-0.3

Source: wage deciles from OECD Employment Outlook, 1973-79 data for 1979 in the US, 1983 in Germany; 1979-89 from 1989 in both countries, 1989-95 from 1994=3 both countries. Employment-population rates, CGAS; unemployment rates, as defined by BLS to be comparable.

Table 2: Contribution of Skill Category to the Standard Deviation of Ln Wages, US and Germany, 1995 CGAS files, Workers 20-64

		USA	Germany
1	**Standard deviation of ln(wage)**	.466	.335
2	**Standard deviation of residual [ln(wage) regressed on skill equivalents]**	.399	.288
3	**Coefficients (Std errors) on Dummy variables for**		
	Skill equivalent II	.162 (.004)	.288 (.004)
	Skill equivalent III	.498 (.005)	.605 (.005)
	Skill equivalent IV	.738 (.007)	.625 (.006)
4	**Standard deviation of ln(wage) with other country's distribution across skill groups**	.444	.381.
5	**Standard deviation of ln(wage) with other country's coefficient of skill groups**	.470	.348
6	**Standard deviation of ln wages within skill groups**		
	Skill equivalent I	.400	.360
	Skill equivalent II	.411	.290
	Skill equivalent III	.391	.200
	Skill equivalent IV	.361	.155

source: computations based on CGAS. Sample size for US 47068 cells; for Germany 42764 cells.

Table 3: Components of the standard deviation of ln wages, US and Germany, 1995 CGAS files, workers 20-64 years

		USA	Germany
1	**Standard deviation of ln(wage)**	.466	.335
2	**Standard deviation of residual [ln(wage) regressed on years of schooling]**	.390	.283
3	**b, coefficient of schooling (standard error)**	.1087 (.0008)	.0740 (.0006)
4	**Standard deviation of years of schooling**	2.347	2.431
5	**Predicted standard deviation of ln(wage) if coefficients for schooling (b) from the other country, initial residuals used**	.426	.387
6	**Predicted standard deviation of ln(wage) if distribution of schooling from the other country, initial residuals used**	.471	.332

Source: computations based on CGAS. Sample size for US 47068 cells; for Germany 42764 cells.

Table 4: The distribution of QUANT scores by years of education
(population 20-65 years, immigrants excluded)

Years of Education	US						Germany					
	Percentiles			mean	sd (ln QUANT)	n	Percentiles			mean	sd (ln QUANT)	n
	5th	50th	95th				5th	50th	95th			
9	96.5	213.5	305.6	203.7	0.341	163	202.8	280.8	341.7	277.7	0.164	299
10	108.8	230.7	307.3	225.2	0.288	121	207.4	287.2	351.7	283.6	0.167	271
11	140.8	237.9	332.4	233.9	0.241	109	218.1	287.0	337.3	286.1	0.130	133
12	186.2	276.6	347.0	273.3	0.187	568	234.7	294.0	352.1	294.0	0.124	372
13	216.8	299.0	384.3	295.5	0.154	147	249.7	303.9	359.3	304.6	0.111	306
14	223.8	298.1	365.6	295.7	0.154	231	228.5	302.2	357.7	302.1	0.136	75
15	242.1	310.9	366.4	305.6	0.142	95	242.2	318.6	369.4	312.3	0.137	70
16	251.4	326.5	396.4	326.1	0.138	274	258.0	323.8	377.0	321.0	0.122	63
17	232.8	334.5	394.3	330.2	0.136	89	246.4	313.5	368.9	311.1	0.118	44
18	277.2	334.3	391.7	335.2	0.126	107	264.2	323.3	377.8	319.8	0.114	39
19	272.9	344.9	394.1	338.9	0.123	59	290.1	341.3	374.2	338.9	0.085	41
20	243.1	343.8	411.5	339.0	0.130	53	263.6	326.1	367.8	321.9	0.133	47
Total					0.230	2062					0.148	1777
Mean years of education					13.600						12.3	
Standard deviation years of schooling (ln):					0.188						0.221	

