

Differentials in service industry
employment growth:
Germany and the US in the comparable
German American structural database

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EXECUTIVE SUMMARY AND MAJOR FINDINGS

Despite much public discussion and strong views about why Germany (and most EU countries) has had worse employment problems than the US, there is little empirical analysis comparing US-German (or US-EU) employment and wage trends at a desegregate level. Most comparative studies of employment and wage patterns have been highly aggregate and speculate about the micro-causes of differences rather than provide quantitative estimates of wage and employment patterns at the relevant levels of detail. As a result, there is some confusion about the basic facts regarding employment and wage differences between these economies.

Conceptually, analysts offer three different hypotheses to explain the difference in employment and wages between EU countries and the US but give little evidence allowing us to choose among them. Proponents of the **wage compression hypothesis** claim that the more narrow distribution of wages in the EU than in the US due to market-distorting institutional wage-setting¹ cuts off low-wage employment especially in service industries. This wage compression, in turn, explains the differences in employment, for it prices low skill Europeans out of the job market. The **skill hypothesis**, on the other hand, states that the difference in US-EU wage structures reflects a more compressed distribution of skills (as indicated in literacy and other international tests) in the EU than in the US, and is thus market conforming rather than market distorting. The reason for the lack of unskilled work in Europe is a lack of unskilled workers. The **measurement-error hypothesis**, advanced to explain US-German differences in service sector employment, argues that the measured higher employment in the US service sector is an artefact due to National Accounts Statistics classifying firms into industries by their main product. This overstates US service sector employment because US industrial firms' allegedly outsource service activities to a greater extent than German firms. Properly measured, service activities are supposedly the same in both economies.

In this study we have used the Comparable-German-American-Structural Database (CGAS) to investigate the underlying forces behind the differences in employment expansion in the US and in the major EU economy, Germany, and the validity of these three hypotheses. The CGAS classifies workers in the US and Germany into comparable industry-occupation-skill-age-gender cells

(potentially 1.2 million cells per years), allowing us to answer questions about employment and wage patterns, which aggregate data leave open to speculation.

Overall, we reject the measurement-error hypothesis and find that the difference in service employment between the US and Germany is real rather than a statistical artefact. Our analysis gives some support to the skill hypothesis although measuring skill in a comparable manner across countries is difficult. And we find greater compression of wages in Germany than in the US, but little evidence that this wage-compression explains differences in employment patterns. The fly in the ointment of the compression hypothesis is that Germany has an inter-industry wage distribution similar to that of the US, making it hard to argue that low-wage services in Germany pay high wages that reduce demand for these services and thus cut off employment.

In this work we try to identify industries in which employment growth and levels differ most strongly between the US and Germany; to analyse the intra-industry and inter-industry distribution of wages; and to compare the occupational content of industries focusing on service industries, accounting for other variables such as gender, skill, and age.

Here are our ten major findings in these areas:

1. The US-German (as well as the US-European) difference in employment-population ratios developed in the 1970s and 1980s. In 1970 both countries had roughly similar employment-population ratios. During the same period the distribution of wages widened in the US while remaining roughly unchanged in Germany.
2. The difference in employment-population ratios is a difference in service employment. The US employs about 54 % of its working-age population in services as compared to Germany with 37 %. But the service sector is heterogeneous with respect to employment trends and with respect to industry wages. Some service industries grow and are 'low-pay' but other growing service industries are well paid.
3. We reject the measurement-error hypothesis that the size of the service sector is similar in the US and Germany on the basis of three types of evidence: input-output data on outsourcing by US and German industries; CGAS data on the difference between the share of employment in service industries and in service occupations; and CGAS data on the concentration

¹ Market distortion is also claimed to be caused by social assistance programs. However, the minimum wage floor created by social assistance in Germany is relative to the mean wage at about 32% and roughly similar to the US minimum wage relative to the US mean wage of 34% (see Freeman/Schettkat 1998, 1999b, c).

of employment by occupations within industries. In each case we found that the difference in the size of the service sector between the US and Germany is real rather than a statistical artefact.

4. Ranking jobs by wages, we find that the US had a bifurcated growth of jobs, with rapid growth at both the lower end and the higher end of the wage scale but with stagnation or decline in jobs paying around the mean wage. By contrast, Germany had a slight decline in low-wage jobs and stagnation of high paid employment, but had modest expansion of jobs slightly below the mean wage. The broadly defined service industries have had more heterogeneous employment growth and wage patterns than some analysts recognise, suggesting the importance of desegregating this broad area.
5. The CGAS shows that the US has a left-hand skewed and wider wage distribution than Germany. As a result the majority of US workers earns a wage far below the mean while German workers earn wages symmetric to the mean. Aggregated to the industry-level, however, the distribution of wages is remarkably similar between the two countries. Not only are the same industries positioned similarly, with low-wage industries in one country also low wage in the other, but their mean level of pay shows nearly the same distribution. The US wage distribution is more unequal and left-skewed than the German wage distribution because of the greater inequality in wages **within industries** in the US than in Germany.
6. Consistent with this, within industries, Germany has a narrower distribution of skills than the US, and a higher average level of skill, as well. The implication is that US firms combine a more heterogeneous workforce than German firms within any sector.
7. The major sectoral contributors to the difference in employee-population ratios between the US and Germany are: 'education and research' (20% of the difference), 'health (19%), 'eating, drinking, care' (16%), the aggregate retail trade sector (12%, food and non-food retail), 'business services' (9%), 'finance' (7%), 'bus, taxi, rent-a-car' (6%), and aggregated 'wholesale trade' (5.5%). Younger workers are disproportionately employed in expanding industries in both countries.
8. Low-wage employment is much more concentrated in 'low-wage' industries in Germany than in the US, where low-wage work is more widely spread across the industries. Low-wage employment is also much more concentrated among women in Germany than in the US whereas in the US low wage employment is much more concentrated among youths. The implication is that EU policies to help low wage workers that focus on specific low pay sectors and on gender wage gaps can be more effective than US policies, which must deal with the more heterogeneous nature of low wage work in the American context.
9. The relation of industry employment growth and wages is weak. Some rapidly growing service industries are 'McDonald' industries, which pay low wages but many others pay wages above the mean. The conjecture that the expansion of service jobs is concentrated in low-wage industries is not confirmed by the data.
10. Given that none of the three leading hypotheses - mis-measurement, wage compression, or skill compression - can explain much of the differential employment experience of the US and Germany, we propose an additional possible explanation to account for the apparent link between industrial structure and aggregate employment. Our hypothesis is that the EU-US employment difference results from Americans allocating more time to work (short vacations, less hours worked) than Europeans, and thus demanding greater labour intensive consumer services.

1. INTRODUCTION: EUROPE'S EMPLOYMENT PROBLEM

Analyses of the European employment problem mix three different measures of employment. Some studies focus on absolute numbers employed, whose growth falls short of US numbers employed in part simply because of slower growth of population in the EU than in the US (Krueger/ Pischke 1999 specifically for the US-German comparison). Other studies focus on the industrial composition of employment, in particular on the low share of low-wage service sector employment in EU countries than in the US. The difficulty with shares of employment is they are only indirectly related to employment rates. Other analysts stress employment to adult population ratios, since these link employment to the potential adult working population. Since ratios of employment in a sector to the adult population link the industrial composition of employment to the aggregate employment rate, they are the measure of employment on which this study focuses.²

The higher employment-population ratios in the US compared to the EU and Germany³ are a recent phenomenon, which developed in the late 1970s and 1980s. Before then the EU and Germany had higher employment-population ratios (see Figure 1.1 and Figure 1.2). The difference in employment-population ratios developed more through enormous job growth in the US than through declining employment in Europe. The differential trends in the use of labour are even more pronounced if we adjust employment-population rates for differences in hours worked per

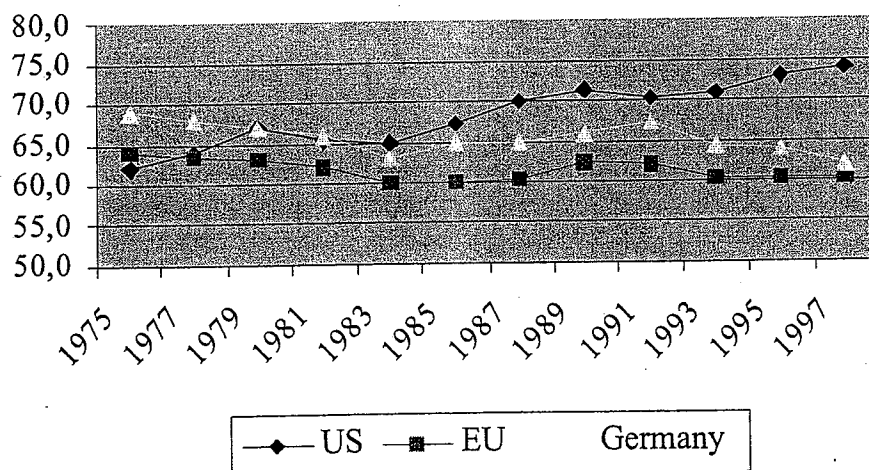
employee to obtain measures of hours worked per adult population (lower panel of Figure 1.2). The differential employment growth between Germany and the US coincides with diverging proportions of women working, differing patterns of youth integration into work, and differences in the employment of the elderly.

It is not possible to explain the difference in employment growth between Germany and the US by differences in the growth of aggregate GDP per capita between the countries. Depending on the years chosen, over the longer run Germany has had as rapid or more rapid aggregate growth (Freeman/ Schettkat 1999a). But the structure of employment by industry in the EU and Germany changed differently than the structure of employment by industry in the US (upper panel of Figure 2). The US shifted workers to the service sector more rapidly than did the EU or Germany, and had an exceptional growth in some low wage and low skilled retail trade sectors - so-called Mc(Donald's) Jobs. The difference in the composition of US and German employment structures raises the question on which this study focuses: whether or in what ways the structural composition of the economy affects employment growth.

1.1. HYPOTHESES

The most popular explanation for the differential pattern of growth of low-wage service sector industries between the EU and the US is the **wage compression hypothesis** that the US has a more flexible wage structure. Both the

FIGURE 1.1 EMPLOYMENT-POPULATION RATIOS IN THE US, THE EU AND GERMANY (WEST)



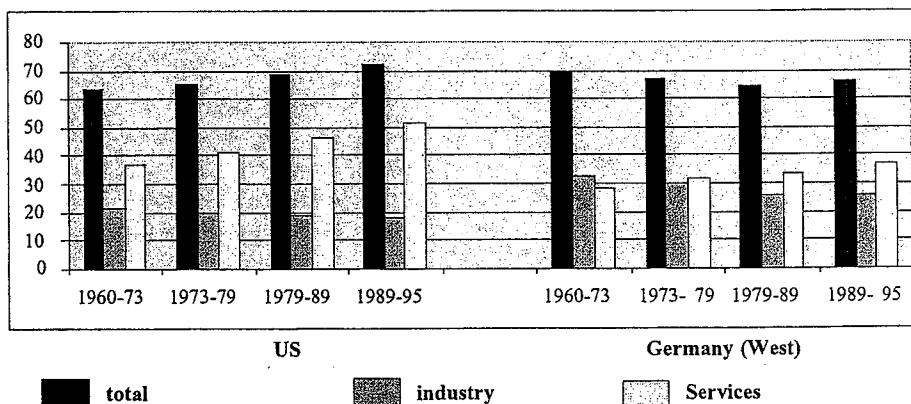
Source: EU, Employment Rates Report 1998.

² The aggregate employment to population rate is simply the sum of employment-population rates by sector.

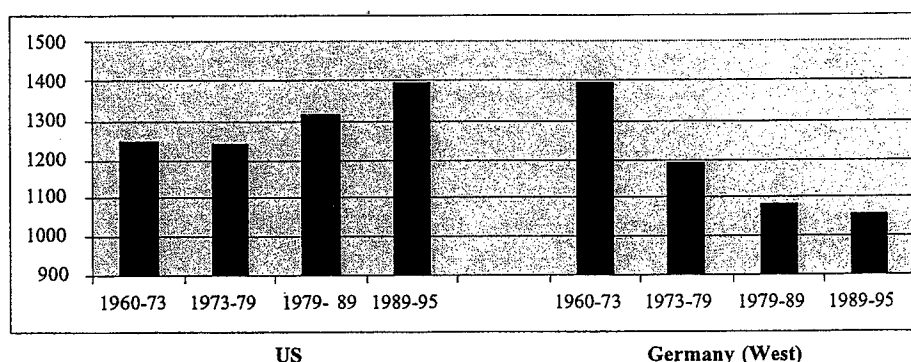
³ In this study we use Germany and West-Germany as synonyms. If we refer to the united Germany it will be mentioned explicitly.

FIGURE 1.2 EMPLOYMENT-POPULATION RATIOS, AND HOURS WORKED PER HEAD OF THE ADULT POPULATION (15-65 YEARS) IN THE US AND GERMANY

employment population ratios (US-concept)



total hours worked per head of adult population (15-65 years)



Source: BLS 1998, OECD Historical Statistics (diskette)

EU and US economies faced the same economic shocks: oil price increases, comparable new technologies, and increased globalisation of economic activity, which adversely affected the demand for unskilled, low-wage workers. The US responded with flexible downward adjustment in the wages of these workers relative to more skilled workers, protecting employment in industries and occupations that disproportionately use low skill labours. By contrast, in Europe the wages of unskilled workers remained constant or even increased relative to wages for skilled workers. Consequently employment of less skilled workers and employment in low-wage, low-skill and often service industries fell in Europe relative to the US.

This explanation treats the difference between the US and German (EU) employment structures as real. It is supported by official statistics that show that the major difference between European/ German and American job growth is in service industries (Figure 2), which employs a disproportionate number of lower wage workers. As we have documented elsewhere (Freeman/ Schettkat 1998,

1999b) Germany is about 20 years behind the US in terms of a shift to service employment. In the 1970s-1990s, service employment expanded in Germany but not by enough to compensate for declining employment in manufacturing. But some analysts have questioned these data on the grounds that much of German business service activity is counted in manufacturing rather than in services (DIW 1996). If this **measurement error hypothesis** is true, the divergence between the structure of the economies may be an artefact of the data; and the clue that the different employment performances of the US and EU has a major structural component would be misleading.

But even if, as we find, the difference in service sector employment is real, it may still be that the standard explanation for this difference - the wage compression story - is exaggerated. In fact our analysis attributes only a modest part of the differential trend in employment-population ratios between Germany and the US to the relatively high wage of less skilled German workers (Freeman/

Schettkat 1999a). An alternative interpretation of the measured structural difference in employment is that Germany lacks low-skill service sector jobs because Germany lacks low-skilled labour. The **skill compression hypothesis** holds that the key to understanding the differential structure in US-German employment lies not in measurement differences nor pay differences but in the underlying distribution of skills between the two economies. We find some support for this hypothesis, but it also falls short of explaining the US-German difference in employment experience.

Thus, our analysis supports the structuralist point that Germany and the EU can increase employment population rates only through expansion of the services sector, but leaves open the \$64,000 question: why has the service sector developed so differently between Germany (EU) and the US?

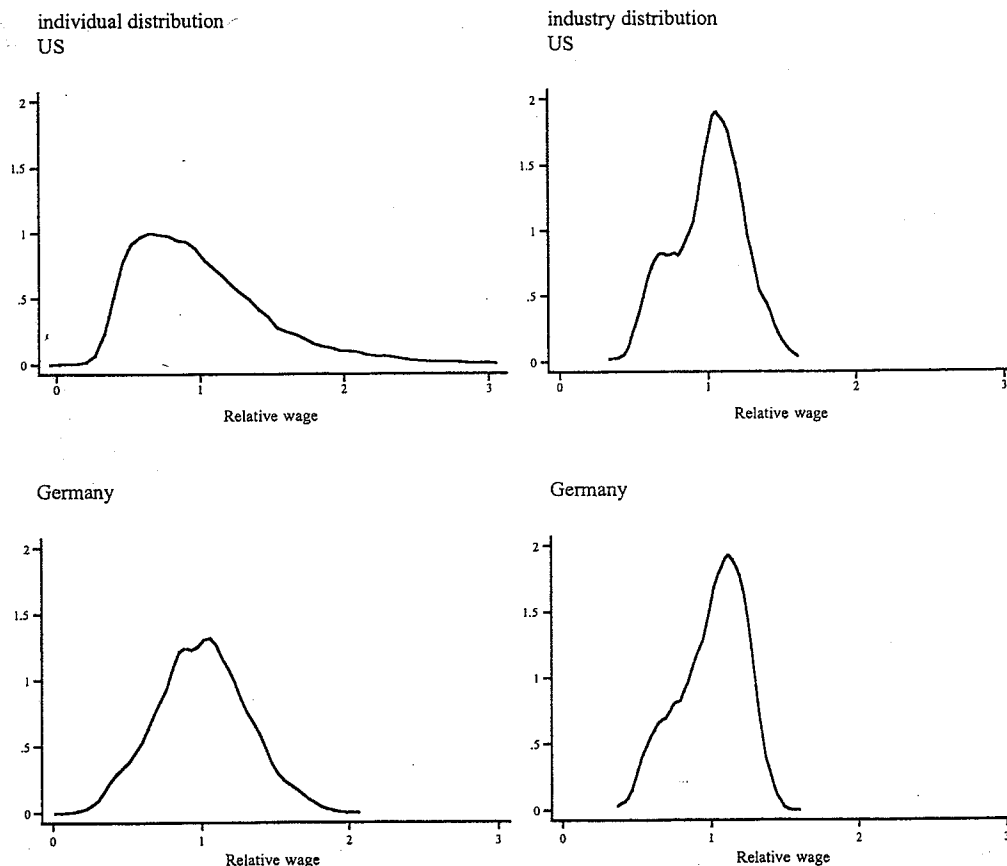
1.2. THE COMPARABLE GERMAN AMERICAN STRUCTURAL DATA FILE

In this report we analyse the growth of service sector employment between the German and the US economy

with a unique data set that we developed: the Comparative German American Structural Database (CGAS, see Freeman/ Schettkat 1998). This newly constructed database classifies workers in the two countries into comparable detailed occupations (about 95) and industries (about 65) for the period 1970 to 1995 (for more details see Freeman/ Schettkat 1998 and Appendix I). The underlying sources of the data for the CGAS database are the US Census of Population, the Current Population Survey, the German Mikrozensus and German social security data (Beschaeftigtenstatistik). Combining these files provides us with a detailed database, which contains employment in highly desegregated cells defined along education, industry, occupation, age, etc. lines. The data set includes not only educational attainment but an "equivalent skill measure" (Freeman/ Schettkat 1999c, Appendix II) and wages for each of the groups. Theoretically the data allows for differentiation of about 1.2 million cells per year, though in fact some cells are empty and others have too few observations to provide meaningful information.

Our analysis proceeds as follows. First, we investigate the measurement error hypothesis that measured differences

FIGURE 3.1 INDIVIDUAL AND INTER-INDUSTRY WAGE DISTRIBUTION IN THE US AND GERMANY



Source: CGAS data base.

in the structure of the German and the US economy are spurious (section 2). According to this view, Germany has as large a service sector as the US, but German manufacturing firms perform service activities in-house rather than buying them from service firms. If this view were correct, much of the remainder of this study would consist of blank pages. It is not, and we show why.

Then we analyse the differences between the US and German employment patterns by sector and occupation. Section three uses the CGAS to analyse the relations between the structure of wages and employment by industry and the link between industry wage growth and employment growth. Section 4 identifies service industries with strong employment growth, and those with large differences in employment between the US and Germany. We also investigate whether these service industries have specific characteristics that may explain their employment performance. Section 5 examines the relation between the level of wages and employment growth and section 6 investigates the distribution of low-wage workers. Section 7 analyses whether relative wages and employment are correlated. Section 8 concludes by trying to explain the difference in employment structures in terms of differences in gross labour costs and product demand between the two countries.

2. THE MEASUREMENT ERROR HYPOTHESIS

Services cover a broad range of heterogeneous industries and activities. Some service industries are dominated by low-skill, low-pay jobs. Others are dominated by high-skill, high-pay jobs. Some service activities produce final products that consumers use. Others produce intermediate products for businesses that businesses could produce in-house. Because service activities are so heterogeneous, they can be located in different parts of an economy: in the industrial sector or in services proper, in the household sector or in the market sector. This heterogeneity suggests that two economies could perform the same amount of service activity while National Accounts statistics, which place firms in industries by their main product, would show one with a larger service sector than the other. For example, if a specific service, say marketing or catering, is provided in-house by a firm whose main product is a manufactured good, National Product statistics would count the employees producing this service as manufacturing employees. If, on the other hand, the firm buys the same service from a specialised service company, National Accounts statistics count the employees as service sector employees.

In the case of international comparisons, if countries differ in the degree of specialisation of firms, the country

with a higher degree of specialisation will have higher service-sector employment in National Accounts statistics, due to differences in the location of the work rather than to differences in economic activities as such. On these grounds DIW (1996) has argued that the data showing that the US service sector is so much bigger than the German service sector is 'measurement error' rather than a real difference in the structure of the economies.

Why do firms outsource services rather than producing them in-house? Coase (1937) analyses the boundaries of the firm in terms of minimising of transaction costs. Outsourcing creates transaction costs (search costs, contract costs, evaluation costs etc.) which make it more expensive to hire outside unless the firm that sells the service: (1) faces less expensive costs, due say to being covered by a different collective bargaining contract or internal wage policy; or (2) can produce it more efficiently with the same cost structure as the purchasing firm.

It is difficult to say a priori whether German manufacturing firms should do more or less outsourcing than American manufacturing firms. Collective bargaining is much more important in the German economy than in the US economy, and German service companies are usually covered by different contracts than German manufacturing firms. This should give German firms a greater incentive to outsource than American firms. But American firms generally pay for the health care of their workers so that large industrial firms can save on health care expenses if they subcontract work to lower wage service sector firms, who often do not have to provide such benefits. In addition, while large US firms may have collective contracts, many smaller service sector firms do not. These factors give American firms greater incentive to outsource.

But costs are only half of the outsourcing decision. Even with a similar cost structure, a specialised service company may hire more specialised workers and build up competence or economies of scale not available to a firm that produces services in-house. Consultant services, advertisement, accounting, the high paid McKinsey jobs are prime examples. Automobile firms have legal divisions, but they contract out specialised legal services and, faced with major law suits, will rely on major law firms rather than their own internal lawyers. Here the larger size of the US market may produce greater specialisation and outsourcing, though the formation of the Common Market should partially counteract these economies of scale effect.

In any case, if German firms were less specialised than their American counterparts, these firms would produce more service activity in-house. Measured German busi-

ness service sector would be smaller than the American one. If, in addition, German and American consumers were equally specialised, the two consumer service sectors would have comparable employment levels. The result would be that Germany would have a relatively smaller business component in its service sector. But this is not the case (see e.g. Appelbaum/ Schettkat 1990, Freeman/ Schettkat 1998, EU 1999). Dividing service industries between business and consumer services,⁴ shows that a larger proportion of the service sector is devoted to business services in Germany than in the US. However, this could be due to greater outsourcing by American households, who consume more services than Germans because more women members of households are employed, leading households to outsource household production. Americans purchase more meals from take-aways and restaurants than do Germans, moving the activity of making meals from the household into the market. The aggregate data thus allow for alternative interpretations. A better way to analyse the relation between the activities of manufacturing and household consumption, and the service sector is with Input-Output tables, which allow us to differentiate industry output by demand categories. With standard Input-Output tables we can distinguish between intermediate business purchases of services and consumer final purchase of the output of the service sector. Table 2.1 summarises the results of comparing German and US input-output tables in terms of the purchases by manufacturers of intermediate and final purchases of services. The input-output data show, contrary to the common view, that **the share of intermediate services in manufacturing output is higher in Germany than in the US** (top panel of Table 2.1). By this metric German manufacturing firms specialise as much or more than their US counterparts. The same pattern is found when we compare the share of intermediate production in the gross production of the originating sector delivered to the other sector (middle panel of Table 2.1). Thus the service industries in Germany are much more directed to business services. It is consumer demand that is more directed to services in the US than in Germany. In 1990 about 72% of the overall consumer demand in the US was demanded for services whereas this share was only 56% in Germany (lower panel Table 2.1). These shares are close to the employment shares - 72% for serv-

ice sector employment in the US and 57% for Germany found in the BLS international data file.

Another way to analyse the extent of service sector activities in Germany versus the US is to compare the industrial classification of workers into services vs. manufacturing with an occupation or task-based classification of workers into services vs. producing work.

In the CGAS we classified occupations into servicing occupations and producing occupations and compared this classification with the conventional industry classification. The results, summarised in Table 2.2, show that some of the US-German difference in the shares of producing and servicing activities may be due to differences in the location of service activities among sectors, but that most of the German-US service activity gap remains in the occupation based classification. The difference in service activities is just 3 percentage points lower measured along the occupational dimension (10%-points) than along the industry dimension (13%-points).