Source: IALS data set, years of education in Germany adjusted (see Appendix).

for 11 years of schooling in Germany see Apprendix

Table 5: Regressions of skills on schooling (population 20-65 years, immigrants excluded, OLS)

	US				Germany			
	I	**II**	**III**	**IV**	**I**	**II**	**III**	**IV**
Constant	127 (5.3)	129 (6.5)	69 (20.5)	163 (7.5)	244 (3.6)	265 (5.3)	239 (13.3)	262 (6.1)
Years of education	11.9 (.4)	11.9 (.4)	16.4 (1.5)	9.6 (.5)	4.4 (.29)	4.0 (.29)	6.2 (1.1)	4.3 (.38)
Age	-	-.05 (.01)	1.3 (.4)	-.002 (.09)	-	-.4 (.08)	.2 (.3)	-.4 (.08)
Age*education	-	-	-.1 (.03)	-	-	-	-.05 (.02)	
Dummy	-	-	-	-34 (3.9)	-	-	-	3.2 (3.0)
R2 adjusted	.33	.33	.33	.35	.12	.14	.14	.14

Source: IALS, Standard errors in parenthesis
The dummy for the US is 11 or less years of schooling, i.e. it covers those regarded as dropouts. For Germany the dummy is 9 years or less of schooling since 11 years of schooling would be quite substantial in Germany. Those with 9 years or less of schooling may be regarded as a 'dropouts' in Germany.

Table 6: The Impact of Skills and the Payoff to Skills on the Ln Incomes and the Dispersion of Income, Germany and US, 1991, (controlling for age, age-squared, sex, and immigrant status)

	Model 1		Model 2		Model 3	
	Germany	**USA**	**Germany**	**USA**	**Germany**	**USA**
Lnscore	0.419	1.003			0.192	0.584
	(0.130)	(0.081)			(0.134)	(0.092)
Educ			0.043	0.103	0.040	0.076
			(0.007)	(0.007)	(0.007)	(0.008)
Age	X	X	X	X	X	X
Age^2	X	X	X	X	X	X
Male	X	X	X	X	X	X
Immigrant	X	X	X	X	X	X
Obs	924	1561	918	1545	918	1545
R^2	.276	.316	.298	.341	.299	.347
Standard Deviations						
Initial	.672	.943	.673	.935	.673	.935
Residual	.572	.778	.563	.760	.562	.751
Pred. Residual If other country's skill distribution	.573	.767	.559	.773	.561	.755

Source: computations based on IALS, adjusted as described in the Appendix, standard errors in paranthesis.

Table 7: Distribution of skill scores by labor force status, population 20-64 years (including immigrants)

Score	USA				Germany			
	Over all	Employed	Unem-ployed	Not in labor force	Overall	Employed	Unem-ployed	Not in labor force
-200	12.9	9.0	28.3	21.0	1.8	0.8	2.0	3.6
200-250	16.6	14.3	17.6	20.3	13.3	9.9	24.3	16.4
250-300	29.2	30.6	27.1	27.6	40.2	38.3	39.2	43.9
300-350	29.3	31.7	23.5	24.6	36.2	41.1	27.9	29.7
350-400	11.3	13.4	3.4	6.2	8.4	9.9	6.6	6.5
400+	0.8	1.1	0.0	0.2	0.0	0.0	0.0	0.0
mean score	277	287	242	255	294	300	281	285