Why has shifting from measuring services by industry to measuring services by occupation had only a modest impact on the gap in service activities between the countries? The answer is found in Table 2.3, which shows that the vast bulk of servicing occupational employment is in fact found in service sector industries. This table measures the share of producing and servicing activities within service industries. Here, we distinguish between business and consumer services although this classification is blurred because many 'business service industries' serve consumers as well (e.g. education, air transportation see footnote 3). Service industries are dominated by activities (occupations) classified as servicing. The share of servicing activities within service industries often exceeds 90%. The only exception are repair services ('automotive repair services' here classified as a business service, and 'other repair services' here classified as consumer services) in which producing activities dominate. The main conclusion from these data is that while the industry classification is imperfect, it still gives an accurate picture of economic structure. The difference in the structure between the two economies is not just measurement error. It is real.⁵ The \$64,000 question remains.

⁴ The common classification of services into business (intermediate services) and consumer (final) services is itself somewhat arbitrary. Although some industries mainly provide services for business and others mainly for consumers the distinction is blurred. Hotels and restaurants may serve consumers but they also serve businessmen. Similarly are educational and training services partly provided for business partly for consumers. Government services are by definition 'final demand' in National Accounts statistics but a substantial part of government services is intermediate input into production. Since it is difficult to split the output of an industry according to user characteristics, the classification is in the end, as many economic statistics, based on convention, which leaves room for speculations on the driving forces behind service sector expansion.

⁵ This result also holds if employment is measured in full-time equivalents instead of persons employed (lower panel of Table 2.2).

TABLE 2.1

SHARE OF INTERMEDIATE GOODS AND SERVICES IN GROSS PRODUCTION (%) AND SHARE OF SERVICES AND MANUFACTURING PRODUCTS IN PRIVATE CONSUMER DEMAND

	USA		Germany (West)	
	1977	1990	1978	1990
Share of intermediate products used as input (% of gross production of receiving industry)				
Services delivered to manufacturing in gross production of manufacturing	12,3	12,8	13,0	16,7
Manufacturing goods delivered to services in gross production of services	8,2	7,6	11,3	9,2
Share of intermediate production delivered to the other sector (% of gross production of the delivering industry)				
Services delivered to manufacturing as a share of gross production of service industries	10.0	8.3	15.8	17.1
Manufacturing goods delivered to services as a share in gross production of manufacturing industries	9.1	10.9	8.0	8.1
Share of services and manufacturing products in final consumer demand				
Services	65.3	71.7	51.5	56.3
Manufacturing goods	29.6	23.9	52.6	38.2

Source: Russo/Schettkat 1999, computations are based on the OECD Input-Output Database. Public sector not included.

Manufacturing: Manufacturing (ISIC 3)

Services: Wholesale and retail trade, restaurants and hotels (ISIC 6), Transport, Storage and Communication (ISIC 7), Financial, Insurance, Real Estate and Business Services (ISIC 8), Community, Social and Personnel Services (ISIC 9).

TABLE 2.2

EMPLOYMENT SHARES IN SERVICES AND MANUFACTURING INDUSTRIES AND IN SERVICING AND PRODUCING OCCUPATIONS (%)

	Germany (West)		US		Germany - USA	
	Industries	Occupations	Industries	Occupations	Industries	Occupations
Weighted by persons employed						
Services/ Servicing	61	68	75	78	-13	-10
Manufacturing/ Producing	37	30	24	21	13	10
Agriculture	1	1	1	2	0	0
Weighted by hours worked (full-time equivalents)						
Service/ Servicing	60	67	73	76	-13	-10
Manufacturing/ Producing	39	32	25	21	14	10
Agriculture	1	1	1	2	0	0

Source: CGAS data base

TABLE 2.3

THE SHARE OF SERVICING OCCUPATIONS IN BUSINESS AND CONSUMER SERVICE INDUSTRIES

Industry	Germany (West)	US	Germany - US
Manufacturing	39.4	43.4	-4.0
Services	86.9	89.8	-2.8
Business services	86.1	89.6	-3.5
Consumer services	89.0	90.4	-1.5
Detailed business service industries:			
Railroads	71.5	65.7	5.8
Communication services	86.3	83.3	3.0
Water transportation	85.0	78.6	6.4
Air transportation	81.4	75.1	6.3
Bus, taxi, trucking, rent-a-car, gas service	80.0	82.9	-2.9
Wholesale trade, durable	74.8	83.4	-8.6
Wholesale, final products	77.2	76.6	0.6
Wholesale, intermediate products	75.0	74.7	0.4
Wholesale, chemical products	83.1	89.2	-6.1
Wholesale trade, non-durable	77.1	74.0	3.1
Real estate	94.4	83.6	10.9
Finance	97.3	99.2	-2.0
Advertising	81.5	92.6	-11.1
Services to dwellings and other buildings	95.1	96.5	-1.3
Business services	77.9	86.0	-8.1
Computer and data processing services	93.1	94.3	-1.2
Automotive repair and related services	16.7	29.3	-12.5
Education & research	93.1	96.9	-3.8
Engineering, architectural and surveying services	93.7	97.0	-3.3
Legal, management, accounting & PR services,	98.1	99.4	-1.3
Detailed consumer service industries:			
Health	94.6	97.0	-2.3
Retail trade, non-food	84.5	86.5	-2.0
Retail trade, food	88.1	71.6	16.5
Eating, drinking & care facilities	88.3	97.5	-9.2
Other repair services	23.4	26.6	-3.2
Private households	95.1	96.4	-1.3
Personal services	86.6	79.5	7.1
Entertainment, sports	86.8	86.4	0.4
Membership organisations	93.4	96.4	-3.0

Source: CGAS data base

3. WAGE-STRUCTURE AND CHARACTERISTICS OF INDUSTRIES

The desegregate CGAS data confirms the fact demonstrated in other data sets that the dispersion of wages in the US is substantially wider than in Germany. Economy-wide, the standard deviation of ln wages in the CGAS is 0.47 in the US and 0.34 in Germany - a 0.13 ln point difference. But the inter-industry distribution of wages looks surprisingly similar between the two countries (see Figure 3.1). The standard deviation of ln mean wages across industries uncontrolled for skill composition is 0.26 for the US and 0.23 for Germany. Not only is the dispersion similar but so too are the industry wages relative to the mean wage in each country. The coefficient of correlation between wages by industry is 0.78; the rank correlation coefficient is 0.74. (columns 2 and 3 in Table 3.1). Despite differences in wage-setting the same industries are at roughly similar positions in the wage distribution (ranks) and pay similar relative mean wages in the US and Germany.

How is it that countries with very different distributions of wages among individuals produce such similar patterns of wages at the industry level?

One answer to this question is arithmetical. If the total dispersion of ln wages is larger in the US than Germany and the dispersion of average industry wages is similar, Germany must have either lower dispersion of pay within industries than the US or a higher proportion of workers in sectors with low dispersion.⁶ Column 5 of Table 3.1 shows that within-sector dispersion dominates the data. In all but three industries (private households, agriculture, and personal services) the standard deviations of ln wages in Germany are smaller than the standard deviation of ln wages in the US. The left-hand skew of the distribution of wages in the US overall is replicated by the left-hand skew of the distribution of wages within industries. This is shown by the ratio of the median wage over the mean wage (column 4, Table 3.1), which are below one. In this metric the value of one indicates a symmetrical distribution, and values below one indicate a left skewed distribution, where proportionately more than half the workers earn less than the mean. In the US a majority of workers is paid below the average wage. The opposite pattern is true for Germany, where the wages within almost every industry follow a symmetric distribution comparable to the wages in the overall economy. There is a surprising sense of self-similarity in the distributions as we desegregate them, shades of fractals. Whether this level pattern

further replicates itself in the distribution of pay among firms or in the distribution of pay within firms cannot be determined from the CGAS, which lacks firm level data.

But we can go beyond the arithmetic to explore a deeper answer to why Germany and the US have dissimilar earnings distributions overall but similar distributions of mean wages by industry. This is that German firms employ a less heterogeneous work force than US firms in the same industry. Columns 6, 7, and 8 of Tables 3.1 and 3.2 display the intra-industry skill distribution for skill-equivalent labour developed in Freeman/ Schettkat 1999c (see also Appendix II). Skill equivalents better reflect differences in the educational systems of the two countries than years of schooling, the common skill measure. Consistent with the left-hand skew in the earnings distribution, the skill distribution in the US is more concentrated in the lowest skill-group I (Realschule in Germany, Highschool in the US) than in Germany. This can be seen by comparing the ratio of workers in skill-group II+ (Lehre or higher education in Germany, college or higher education in the US) over workers in skill-group I (columns 9 in Table 3.1) between the two countries. This ratio is substantially higher in Germany than in the US, overall and in every industry. Again, going back to the arithmetic, an American industry that combines high-wage, high-skill and low-wage, low-skill workers could readily have the same wage relative to national average as a German industry that hires a more homogeneous group of workers. Within- industry variation in wages would be higher in the US but the industry would be as far from the national average as in Germany.

The CGAS contains data on the occupation of workers within industries that allows us to explore the employment of workers who do different tasks in an industry in greater depth. If German firms were more specialised than American firms, they would employ fewer occupations within an industry. This in turn would help explain the lower intra-industry dispersion of wages in Germany than in the US. To measure the specialisation of employment within an industry, we use a measure of concentration of activity from the industrial organisation literature: the Herfindahl⁷ index. The lower is this index, the more firms (occupations) operate in the sector and thus less concentrated is the activity. We calculated a Herfindahl measure of occupational concentration within industries. In about 60% of the 64 industries in our data, Germany has a greater number of different occupations than the US but a higher Herfindahl index of occupational concentra-

⁶ This is based on the decomposition of the variance of wages into its intra-industry component and cross-industry component.

⁷ The Herfindahl index is the sum of the . shares. $H = \sum a_i^2$; a_i = share of firm i

TABLE 3.1 INDUSTRY WAGE CHARACTERISTICS, US (SORTED BY 1989 US WAGES, ASCENDING)

Industry	Type	Wages				Skills			Occupations		
		Wage relative to mean wage	Wage rank (1=lowest)	Median/mean	Standard deviation of Ln wage	share of skill group in industry employment		ratio	number	Herfindahl	
	I	2	3	4	5	6	7	8	9	10	11
Private households	Services	0.41	1	0.90	0.38	0.86	0.10	0.04	0.17	36	0.63
	Agriculture	0.57	2	0.90	0.29	0.75	0.15	0.10	0.34	51	0.73
Eating, drinking & care facilities	Services	0.62	3	0.86	0.38	0.68	0.20	0.12	0.48	66	0.12
	Manufacturing	0.64	4	0.79	0.37	0.83	0.10	0.07	0.20	44	0.32
Personal services	Services	0.66	5	0.86	0.37	0.73	0.18	0.10	0.38	46	0.23
	Services	0.66	6	0.89	0.34	0.76	0.17	0.07	0.32	38	0.39
Retail trade, food	Services	0.70	7	0.90	0.36	0.74	0.19	0.07	0.34	43	0.36
	Manufacturing	0.70	8	0.86	0.36	0.87	0.08	0.05	0.14	39	0.11
Leather and leather products	Manufacturing	0.71	9	0.86	0.45	0.83	0.09	0.08	0.21	33	0.13
	Services	0.73	10	0.89	0.36	0.60	0.24	0.16	0.66	70	0.36
Retail trade, non-food	Services	0.73	11	0.96	0.58	0.75	0.15	0.10	0.33	24	0.58
	Agriculture	0.73	12	0.85	0.35	0.80	0.11	0.08	0.25	42	0.17
Carpets and rugs	Manufacturing	0.81	13	0.91	0.35	0.80	0.13	0.08	0.26	53	0.06
	Manufacturing	0.82	14	0.79	0.52	0.70	0.20	0.09	0.42	32	0.10
Toys, amusement, and sporting goods	Manufacturing	0.83	15	0.97	0.34	0.81	0.15	0.04	0.24	40	0.41
	Services	0.84	16	0.91	0.45	0.73	0.17	0.10	0.36	24	0.14
Pottery and related products	Manufacturing	0.86	17	0.92	0.44	0.38	0.19	0.43	1.64	54	0.14
	Services	0.87	18	0.82	0.60	0.67	0.20	0.14	0.50	44	0.08
Membership organizations	Manufacturing	0.88	19	0.83	0.46	0.45	0.27	0.28	1.22	70	0.06
	Services	0.90	20	0.96	0.39	0.71	0.20	0.09	0.42	47	0.13
Miscellaneous manufacturing	Services	0.90	21	0.98	0.34	0.68	0.22	0.10	0.46	62	0.14
	Other repair services	0.91	22	0.82	0.53	0.48	0.27	0.25	1.08	60	0.11
Bus, taxi, rent-a-car, gasoline	Services	0.93	23	0.86	0.46	0.66	0.17	0.17	0.52	56	0.10
	Entertainment, sports	0.93	24	0.92	0.42	0.71	0.18	0.10	0.40	48	0.11
Wholesale, intermediate products	Services	0.94	25	0.82	0.60	0.54	0.18	0.28	0.85	32	0.17
	Manufacturing	0.94	26	0.96	0.39	0.63	0.21	0.16	0.58	45	0.11
Rubber and misc. plastics	Agriculture	0.95	27	0.91	0.41	0.71	0.17	0.12	0.41	54	0.08
	Services	0.96	28	0.88	0.40	0.40	0.28	0.33	1.52	63	0.12
Forestry	Manufacturing	0.96	29	0.86	0.51	0.43	0.26	0.30	1.31	51	0.19
	Agriculture	0.96	30	0.91	0.41	0.54	0.23	0.23	0.86	47	0.09
Wholesale trade, nondurable	Services	0.96	30	0.91	0.41	0.54	0.23	0.23	0.86	47	0.09
	Manufacturing	0.96	30	0.91	0.41	0.54	0.23	0.23	0.86	47	0.09
Food industries	Services	0.99	30	0.88	0.40	0.40	0.28	0.33	1.52	63	0.12
	Health	0.99	30	0.88	0.40	0.40	0.28	0.33	1.52	63	0.12
Real estate	Services	1.02	30	0.86	0.51	0.43	0.26	0.30	1.31	51	0.19
	Manufacturing	1.02	30	0.91	0.41	0.54	0.23	0.23	0.86	47	0.09
Printing, publishing, etc.	Services	1.02	30	0.86	0.51	0.43	0.26	0.30	1.31	51	0.19
	Manufacturing	1.02	30	0.91	0.41	0.54	0.23	0.23	0.86	47	0.09