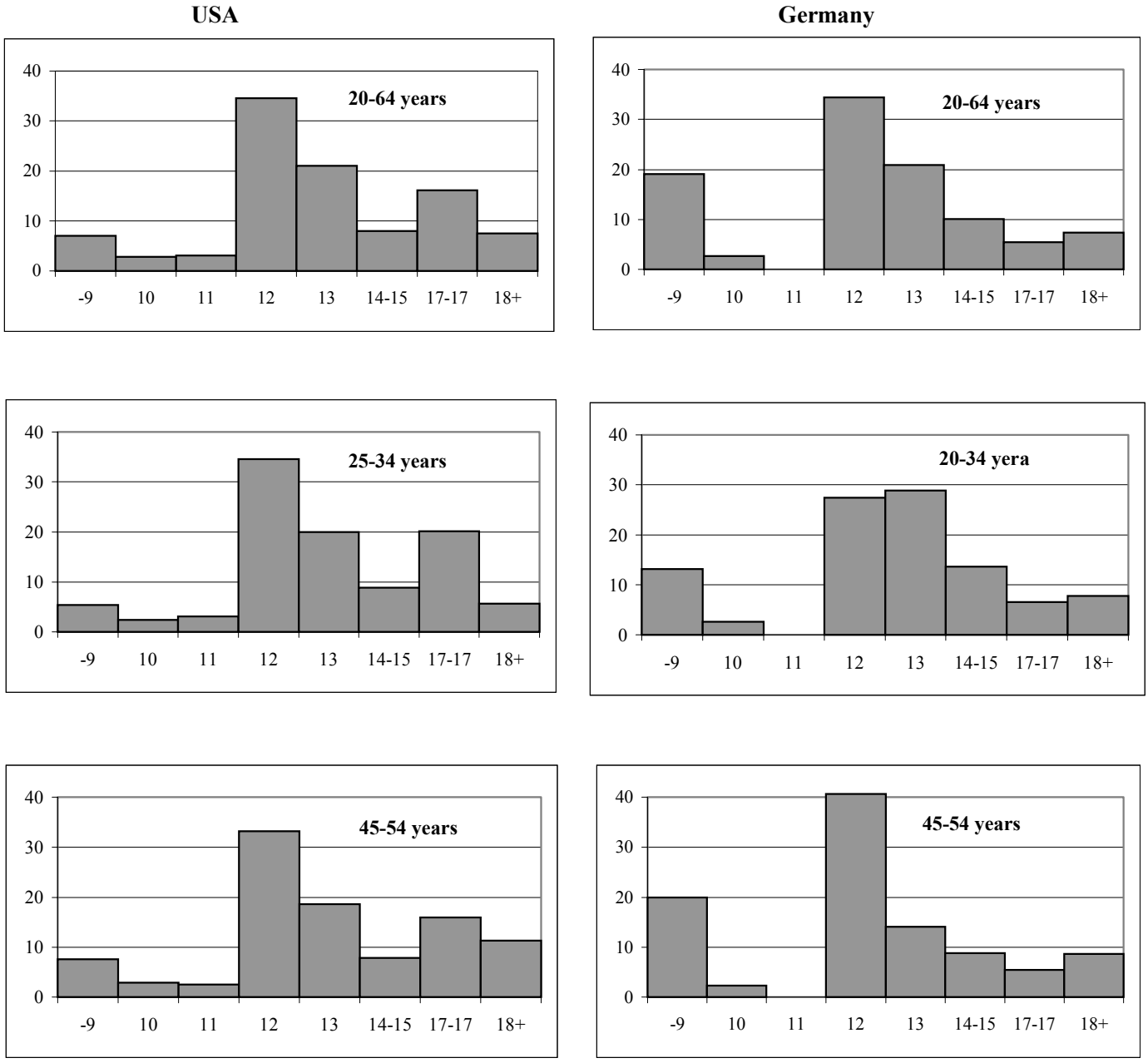
Source: Computations are based on IALS.

Figure 1: Equivalent skill levels

Level	US			Years of schooling	Germany		
	Grades	Employment share	Skill score, ln skills (sd ln skills)		Employment share	Skill score ln skills (sd ln skills)	Grades
I	9th grade - 10th grade 11th grade Highschool graduate	45	245 5.46 (.327)	-9 10 11	16	278 5.61 (.173)	No certificate Hauptschule Realschule
II	Some college, no degree Associate degree	30	294 5.67 (.178)	12 13 14 15	69	300 5.70 (.123)	Hauptschule + Apprenticeship Realschule + Apprenticeship; Abitur Hauptschule + Meister Realschule + Meister
III	Bachelor's degree	17	322 5.76 (.204)	16 17	7	311 5.73 (.157)	Fachhochschule Abitur + Fachhochschule
IV	Master or higher	8	331 5.78 (.164)	18+	8	327 5.78 (.114)	University degrees

Source: Own estimates, wages are in national currencies, literacy scores are the mean of 5 quantitative scores, skills includes immigrants, population 20-65 years. Skill is the average points of the 5 items measuring quantitative skills.

Figure 2: Distribution of years of schooling (population 20-65)



Sorce: computations based on CGAS

Figure 3: Literacy-scores, population 20-64 years

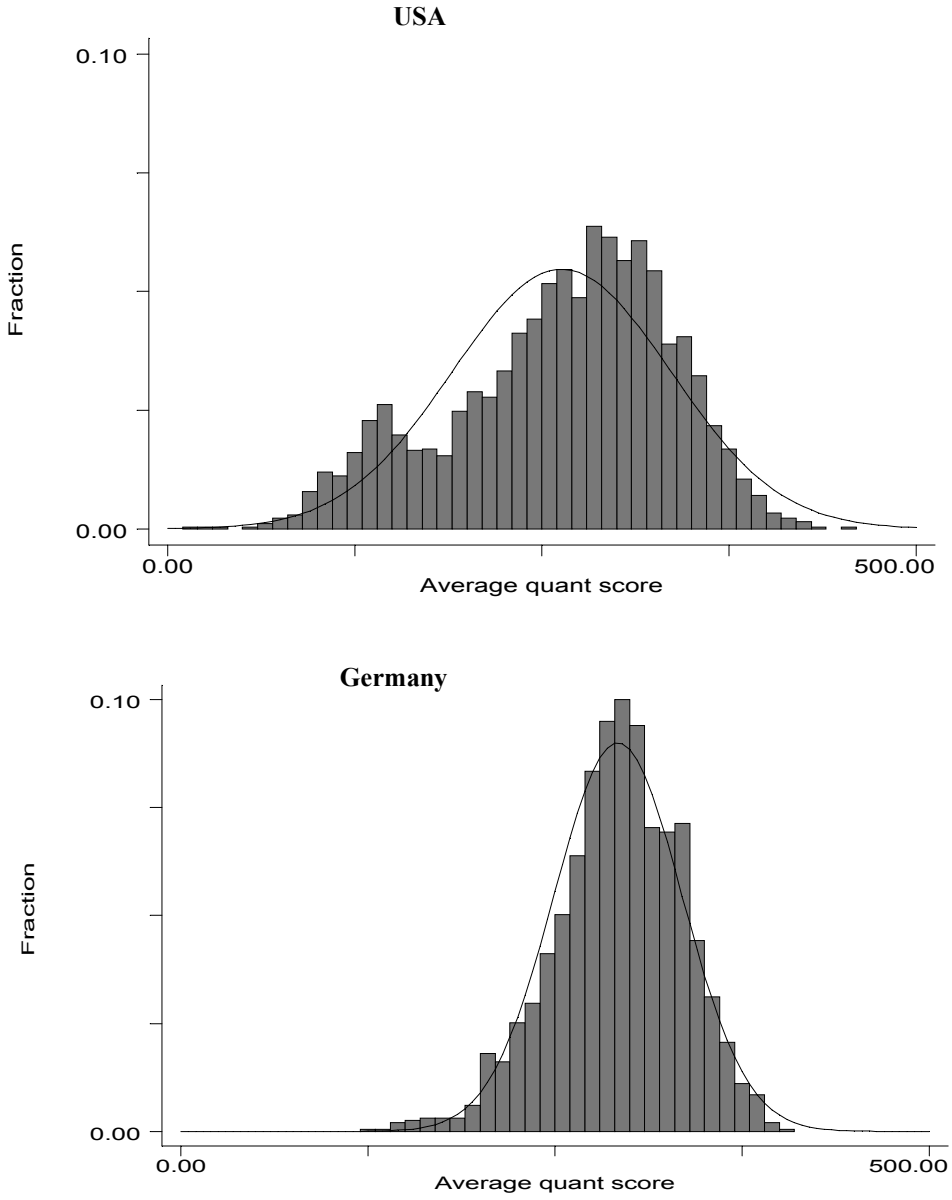
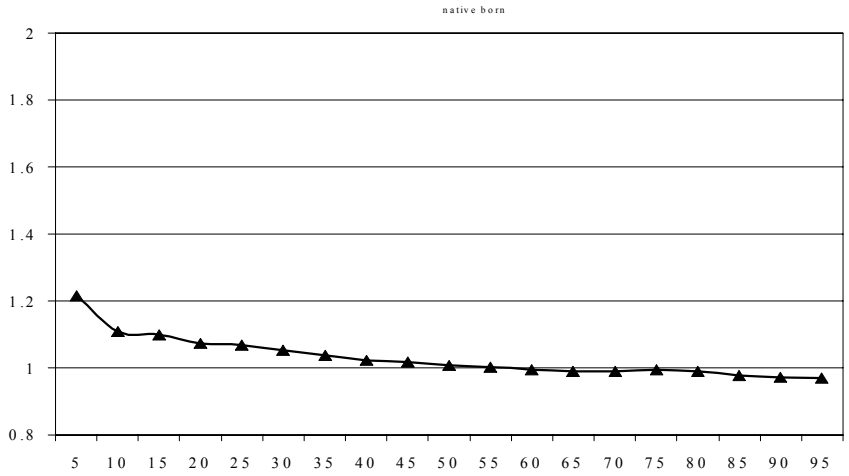
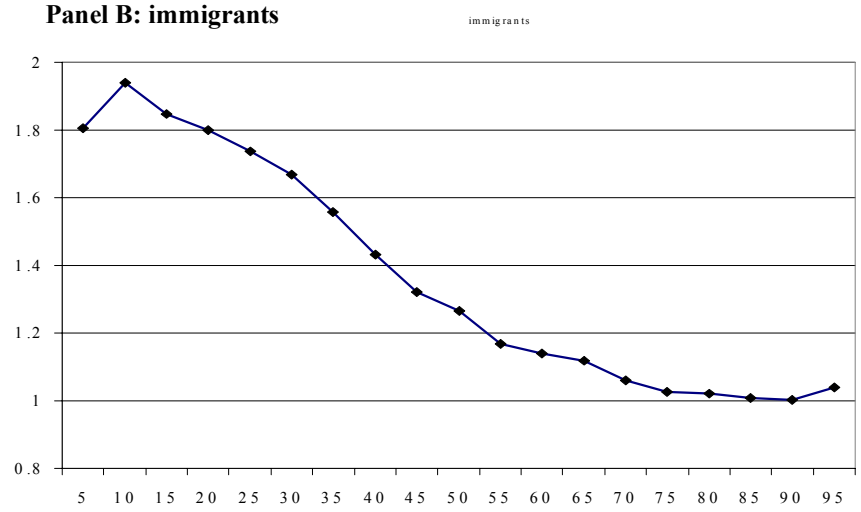