Metal industries	Manufacturing	1.04	31	0.94	0.35	0.73	0.16	0.11	0.36	61	0.07
Wholesale, final products	Services	1.07	32	0.88	0.49	0.49	0.24	0.28	1.05	34	0.14
Engines, machines	Manufacturing	1.07	33	0.95	0.35	0.68	0.20	0.12	0.47	57	0.06
Construction	Manufacturing	1.07	34	0.98	0.31	0.73	0.18	0.09	0.38	70	0.19
Cycles and misc. equipment	Manufacturing	1.08	35	0.89	0.44	0.75	0.16	0.09	0.34	26	0.14
Education & research	Services	1.08	36	0.99	0.41	0.27	0.16	0.57	2.69	75	0.23
Nonmetal mining, glass & stone	Manufacturing	1.09	37	0.93	0.38	0.74	0.15	0.11	0.36	55	0.06
Beverage industries	Manufacturing	1.11	38	0.92	0.37	0.58	0.24	0.18	0.72	40	0.08
Wholesale trade, durable	Services	1.12	39	0.94	0.41	0.49	0.27	0.25	1.06	53	0.14
Paper and allied products	Manufacturing	1.14	40	0.93	0.41	0.69	0.16	0.15	0.44	49	0.10
Finance	Services	1.16	41	0.85	0.41	0.40	0.27	0.33	1.47	54	0.12
Government	Services	1.17	42	0.94	0.44	0.41	0.27	0.32	1.45	74	0.07
Electrical machinery, supplies	Manufacturing	1.17	43	0.82	0.47	0.56	0.21	0.23	0.78	61	0.06
Wholesale, chemical products	Services	1.18	44	0.89	0.47	0.40	0.23	0.37	1.49	31	0.15
Photographic equipment, watches	Manufacturing	1.19	45	0.86	0.47	0.50	0.23	0.27	1.00	48	0.06
Water transportation	Services	1.21	46	0.89	0.54	0.60	0.18	0.22	0.66	38	0.08
Railroad locomotives and equipment	Manufacturing	1.23	47	0.92	0.40	0.64	0.23	0.13	0.56	20	0.11
National security, internat. aff.	Services	1.23	48	0.92	0.41	0.40	0.29	0.30	1.47	68	0.07
Motor vehicles and equipment	Manufacturing	1.26	49	0.98	0.38	0.67	0.19	0.14	0.48	56	0.09
Metal mining	Mining	1.27	50	0.96	0.37	0.62	0.20	0.18	0.60	33	0.09
Public utilities	Services	1.27	51	0.96	0.38	0.55	0.25	0.20	0.83	63	0.06
Communication services	Services	1.28	52	0.97	0.29	0.54	0.28	0.18	0.84	55	0.14
Legal, management, accounting & PR	Services	1.30	53	0.85	0.45	0.22	0.21	0.57	3.48	50	0.15
Advertising	Services	1.33	54	0.79	0.55	0.24	0.27	0.49	3.21	33	0.20
Chemicals and allied products	Manufacturing	1.34	55	0.93	0.44	0.50	0.19	0.32	1.01	63	0.06
Air transportation	Services	1.35	56	0.90	0.49	0.41	0.33	0.26	1.43	49	0.10
Air, ship & space manufactures	Manufacturing	1.36	57	0.94	0.40	0.47	0.24	0.28	1.11	62	0.06
Tobacco manufactures	Manufacturing	1.36	58	0.99	0.46	0.52	0.23	0.25	0.94	29	0.08
Railroads	Services	1.38	59	0.96	0.29	0.70	0.18	0.12	0.43	43	0.14
Oil & gas extraction	Mining	1.41	60	0.88	0.52	0.43	0.21	0.36	1.31	50	0.08
Engineering, architecture, survey	Services	1.41	61	0.94	0.40	0.21	0.23	0.56	3.75	49	0.26
Computer and data processing	Services	1.45	62	0.99	0.43	0.21	0.26	0.53	3.76	37	0.24
Petroleum and coal products	Manufacturing	1.49	63	0.94	0.43	0.50	0.21	0.29	1.00	45	0.06
Office related; computers etc.	Manufacturing	1.52	64	0.96	0.46	0.32	0.27	0.41	2.12	49	0.09
TOTAL US 1989:											0.04

TABLE 3.2 INDUSTRY WAGE CHARACTERISTICS, WEST-GERMANY (SORTED BY 1989 US WAGES, ASCENDING)

Industry	Type	Wages				Skills				Occupations	
		Wage relative to mean wage	Wage rank (1=lowest)	Median/mean	Standard deviation of Ln wage	(share of skill group in industry employment)	I	II	III*	ratio II/I	Herfindahl number
	1	2	3	4	5		6	7	8	9	10
Private households	Services	0.45	1	1.00	0.39		0.47	0.51	0.02	1.12	21
Agriculture	Agriculture	0.50	2	0.98	0.34		0.47	0.50	0.03	1.12	42
Eating, drinking & care facilities	Services	0.63	5	1.00	0.34		0.32	0.63	0.05	2.13	55
Apparel etc.	Manufacturing	0.76	13	0.93	0.30		0.28	0.69	0.03	2.56	47
Personal services	Services	0.53	3	0.92	0.40		0.17	0.81	0.02	4.97	45
Services to dwellings etc.	Services	0.66	6	0.97	0.29		0.52	0.46	0.02	0.93	26
Retail trade, food	Services	0.60	4	0.95	0.35		0.20	0.78	0.02	3.89	46
Meat products	Manufacturing	0.70	8	0.97	0.25		0.21	0.78	0.01	3.86	35
Leather and leather products	Manufacturing	0.77	14	0.98	0.34		0.39	0.58	0.03	1.57	38
Retail trade, non-food	Services	0.66	7	0.98	0.34		0.13	0.81	0.06	6.54	74
Fishing	Agriculture	0.70	9	1.01	0.28		0.19	0.81	0.00	4.37	9
Carpets and rugs	Manufacturing	0.88	23	0.98	0.28		0.38	0.59	0.03	1.63	49
Lumber and wood products	Manufacturing	0.94	27	0.98	0.20		0.19	0.78	0.03	4.15	58
Toys, amusement, and sporting goods	Manufacturing	0.90	26	1.00	0.27		0.26	0.69	0.05	2.88	42
Autom. Repair services etc.	Services	0.84	19	0.97	0.17		0.09	0.88	0.03	10.10	43
Pottery and related products	Manufacturing	0.96	29	1.00	0.24		0.36	0.59	0.05	1.76	54
Membership organizations	Services	1.02	33	0.99	0.25		0.15	0.57	0.28	5.83	67
Miscellaneous manufacturing	Manufacturing	1.08	43	0.99	0.21		0.26	0.69	0.05	2.80	54
Business services	Services	0.79	15	0.97	0.26		0.20	0.66	0.13	3.88	54
Other repair services	Services	0.72	10	1.00	0.28		0.10	0.86	0.04	8.87	28
Bus, taxi, rent-a-car, gasoline	Services	0.88	22	0.99	0.16		0.19	0.77	0.04	4.14	64
Entertainment, sports	Services	1.07	42	1.01	0.23		0.15	0.59	0.26	5.68	53
Wholesale, intermediate products	Services	0.96	28	0.99	0.20		0.16	0.78	0.06	5.15	55
Rubber and misc. plastics	Manufacturing	1.04	37	0.99	0.22		0.34	0.61	0.05	1.96	56
Forestry	Agriculture	0.90	25	0.99	0.19		0.23	0.65	0.11	3.28	16
Wholesale trade, nondurable	Services	0.75	11	0.99	0.30		0.22	0.75	0.03	3.65	42
Food industries	Manufacturing	0.79	17	0.98	0.28		0.25	0.72	0.03	2.95	63
Health	Services	0.89	24	0.96	0.25		0.13	0.66	0.22	6.82	69
Real estate	Services	1.04	38	0.96	0.22		0.15	0.72	0.13	5.67	42

Printing, publishing, etc.	Manufacturing.	1.15	51	1.00	0.19	0.16	0.74	0.10	5.16	56	0.13
Metal industries	Manufacturing	1.13	49	0.98	0.19	0.25	0.70	0.05	2.98	68	0.09
Wholesale, final products	Services	0.80	18	0.98	0.30	0.14	0.79	0.07	6.17	48	0.13
Engines, machines	Manufacturing	1.23	56	0.97	0.19	0.14	0.75	0.11	5.90	65	0.09
Construction	Manufacturing	0.97	30	0.97	0.19	0.19	0.76	0.05	4.32	75	0.10
Cycles and misc. equipment	Manufacturing	1.07	40	0.98	0.18	0.24	0.69	0.07	3.10	28	0.14
Education & research	Services	1.17	52	1.02	0.25	0.07	0.27	0.65	12.87	69	0.33
Nonmetal mining, glass & stone	Manufacturing	1.14	50	0.97	0.17	0.25	0.69	0.06	2.94	64	0.09
Beverage industries	Manufacturing	1.07	39	0.98	0.19	0.21	0.72	0.07	3.72	42	0.08
Wholesale trade, durable	Services	0.84	20	0.97	0.25	0.09	0.80	0.11	9.76	40	0.12
Paper and allied products	Manufacturing	0.75	12	1.00	0.33	0.34	0.63	0.03	1.92	45	0.10
Finance	Services	1.19	54	1.00	0.17	0.09	0.81	0.10	9.97	59	0.24
Government	Services	1.11	46	1.00	0.22	0.13	0.66	0.21	6.55	91	0.16
Electrical machinery, supplies	Manufacturing	1.17	53	0.97	0.26	0.21	0.63	0.16	3.72	68	0.06
Wholesale, chemical products	Services	0.79	16	0.97	0.36	0.12	0.81	0.07	7.26	34	0.11
Photographic equipment, watches	Manufacturing	1.02	34	0.98	0.25	0.17	0.74	0.09	4.95	59	0.10
Water transportation	Services	1.08	44	0.99	0.15	0.16	0.73	0.12	5.34	42	0.15
Railroad locomotives and equipment	Manufacturing	1.21	55	0.96	0.16	0.20	0.73	0.07	3.94	26	0.10
National security, internat. aff.	Services	1.04	35	0.97	0.23	0.22	0.65	0.13	3.54	64	0.06
Motor vehicles and equipment	Manufacturing	1.31	61	0.97	0.17	0.21	0.71	0.07	3.66	71	0.08
Metal mining	Mining	1.30	60	0.99	0.12	0.19	0.81	0.00	4.21	16	0.11
Public utilities	Services	1.25	57	0.98	0.17	0.15	0.76	0.09	5.51	64	0.07
Communication services	Services	1.04	36	0.99	0.23	0.15	0.77	0.08	5.78	51	0.21
Legal, management, accounting & PR	Services	0.84	21	0.94	0.25	0.06	0.63	0.31	16.55	42	0.24
Advertising	Services	1.00	32	0.99	0.20	0.08	0.67	0.24	11.01	36	0.14
Chemicals and allied products	Manufacturing	1.26	59	0.98	0.19	0.17	0.68	0.15	4.92	72	0.09
Air transportation	Services	1.25	58	0.98	0.20	0.14	0.69	0.17	6.36	46	0.09
Air, ship & space manufactures	Manufacturing	1.35	62	0.95	0.19	0.08	0.70	0.22	11.61	51	0.08
Tobacco manufactures	Manufacturing	1.12	47	0.96	0.23	0.24	0.70	0.07	3.24	25	0.10
Railroads	Services	1.13	48	0.99	0.16	0.16	0.77	0.06	5.11	50	0.14
Oil & gas extraction	Mining	1.51	64	0.99	0.14	0.08	0.67	0.25	11.36	23	0.09
Engineering, architecture, survey	Services	1.11	45	1.00	0.24	0.07	0.45	0.48	13.15	51	0.23
Computer and data processing	Services	1.07	42	1.05	0.28	0.06	0.57	0.37	16.51	41	0.28
Petroleum and coal products	Manufacturing	0.99	31	0.97	0.24	0.16	0.70	0.14	5.27	34	0.07
Office related, computers etc.	Manufacturing	1.35	63	1.02	0.24	0.12	0.62	0.27	7.39	44	0.08
TOTAL West-Germany 1989:				1.00	0.34	0.19	0.68	0.13	4.32	94	0.04

tion. These results confirm our rejection of the mismeasurement hypothesis in section 2, for it shows that US production is less specialised than German production.⁸ But the higher dispersion of employment by occupation within industries does not explain the higher intra-industry variation of wages in the US. Wage dispersion is high in the US because of high wage variation within occupational groups possibly linked to high skill variation.