Figure 4: Ratios of literacy scores by percentiles, population 15-64,
German score / US score

Panel A: native born

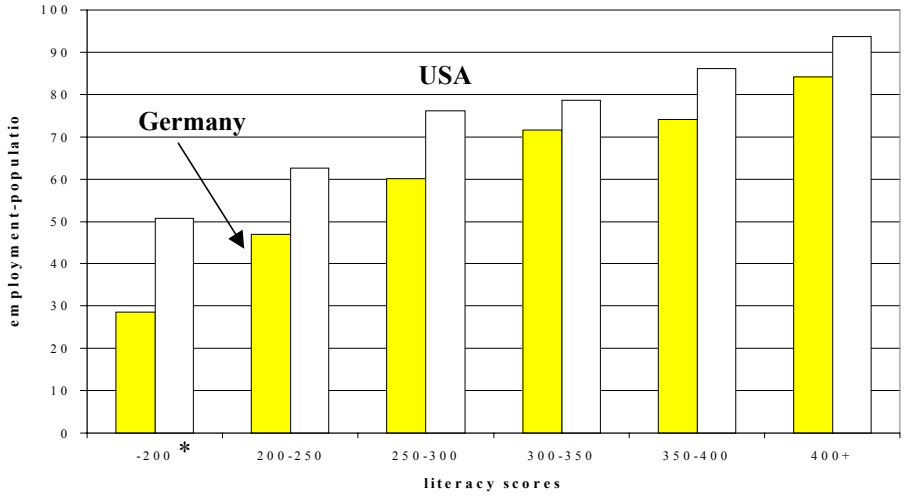


Panel B: immigrants



Source:computations are based on IALS, variable is QUANT (average of 5 numeracy tests)

Figure 5: Employment-population rates by Literacy Score, 20-64 years



Source: computations based on IALS and BLS. * Germany '-200' has a share in employment of .8% only.

Appendix A: Adjusting the IALS Years of Education

The IALS counts years of education only if schooling is 'full-time education'.[6] Since apprenticeships are a combination of part-time schooling (1 or 2 days per week) and practical training, apprenticeships do not count as years of 'full-time' education. Thus many persons in the IALS are counted in the categories '9 and 10 years of education' (56%). By contrast, in the CGAS, which includes apprenticeship years as part of schooling many persons are counted in categories '12 and 13 years of schooling' (49%). Thus the actual length of the education of Germans with an apprenticeship (as well as the classification in ISCED, see below) is misleading. Many Germans appear to have less education than they actually got.

Since job-relevant skills are build-up during apprenticeships the classification of education in IALS is a misleading and will bias upward the 'scores' of Germans with low years of education. This may explain why Germans with low years of education score as high as the average American who has many more years of schooling.

Including apprenticeships in years of education will shift many Germans from 9/10 years of education to 12/13 years. To correct for the exclusion of the apprenticeship education in German years of education we adjusted years of education for non-immigrants as follows.

The ideal adjustment would be to simply add 3 years to the education of Germans in the IALS who reported having served apprenticeships. But the IALS contains no data on this.[7] So we randomly assigned an extra three years to enough Germans with 9 and 10 years of schooling to replicate the CGAS distribution at the lower level of the skill ladder. Specifically, we draw a random sample of 44% of those with 9 years of education in IALS who had a quant-score[8] of 228 or higher. We used the limit of 228 (which is the score of the 5th percentile for those with 12 years of education in original IALS) on the assumption that those with an apprenticeship score on average higher than those who completed 9 years of 'full-time' education only. For the group with 10 years of 'full-time' education we followed a similar procedure. Here the lower score-limit was 235 (the value of the 5th percentile of those with 13 years of schooling in original IALS). We decided to expand the 13 years of education to the share found in CGAS rather than reducing the groups of ten years of education in original IALS to the share in CGAS.

The small number of people who reported 11 years of education in IALS are very difficult to fit into the German education system. In some tabulations we gave them 11 years; in others we dropped that groups from the data because any reclassification seemed to be arbitrary. This made no substantive difference in our results.

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[6] Questions asked in IALS (German questionnaire)
Question 10 explicitly asks 'Insgesamt Schulbesuch, **Vollzeit**-Berufsschule, Universitaet'
Question 12 asks: 'Welchen hoechsten allgemeinbildenden Schul- oder Hochschulabschluss haben Sie?
Question 15 asks for **'abgeschlossene Lehre'** but is not included in the IALS files.

[7] Additional variables A9 and A11 do not help because they refer to the type of the level 2 and level 3 education. The 'abgeschlossene Lehre' question is not included in the ILAS files.

[8] 'quant' is the mean of 5 variables measuring the scores in quantity tests in IALS.