4. SERVICE SECTORS WITH DIFFERING EMPLOYMENT EXPERIENCES

There are various ways to categorise industries according to their employment experience. We first examine industries with rapid employment growth, defined as those with a rate of industry-specific employee-population ratios of 30 percent or more in the 25-year period from 1970 to 1995. Which industries had rapid growth, are these the same industries in the US and Germany?

Since the EU employment problem relates to wage and salary jobs rather than to self-employment (which may be a response to lack of wage and salary jobs), we examine wage and salary employment-to-population ratios (employee-to-population ratios) rather than overall employment to population ratios. However, this choice does not influence the results since the two measures correlate highly: those displayed in Table 4.1 correlate with a coefficient of 0.96 or higher.

Columns 5 and 6 of Table 4.1 show a substantial similarity in the industrial pattern of growth between Germany and the US. Rapidly growing industries in the US are to a large extent also rapidly growing industries in Germany. The correlation coefficient between the growth rates is about 0.6. If one looks solely at the service sector industries, where much of the growth is concentrated, the correlation of the changes in employment in the two countries varies considerably over time. For the period 1970 to 1989 the correlation is around 0.8, but from 1989 to 1995 it is only 0.44. Turning to the levels of industry-specific employment-population ratios, the correlation for service sector industries rose from 0.7 in 1970 to 0.9 in 1995, indicating that the structure of the service sectors became more similar over time, although this does not necessarily mean that the levels narrowed. Correlating employment-population ratios in the service industries in 1995 (1989) with that of 1970 produces coefficients higher than .9 in both countries.⁹

Table 4.1 shows the heterogeneity of employment experience in the service industries. There is no uniform pattern of positive employment/population growth rates in the sector. Instead in both the US and Germany employment declined relative to population in about one-third of the service industries (9 out of the 32). Even more striking 'eating, drinking, care facilities' - the number one example for Mc jobs in public discussions - grew at a higher rate in Germany than in the US, albeit from much lower levels. But despite the similarity in growth rates among service sector industries and the increasing correlation in levels of employment between those industries in Germany and the US, columns 8 and 9 in Table 4.1 show that the **absolute difference** in employee-population ratios even increased over time.

What are the job characteristics of industries with rapid employment growth?

Table 4.2 contains the data for answering this question. Consider first the wage characteristics of the rapidly growing sectors. 'Eating, drinking, care' is a low-pay industry in both countries, paying only 63% of the mean in both countries. And there are other 'high-growth' industries like 'services to dwellings', 'business services' which are typically low skill and low paid services, but generalising from these cases is very misleading, for there are also high wage service industries which had rapid growth. In fact, the overall correlations between employment growth and the level of wages or almost all other industry-characteristics are slight. The only significant correlation between the growth rates in employee-population ratios for the US is with measures of the age composition of the work force. Industries with a low average age of employees in the industry or with a high share of employees below 35 years) tended to grow more rapidly than others. But the causality here must surely run from growth to the age composition of employment as growing service industries are likely to expand employment by hiring more younger workers. In Germany we find a similar relation between employment growth and age structure as in the US. In addition, rapidly growing German service industries employ a higher share of women.¹⁰ All other industry-characteristics, however, do not significantly correlate with employment growth. Most important, there is neither a significant correlation between employment growth and the relative wage, or wage dispersion in the industry, nor between skill measures:

⁸ Although Germany has a more concentrated intra-industry occupational distribution, industries, which are combining a higher number of occupations are similar industries in both countries. The correlation between the Herfindahl indices for occupational concentration across the industries in the two countries is .73.

⁹ This is very much in line with the results we found in another analysis for the persistence of the overall industry structure (Freeman/ Schettkat 1998).

¹⁰ In both countries, however, do industries with a higher share of female employment have a higher share of low wage workers (workers with a wage two-thirds of the mean) but at the same time do these industries in tendency pay women better compared to the mean industry wage than industries with a low share of female employment.

TABLE 4.1: EMPLOYMENT GROWTH IN SERVICE INDUSTRIES (EMPLOYEES 15-65 YEARS, SORTED BY 1989 US WAGES, DESCENDING ORDER)

Industry	Employee-population ratios				Employment growth between 1970 and 1995		Difference in employment-population ratios US - Germany		Contribution to overall Difference in employee-population ratio of Services	
	US		Germany		US		Germany		1970	
	1970	1995	1970	1995	5	6	7	8	9	10
Computer and data processing	12		34	0.3	379.01	40.85	18.81	-0.01	0.28	-0.08
Engineering, architecture, survey				0.4	59.67	-56.30	-14.49	-0.55	0.04	-5.46
Railroads				0.5	-70.80	61.42	-28.83	0.26	-0.32	2.56
Air transportation				0.2	32.59	85.20	-79.85	0.03	-0.03	0.31
Advertising				0.2	5.35	143.04	19.94	0.15	0.44	1.44
Legal, management, accounting & PR				0.7	162.99	-3.83	-9.03	0.25	0.11	2.48
Communication services				1.2	-12.86	42.80	-41.05	0.35	0.13	3.47
Public utilities				0.8	1.74				0.42	2.98
National security, internat. aff.				0.1	-25.71	-68.26	28.49	-0.09	0.01	-0.91
Water transportation				0.2	-39.77	238.29	-251.61	0.01	-0.29	0.06
Wholesale, chemical products				0.1	-13.32	11.33	47.26	-2.33	-1.61	23.07
Government				0.4	58.59	44.20	-6.90	0.82	1.01	8.08
Finance				2.3	37.30	-22.06	30.95	0.70	0.84	6.90
Wholesale trade, durable				0.3	8.88	92.03	-62.55	3.24	2.99	32.09
Education & research				3.7	29.48	-36.02	50.25	-0.26	-0.06	-2.58
Wholesale, final products				0.3	14.23	15.82	70.69	0.29	0.68	2.91
Real estate				0.5	86.51	116.63	-28.04	1.66	2.66	16.39
Health				1.7	88.59	-24.55	22.44	0.12	0.23	1.18
Wholesale trade, nondurable				0.6	-2.11	-57.88	57.88	-0.37	0.06	-0.36
Wholesale, intermediate products				0.5	-0.01	114.80	39.19	0.28	0.81	2.78
Entertainment, sports				0.0	153.99	70.24	-44.77	0.18	0.21	1.75
Other repair services				0.0	25.47	89.90	-76.03	1.37	0.81	13.58
Bus, taxi, rent-a-car, gasoline				1.9	13.88	95.23	67.48	0.48	1.32	4.75
Business services				0.2	162.71	42.46	-14.89	0.02	-0.06	0.15
Membership organisations				0.5	27.57	-6.84	65.02	-0.21	-0.02	-2.08
Auto. repair services etc.				0.5	58.18	46.38	-19.80	1.15	0.92	11.35
Retail trade, non-food				4.9	26.58	25.95	21.88	0.40	0.78	3.93
Retail trade, food				0.3	47.83	152.97	59.63	-0.03	-0.02	-0.34
Services to dwellings etc.				0.3	212.59	45.77	-63.81	0.11	-0.35	1.06
Personal services				0.3	-18.04	145.86	-21.32	1.09	2.20	10.78
Eating, drinking & care facilities				0.3	124.55	-29.62	-11.54	0.49	0.25	4.84
Private households				0.3	-41.16					1.76
Ten highest paying service industries (according to US 1989 ranks)	12.8	18.6	8.0	12.7						
Employee-population ratio	9.1	8.7	6.9	4.3						
Share in overall employees	12.8	18.6	8.0	12.7						
Ten lowest paying service industries (according to US 1989 ranks)	23.24	28.53	14.37	22.71						
Employee-population ratio										
Share in overall employees										

Source: CGAS data base

TABLE 4.2: CHARACTERISTICS OF SERVICE INDUSTRIES (SORTED ACCORDING TO US 1989 WAGE, DESCENDING)

Industry	US	share of women	skill ratio (skill I/ skill II+)	standard deviation of ln wage	wage ratio median/mean	wage of women/industry wage	industry wage/overall mean wage	wage rank	mean age	share of employees		
										below 35 years	servicing occupations	wage below 2/3
		12		3	4	5	6	7	8	9	10	11
Private households		0.84	5.73	0.38	0.91	0.95	0.41	32	37.0	49.21	88.82	90.5
Eating, drinking & care facilities		0.59	2.13	0.37	0.86	0.93	0.63	31	30.9	69.19	97.57	76.6
Personal services		0.72	2.99	0.37	0.88	0.88	0.66	30	34.5	56.37	79.62	73.9
Services to dwellings etc.		0.45	3.63	0.34	0.89	0.88	0.67	29	35.3	55.53	96.06	70.9
Retail trade, food		0.52	3.00	0.35	0.90	0.84	0.70	28	31.0	68.16	72.20	65.7
Retail trade, non-food		0.57	1.60	0.36	0.89	0.85	0.74	27	33.0	62.77	86.17	61.0
Autom. repair services etc.		0.08	4.75	0.33	0.97	0.91	0.84	26	32.2	67.51	21.62	28.9
Membership organizations		0.54	0.60	0.42	0.91	0.90	0.88	25	41.3	34.43	97.15	33.0
Business services		0.55	1.01	0.45	0.93	0.88	0.90	24	35.0	57.06	89.79	42.2
Bus, taxi, rent-a-car, gasoline		0.23	2.15	0.34	0.98	0.84	0.91	23	35.5	54.32	80.42	22.8
Other repair services		0.17	2.62	0.38	0.96	0.78	0.91	22	35.2	58.51	28.76	24.1
Entertainment, sports		0.42	0.97	0.52	0.84	0.89	0.93	21	32.9	62.46	88.07	46.7
Wholesale, intermediate products		0.24	1.92	0.46	0.86	0.89	0.94	20	37.5	48.57	79.33	31.8
Wholesale trade, nondurable		0.25	1.79	0.38	0.96	0.80	0.96	19	36.8	50.22	81.94	23.3
Health		0.81	0.72	0.39	0.88	0.94	0.99	18	37.9	44.70	96.88	24.0
Real estate		0.54	0.97	0.48	0.85	0.89	1.04	17	38.9	43.15	87.15	22.5
Wholesale, final products		0.39	1.15	0.49	0.88	0.82	1.07	16	36.2	52.57	84.34	28.0
Education & research		0.68	0.36	0.41	0.99	0.90	1.08	15	40.1	34.02	92.65	24.1
Wholesale trade, durable		0.29	0.99	0.41	0.94	0.83	1.13	14	36.4	50.45	81.35	16.4
Finance		0.67	0.71	0.41	0.85	0.80	1.16	13	36.1	52.85	99.18	11.7
Government		0.44	0.68	0.44	0.94	0.85	1.17	12	39.8	36.55	93.96	8.9
Wholesale, chemical products		0.39	0.69	0.47	0.89	0.85	1.18	11	36.6	53.81	88.92	19.4
Water transportation		0.25	1.56	0.54	0.89	0.74	1.21	10	39.5	41.66	76.70	21.1
National security, internat. aff.		0.38	0.67	0.41	0.92	0.81	1.23	9	40.3	33.50	81.63	7.8
Public utilities		0.19	1.19	0.38	0.96	0.83	1.28	8	39.5	38.27	57.58	9.3
Communication services		0.42	1.19	0.29	0.97	0.89	1.28	7	39.7	35.69	80.05	3.8
Legal, management, accounting & PR		0.68	0.39	0.45	0.87	0.83	1.30	6	34.7	58.73	99.35	11.3
Advertising		0.53	0.32	0.55	0.79	0.88	1.33	5	35.5	54.32	92.54	15.5
Air transportation		0.34	0.70	0.48	0.90	0.83	1.36	4	37.4	46.12	75.33	13.1
Railroads		0.08	2.29	0.28	0.96	0.88	1.38	3	43.0	20.60	66.71	3.0
Engineering, architecture, survey		0.26	0.31	0.40	0.94	0.76	1.41	2	36.9	49.98	95.39	7.0
Computer and data processing		0.39	0.28	0.43	0.98	0.81	1.45	1	34.7	57.30	91.23	9.0

Industry	share of women	skill ratio (skill I/ skill II+)	standard deviation of ln wage	wage ratio median/ mean	wage of women/ industry wage	industry wage/ overall mean wage	wage rank	mean wage	share of employees		
									share of employees below 35 years	share of employees servicing occupations	wage below 2/3
	1	2	3	4	5	6	78		9	101	1
Germany											
Private households	0.98	0.39	0.89	1.00	0.98	0.45	32	40.2	39.5	95.7	94.6
Eating, drinking & care facilities	0.65	0.34	0.47	1.00	0.87	0.63	29	36.6	50.3	85.8	59.3
Personal services	0.83	0.40	0.25	0.92	0.87	0.52	31	34.2	58.6	90.8	78.4
Services to dwellings etc.	0.70	0.29	1.22	0.97	0.85	0.66	28	39.8	37.3	90.9	62.0
Retail trade, food	0.74	0.35	0.25	0.95	0.85	0.60	30	37.3	46.9	88.5	69.7
Retail trade, non-food	0.66	0.34	0.15	0.98	0.84	0.66	27	37.3	47.2	82.7	56.5
Autom. repair services etc.	0.11	0.17	0.10	0.97	0.84	0.84	21	34.2	58.6	16.4	6.7
Membership organizations	0.57	0.25	0.17	0.99	0.86	1.01	14	40.3	37.4	89.1	7.7
Business services	0.41	0.26	0.29	0.97	0.86	0.78	24	36.9	48.8	75.4	26.5
Bus, taxi, rent-a-car, gasoline	0.22	0.16	0.24	0.99	0.88	0.88	18	38.4	42.9	85.0	7.2
Other repair services	0.28	0.28	0.12	1.00	0.78	0.72	26	36.1	56.1	31.8	39.3
Entertainment, sports	0.50	0.23	0.18	1.01	0.86	1.07	10	39.5	40.7	88.8	4.3
Wholesale, intermediate products	0.33	0.20	0.19	0.99	0.87	0.96	16	39.2	41.9	78.5	6.1
Wholesale trade, nondurable	0.36	0.30	0.27	0.99	0.79	0.75	25	38.3	44.2	82.7	37.1
Health	0.77	0.25	0.16	0.96	0.91	0.89	17	35.9	54.3	93.5	13.0
Real estate	0.53	0.22	0.19	0.96	0.87	1.04	11	41.2	31.6	91.1	5.3
Wholesale, final products	0.46	0.30	0.17	0.98	0.80	0.80	22	38.5	43.8	81.0	29.8
Education & research	0.57	0.25	0.08	1.02	0.87	1.17	4	40.9	30.3	95.1	4.7
Wholesale trade, durable	0.29	0.25	0.10	0.97	0.83	0.84	20	38.8	42.2	73.2	19.7
Finance	0.50	0.17	0.10	1.00	0.87	1.18	3	37.6	46.3	97.4	0.3
Government	0.40	0.22	0.15	1.00	0.83	1.11	6	39.7	39.4	88.1	2.9
Wholesale, chemical products	0.53	0.36	0.15	0.97	0.79	0.79	23	38.5	40.9	77.3	35.5
Water transportation	0.17	0.15	0.18	0.99	0.91	1.08	8	41.5	34.0	73.8	0.3
National security, internat. aff.	0.26	0.23	0.28	0.97	0.88	1.04	13	40.0	41.1	65.8	3.7
Public utilities	0.14	0.17	0.18	0.98	0.85	1.25	2	41.9	31.0	55.6	0.2
Communication services	0.35	0.23	0.17	0.99	0.80	1.04	12	39.5	40.0	84.0	6.6
Legal, management, accounting & PR	0.75	0.25	0.07	0.94	0.87	0.84	19	34.2	59.9	98.0	22.2
Advertising	0.57	0.20	0.11	0.99	0.90	1.00	15	35.5	56.4	83.4	4.6
Air transportation	0.32	0.20	0.16	0.98	0.84	1.25	1	38.2	41.8	75.7	0.2
Railroads	0.07	0.16	0.19	0.99	0.76	1.13	5	44.2	20.9	72.1	0.7
Engineering, architecture, survey	0.41	0.24	0.08	1.00	0.79	1.11	7	38.5	44.4	92.9	2.2
Computer and data processing	0.32	0.28	0.06	1.05	0.75	1.07	9	35.4	54.8	93.3	10.8

4.1. SECTORS WITH GREAT DIFFERENCES IN EMPLOYMENT/GROWTH RATES

What are the characteristics of industries in which US-German employment-population ratios differs most? In which US-German employment growth rates differ most?

The difference in industry-specific employment-population ratios for 1970 and 1995 in columns 8, 9 of table 4.1 show that in most sectors more workers are employed per adult in the US than in Germany, though there are nevertheless some service industries which have a higher employee-population ratio in Germany. 'Railroads', some 'wholesale' industries, 'services to dwellings', 'automotive repair', 'personal services' 'membership organisations', and 'government' employ a higher share of the population in Germany than in the US. The contribution of these industries to the overall difference in the service sector employee-population ratio in 1995, however, is less than 1 percent save for 'railroads', 'government', 'personal services' (column 10, 11 of Table 4.1). The big differences in employment rates are for sectors where the US has greater employment. Ranking sectors by their 1995 contribution to the overall higher employee-population ratio in the US than Germany we find that the biggest contributors are: 'education and research' (20% of the overall difference), 'health (19%), 'eating, drinking, care' (16%), the aggregate retail trade sector (12%, food and non-food retail), 'business services' (9%), 'finance' (7%), 'bus, taxi, rent-a-car' (6%), and aggregated 'wholesale trade' (5.5%). These eight sectors contribute about 80 percent of the overall US-German difference in the service-sector employee-population ratio. Some of these sectors are low paid but some, most notably education and research are high pay sectors.

To analyse the characteristic of sectors where the US and Germany had different growth rates, we took the difference in their differences, as given in column 7 of Table 4.1. Again, the picture is heterogeneous. Some industries grow faster in the US than in Germany but in many cases the contrary holds. However, there is not one significant correlation of this series with any of the industry characteristics displayed in Table 4.2 of the one or the other country.

In short, the overriding impression from this analysis is that the service sector is heterogeneous in terms of employment and wages, with no systematic relation between the level of wages and employment trends. The disparate nature of the rapidly growing service industries calls into question the standard version of the wage compression hypothesis - that German or EU employment

growth has been sluggish relative to the US among low skill workers because wages are less dispersed in the EU. This observation leads naturally to the next issue: whether employment growth is concentrated in different parts of the wage distribution in Germany and the US.

5. EMPLOYMENT GROWTH DIFFERENTIALS BY WAGE LEVEL

The wage compression hypothesis holds that employment in low-wage jobs has grown in the US at a higher rate than in the rest of the economy. But the preceding analysis shows that some high growth industries in the US were high paying industries. Overall, is the difference in employment growth between the US and Germany concentrated in low-wage groups?

The diagrams in Figure 5.1 display differences in employee-population ratios from the CGAS at the vertical axes and categories relative wages at the horizontal axes. These data is obtained from very detailed cells. The top diagram shows that employee-population ratios in the US increased strongly not only at the low-wage end but also in high-wage classes although at more moderate rates. In the period 1970 to 1995 about 70% to the overall growth in the employee-population ratio in the US occurred in jobs paying two-thirds or less of the mean wage. Another 35% of growth in employment-population occurred in jobs paying more than one-third above than the mean wage. By contrast, employment fell slightly in jobs in the middle of the income distribution, which reduced the increase in the overall employee-population ratio by about 4 percent. This is u-shape represents the hollowing out of the US job distribution and is another way of looking at the pattern of rising wage inequality. With more workers in low wage and high wage jobs, the decile distribution of wages necessarily rises.

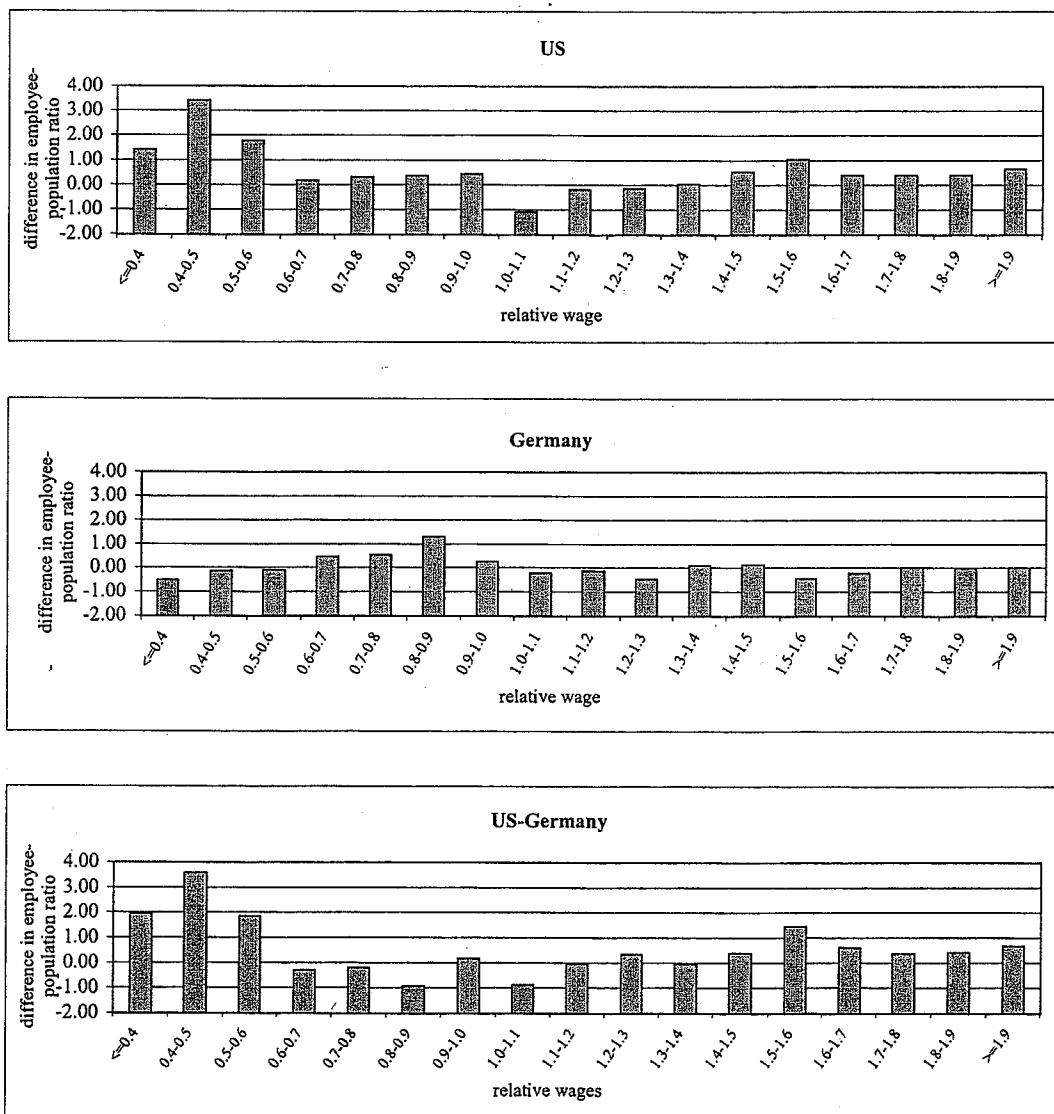
The middle diagram of Figure 5.1 shows the difference in employee-population ratios in Germany between 1995 and 1970 versus the wage class. The pattern here is quite flat, as one may have expected from the minor change in the aggregate employee-population ratio. However, the wage groups slightly below the mean had some increase in employment while those in the very low-wage groups had some decrease. If we ask how much the different wage groups contributed to the overall change in the employee-population ratio in Germany (which only increased by about 0.6 percentage-points), we find a negative contribution of jobs with wages equal to or below two-thirds of the mean wage, a negative contribution of jobs which paid one-third above the mean wage, but a positive contribution of jobs in the middle range.

The bottom diagram of Figure 5.1 makes the differential pattern of employment growth between the US and Germany even more pronounced, by displaying country differences in the difference in the wage-group specific employee-population ratios along the vertical axis. Overall between 1970 and 1995 the US employee-population ratio increased by 10 percentage-points relative to the German employee-population ratio. Low-wage jobs contributed about 125% to this difference. That is, the difference in the growth of low-wage employment between the US and Germany is higher than the overall difference. Another 56% is contributed by jobs paying one-third or more above the mean wage. By contrast, jobs with wages in the middle of the distribution (wages within one-third

of the mean) grew faster in Germany than in the US, contributing -86% to the overall difference in employment growth. Thus the difference in employment growth between the two countries results from higher growth of employment at the upper and lower end of the scale in the US than in Germany partly compensated by a stronger expansion of jobs in the middle of the wage scale in Germany.

Why have we found clear differences in employment growth patterns when analysing trends in employee-population ratios across wage groups but found that wage growth/levels were unrelated across industries. Part of the answer is that we looked only at linear relations between

FIGURE 5.1: DIFFERENCES IN EMPLOYEE-POPULATION RATIOS BY WAGE GROUPS, 1970-1995



Source: CGAS data base

wages and employment growth in our industry analysis, whereas employment growth across wage groups in the US has a clear U-shape. Another reason could be that low wage workers are spread fairly uniformly across the industries and experience employment growth within each industry, which would be masked in any industry level analysis. Where, in fact, are low wage workers found in the US and Germany?

6. LOW-WAGE WORKERS

Are low-wage workers evenly spread across industries or are they concentrated in specific industries? Do low-wage Germans and low-wage Americans have similar or dissimilar educational and demographic profiles?

To examine the concentration of employment of low-wage workers among sectors we calculated Herfindahl indices (introduced earlier to analyse the occupational composition of industries) to measure the concentration of low-wage workers by industry. The Herfindahl indices in Table 6.1 show a striking change over time in the concentration of low-wage workers by industry between Germany and the US. In 1970 low-wage workers were equally concentrated across industries in the US and Germany but in the 1990s they became much more concentrated in Germany compared to the US. Indeed in 1995, low-wage workers were concentrated in low-pay industries in Germany but were widely distributed across the economy in the US. About 50% of the low-wage American workers work in industries in which the industry mean wage of is 80% or less of the overall mean (column 10 of Table 6.1 we used a wider definition than the two-third of the mean here, because very few industries have mean wages that low, see Table 4.1). By contrast, in Germany 75% of the low-wage workers are in industries with wages of 80% or less of the mean wage (columns 7, 8). A roughly similar proportion of the low-wage Germans and low-wage Americans work in services (80%) which is only 5 percentage points above the US service share in overall employment but 20 percentage-points above the overall service share in Germany (compare the upper and lower panel of Table 6.1).

That low-wage workers are much wider spread across the industries in the US than in Germany helps explain why we simultaneously find a u-shaped pattern of employment growth across the wage groups in the US but no relation between industry-specific employment growth and industry wages. The link between low-wage employment and specific industries exemplified by 'McDonald' Jobs is

thus much weaker in the US than in Germany. Over time the increase in wage dispersion within US industries indicates that both low-wage employment and high-wage employment grew while the stability of wage dispersion within German industries is consistent with the growth of German jobs in the middle of the wage distribution.

The most striking difference in the demography of low-wage workers between Germany and the US is that women workers are more highly represented among low wage employees in Germany than in the US (column 5 of Table 6.1) whereas young workers (column 6) are more highly represented among low wage employees in the US than in Germany. Given male-female wage gaps, this may help explain why relative wages in low-pay services are actually further below the average wage in Germany compared to the US. In the US, with the rising profile of wages by age, low-wage employment is increasingly becoming youth employment.

TABLE 6.1: CHARACTERISTICS FOR LOW-WAGE, MIDDLE RANGE AND HIGH-WAGE WORKERS (15-65 YEARS)

	share in overall employment [in%]	wage in the group / overall mean	education (mean) [years]	age (mean) [years]	Shares					Herfindahl index
					female [in%]	under 25 years [in%]	service industries [in%]	service occupations [in%]	industries with mean wage < 8 overall mean [in%]	
	1	2	3	4	5	6	7	8	9	10
Low-wage workers (<=2/3 of mean wage)										
US										
1970	24.9	0.33	11.0	37.5	74.3	30.7	70.4	72.6	33.7	0.056
1995	31.6	0.52	12.0	32.0	60.5	41.1	79.2	74.7	48.4	0.071
Germany										
1970	16.3	0.51	10.0	32.8	90.3	35.4	55.5	61.9	59.6	0.060
1995	15.2	0.53	11.0	35.8	85.7	19.9	82.2	77.0	74.9	0.120
Middle range workers (>2/3 of mean wage <4/3)										
US										
1970	58.2	0.96	11.9	38.5	30.6	17.6	59.7	64.4	6.0	0.037
1995	49.2	0.96	13.4	38.7	46.1	6.9	72.4	75.3	14.3	0.049
Germany										
1970	70.6	1.01	11.7	38.1	28.5	16.7	40.9	49.6	9.7	0.044
1995	72.3	0.99	12.7	39.6	41.1	8.7	59.4	63.5	12.3	0.045
High wage workers (>=4/3 of mean wage)										
US										
1970	16.9	1.77	14.3	43.5	14.7	4.7	58.2	79.6	3.0	0.062
1995	19.3	1.74	15.7	43.6	30.6	0.5	73.3	88.2	4.4	0.056
Germany										
1970	13.2	1.49	15.0	45.1	3.5	2.1	61.0	87.9	0.8	0.091
1995	12.5	1.48	15.7	45.2	3.8	0.7	48.5	87.2	0.6	0.076
All employees (15-65)										
US										
1970			12.1	39.1	38.8	18.7	62.1	69.0	12.4	0.037
1995			13.4	37.6	47.7	16.4	74.7	77.6	23.1	0.047
Germany										
1970			11.7	37.7	34.7	18.4	43.5	56.7	16.1	0.038
1995			12.8	39.7	43.3	9.6	61.5	68.3	20.4	0.042

Source: CGAS data base

7. THE WAGE COMPRESSION HYPOTHESIS AND DEMAND FOR LOW WAGE LABOUR

The wage compression hypothesis blames the EU's employment problems on its relatively egalitarian wage structure. At the industry level, this suggests that employment by industry should be inversely related to wages along a demand curve. While popular, this explanation turns out to be difficult to prove empirically. Many studies tried to identify the relationship between wage structure and employment growth (Katz/ Loreman/ Blanchflower 1995, Krueger/ Pischke 1999, Card/ Kramarz/ Lemieux 1994) but have not managed to find much trade-off. We sought to give the wage compression explanation of the US-German employment difference a maximal chance of working by investigating the relation for several employment and wage measures. We used as employment measures: the growth rate of employment by industry over time; the change in the share of employment by industry, and changes in employment-population ratios by industry. We related these employment measures to the relative industry wage of the initial year and the change in relative industry wage within each country (Table 7.1, equation 1 for the initial wage, equation 2 for the change in wages), essentially using each country's earlier/later experience as a counterfactual. We also sought a demand relation using cross-country analysis. First, we regressed the difference in employment between Germany and the US on the difference in relative wages (cross-country analysis, equation 3), which makes each country's employment and wage experience the counterfactual for the other. Then we regressed the difference in the change of employment between Germany and the US on the difference in the change in relative wages (difference in difference, equation 4), making each country's change in employment and wage the counterfactual for the other¹¹.

The regressions in Table 7.1 show that none of these calculations yield a systematic statistically significant relation between wage structure, changes in relative wages and employment. The calculation that we view as providing the best test of the compression story is the difference in the difference regression (international comparative, equations 4), since this tests whether differential industry employment trends in two countries are influenced by differential wage trends. It does not produce significant coefficients in the 1970-1989 period nor in the sub-periods.¹²

In sum, our examination of the wage compression hypothesis (like that of other empirical researchers) finds little

empirical support for the belief that lack of jobs in the EU is due to the effect of the compression of wages on employment in low skill industries. It is possible that a more sophisticated version of the hypothesis, which explains weaker employment growth in high wage industries by insufficient wage dispersion in those areas due presumably to supply side factors (see Davis and Hendrickson) while explaining weaker employment growth in low wage industries to demand side factors as suggested by Freeman (1998) might work, but the technical difficulty in fitting a model that lies along the supply curve for some observations and along the demand curve for others is high. In any case, we are left with the conundrum: the bulk of the difference between US and German employment can be traced to structural factors in the form of differential size and growth of the service sectors, but none of the extant hypotheses seems able to account for this difference.

8. WAGES, WEDGES, CONSUMER DEMAND, ALLOCATION OF TIME, AND HOUSEHOLD PRODUCTION

What, then, might explain the linkage between the structure of employment and the aggregate employment-population outcomes? One possible explanation is that at least part of the US-German (US-EU) difference is attributable to differences in the consumption behaviour of Americans and Germans. Americans work long hours and take short vacations. Both men and women in couples are generally employed full-time. This means that Americans devote less time to leisure and household production than Germans. Taking this behaviour as given, if Americans demanded a similar bundle of household services as Germans, they would have to buy these services in the market rather than produce them at home. The result should be a much larger consumer service sector in the US than in Germany, due to the given difference in the allocation of time. If the only area for major employment growth in a modern economy is in the service sector, moreover, the difference in consumer demands would translate into smaller employment levels and growth in Germany (and other EU economies with a similar structure).

Our analysis of private final consumption shows a pattern consistent with this reasoning. American and German households spend about 30% of their incomes on 'food and beverages' but they spend this money in different sectors. In the US more than half of food and beverages

¹¹ See Appendix III

¹² In addition, we replicated Alan Krueger and Steve Pischke (1999) analysis using age-skill cells instead of industries and also found no relation.

TABLE 7.1: ESTIMATES OF THE WAGE ELASTICITY OF EMPLOYMENT

		Employment growth		Number of industries		Employment shares		Number of industries		Employment population ratios	
		Elasticity				Elasticity				Elasticity	Number of industries
Germany											
Equation 1	1989-1970	Ns		62		Ns		62		Ns	62
	1980-1970	.33 (.176)		55		.33 (.18)		55		.33 (.17)	55
	1989-1980	Ns		55		Ns		55		Ns	55
	1995-1989	Ns		64		Ns		64		Ns	64
Equation 2	1989-1970	-1.7 (.59)		62		-1.78 (.59)		62		-1.78 (.59)	62
	1980-1970	Ns		55		Ns		55		Ns	55
	1989-1980	-2.6 (.76)*		55		-2.6 (.76)*		55		-2.61 (.760)	55
	1995-1989	Ns		64		Ns		64		Ns	64
US											
Equation 1	1989-1970	Ns		64		Ns		64		Ns	64
	1980-1970	Ns		64		Ns		64		Ns	64
	1989-1980	-.33 (.19)		64		-.33 (.19)		64		-.33 (.19)	64
	1995-1989	Ns		64		Ns		64		Ns	64
Equation 2	1989-1970	Ns		64		Ns		64		Ns	64
	1980-1970	-1.08 (.33)*		64		-1.08 (.33)*		64		-1.08 (.33)	64
	1989-1980	Ns		64		Ns		64		Ns	64
	1995-1989	Ns		64		Ns		64		Ns	64
Germany - US (cross-country)											
Equation 3	1970	Ns		62		Ns		64		Ns	62
	1980	Ns		55		Ns		55		Ns	55
	1989	Ns		64		1.2 (.67)		64		1.26 (.67)	64
	1995	Ns		64		Ns		64		Ns	64
Germany - US (difference in difference)											
Equation 4	1989-1970	Ns		62		Ns		62		Ns	62
	1980-1970	Ns		55		Ns		55		Ns	55
	1989-1980	Ns		55		Ns		55		Ns	55
	1995-1989	Ns		64		Ns		64		Ns	64

Coefficients displayed are significant at the 10% level; a * indicates significance at the 5% level; in parentheses: standard errors

Source: CGAS data base

spending goes to restaurants (which contributes about 2.2 percentage points to the US-German difference in employees-population rates, according to Table 4.1). In Germany only 25% of food and beverages spending goes to restaurants. This difference in consumption patterns shows that the US service industries employs relatively more workers than the German service industries in part because they face greater demand for output.¹³

We can carry this analysis further, however, moving some of the givens from premises to an endogenous part of the story. Bell and Freeman (1995) have argued that the difference in the dispersion of wages between the US and Germany underlie much of the difference in work time. After all, basic labour supply analysis suggests that a smaller wage payoff to additional hours of work should lead workers to choose less hours, and a lower dispersion of pay means almost arithmetically smaller payoffs. At the same time, the wedge between workers' wages and labour costs/prices due to non-wage costs and taxes differs between Germany and the US. Non-wage costs add about 46 % to prices in Germany but add only 17 % to prices in the US. The difference is due to differences in social security contributions, paid vacation, value added tax and sales. Figure 8.1 shows rough estimates of the difference between wages, labour costs and prices between the two countries.¹⁴ Moreover, while social security contributions and paid vacation, which make up the lion's share in non-wage labour costs, is roughly similar for all industries and skill groups in Germany, these costs vary across groups in the US. In the US, legally fixed non-wage labour costs are low and private pension plans and health insurance cover disproportionately higher skilled workers. Thus, non-wage labour costs affect prices evenly in Germany, but fall disproportionately on higher wage workers in the US. As a result the relative cost of services from low-wage workers will be lower in the US,¹⁵ reinforcing the outsourcing incentive for household services.

The magnitude of this effect depends on the price elasticity of demand for services, which have a high content of low-skilled labour. With price-elastic product demand the

difference in labour costs should affect product demand and consequently labour demand (Schettkat 1998, Appelbaum/ Schettkat 1999).¹⁶ Assuming that the wedge between wages and costs/prices affects consumer services with an elasticity -1, we estimate that the greater difference between gross wages and prices in Germany may have reduced the employment-population ratio by about 2.5 percentage points and may be the cause for part of the service gap between the US and Germany (Europe).

The proposed explanations put wage dispersion and labour costs at the centre of the story, but through the substitution of time and goods in household production rather than through the substitution of skilled for unskilled workers in the business sector. However, the importance of product market effects through prices, competition and regulation as well as differences in consumption patterns and time use, and a more sophisticated investigation of skill differences based on better data could not be done in this study.

¹³ It is often argued that Germans and other Europeans spend their vacation in other countries and thus create service demand outside the domestic economy, i.e. in National Accounting terms they import services. German households spend 4.9% of their overall expenditures abroad compared to only 1.4% of American households. At the same, however, on residents purchase goods and services amounting to 3.3% of overall final consumption expenditure in Germany, the comparable US figure is 1.9%. Thus the net effect of 'consumption trading' (for all products not only services) is -1.6 percentage in Germany but 0.5 in the US.

¹⁴ In both countries legal social security contribution are only due up to a certain income and therefore have a regressive effect.

¹⁵ See Freeman/ Schettkat 1998, 1999b for details.

¹⁶ Our 'back-of-the-envelope' calculation of the impact of price variations on employment is: demand (q) responds to changes in price (p) according to the price elasticity of demand.

1. $d \ln(q) = -\epsilon d \ln(p)$

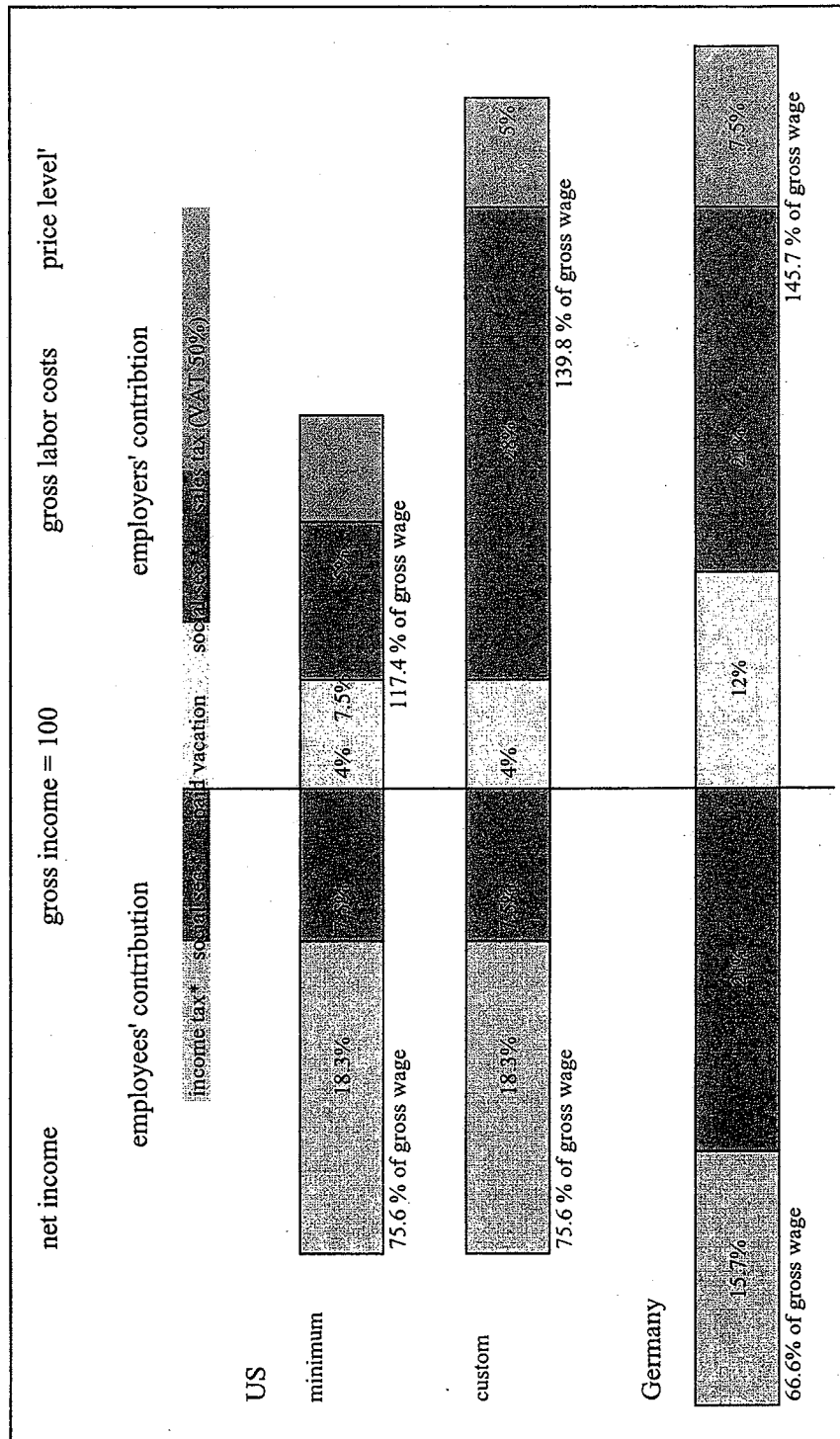
If prices are set as a mark-up (assumed fixed) over labor costs (including non-wage labor costs) the impact of wage variations on prices depends on the share of labor costs in overall costs (α):

2. $d \ln(p) = \alpha d \ln(w)$ so that $d \ln(q) = -\eta \alpha d \ln(w)$

Changes in employment depend in addition on changes in productivity (t). Abstracting from any direct wage elasticity of labor demand we get:

3. $d \ln(E) = d \ln(q) - d \ln(t)$ or $d \ln(E) = -\eta \alpha d \ln(w) - d \ln(t)$

FIGURE 8.1: ESTIMATE OF THE WEDGE IN THE US AND GERMANY



* legally defined social security contributions apply only to incomes up to certain level and may therefore be lower than the given percentages for incomes above these ceilings

** income taxes apply to a single low-wage worker (OECD 1998)

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APPENDIX I: THE COMPARABLE GERMAN-AMERICAN STRUCTURAL (CGAS) DATABASE

COMPARABILITY

We made an effort to reclassify the German and US data into similar occupations and industries. The data have been made comparable over time (from 1970 to 1995) and between countries. This required some aggregation and we were left with 64 comparable industries and 94 comparable occupations.

DATA

The US are sub-samples from the 1970, 1980 and 1990 Census and the 1989 and 1995 CPS outgoing rotation group files. These data is available at individual level. Since we had for Germany only information on a detailed cell level but no strictly individual data, we aggregated the US data into comparable cells.

For Germany access to data is difficult and except from small surveys (like the GSOEP) no information on hourly wages is available. Reliable income data is available from the Beschaeftigtenstatistik, which covers all employees subject to social security contributions but there is only limited information on hours worked. Hours worked are available from the Mikrozensus –a 1% survey of the German population. We used the income information from the Beschaeftigtenstatistik and estimated wage functions (daily wage) for full-time workers (excluding apprentices) with the following explanatory variables: age (5-year age groups), education (8 groups), sex, occupation (94), and industry (64). The coefficients were used to estimate per day wages for the Mikrozensus sample. We estimated hours worked for similar cell definitions and used this to estimate hourly wages.

APPENDIX II: EQUIVALENT SKILL GROUPS

Comparing skills across countries is difficult. The standard measure of skills are inputs like years of schooling or the highest degree achieved, which differ depending on the institutional features of educational systems. In addition if the quality of education differs, even well chosen comparisons of educational levels may be misleading. The fact that the US educational system is based at a local level, with relatively little national or even state control, implies moreover that to a greater extent than in most countries, a year of schooling has different meaning within the country. In the following we present two different classifications of skill: one that we have derived that seeks to transform German and US schooling levels into comparable measures on the CGAS; and one based on Green-Steedman, who have developed another such comparison.

Based on years of schooling as derived from the national data sets, we then developed a comparable classification scheme, which accounts for differences in skill levels attached to years of schooling. We distinguish four levels, in which to classify workers into equivalent skill groups. Hillary Steedman and Andy Green developed a somewhat different classification scheme, based on 'detailed scrutiny of syllabuses, examination papers and assessment procedures' (Green/ Steedman, 1997, 2) that provides a useful alternative to ours. Green and Steedman correct for the difference in actual skill levels by shifting the German scale up across the entire skill levels. i.e., the German educational system is estimated to produce higher skill levels in general. Our classification scheme shifts the German scale up only at the lower end of the schedule. This may be justified by the fact that in the International Adult Literacy Survey (OECD 1997) among the low educated adults (not completed upper secondary education) about 50% scored at level 3 and 4/5 on the document reading scale but only about 18% of the Americans. We do not regard years of schooling in Germany at the higher levels to be superior to the American schooling.

Table A.2 shows the share of employment in the four levels of education by the two categorisations. For the lowest level the two systems give comparable employment and log wages. Our categorisation puts more US workers in the second and third lowest levels and fewer in the highest level than does Green/Steedman. For Germany our scheme gives more weight to the second level and much less to the third and fourth level whereas in the Green-Steedman scheme level three covers almost 60% of the workforce and level four constitutes 25% of the workforce. Our top group are masters' and above whereas their top group consists of all bachelors' degrees and above, on the US schooling. If one takes the standard deviation of log wages as a measure for the quality of the classification schemes – the lower the standard deviation for wages within a grouping the better the grouping – there is no difference between the two schemes for the US but our scheme produces substantially lower standard deviations for Germany.

TABLE A.1 EQUIVALENT SKILL LEVELS

Level	Freeman-Schettkat			Green-Steedman		
	US	Years of schooling	Germany	US	Years of schooling	Germany
1	9 th grade	9-	No certificate Hauptschule	High school Graduate	9-	Hauptschule
	10 th grade	10	Realschule		10	Realschule, Apprentice of less than 3 years
	11 th grade	11			11	
	Highschool graduate	12	Hauptschule + Apprenticeship		12	Abitur, Fachhochschulreife
2	Some college, no degree	13	Realschule + Apprenticeship; Abitur	Some college	13	Apprentice 3 years or more
		14	Hauptschule + Meister Realschule + Meister		14	
	Associate degree	15		Associate degree and equivalent qualifications	15	
3	Bachelor's degree	16	All 4 years Bachelor degrees & higher	16	All first and higher degree	
		17		17		
4	Master or higher	18+	University degrees	18+		

Source: Own estimates and Green and Steedman (1997)

TABLE A.2 WAGES, WAGE DISPERSION AND SKILL DISTRIBUTIONS ACCORDING TO DIFFERENT CLASSIFICATION SCHEMES (1989)

Skill level	Ours			Green/ Steedman		
	Log wage	Standard deviation	Share in employment	Log wage	Standard deviation	Share in employment
US						
Level 1	2.08	.40	45	2.08	.40	45
Level 2	2.29	.42	30	2.20	.42	21
Level 3	2.57	.38	17	2.33	.41	8
Level 4	2.79	.39	8	2.64	.39	25
Germany						
Level 1	2.71	.37	16	2.7	.37	13
Level 2	2.98	.30	69	2.75	.36	2
Level 3	3.32	.19	7	2.96	.29	58
Level 4	3.32	.15	8	3.25	.22	26

Source: Computations based on the CGAS

APPENDIX III: REGRESSION MODELS

We tested the following models for three different specifications of employment:

1: CHANGES OF INDUSTRY EMPLOYMENT REGRESSED ON RELATIVE WAGES IN THE INITIAL YEAR:

$$\Delta \ln(e) = \alpha + \beta \ln(w)_{t-1} + \varepsilon$$

2: CHANGES OF INDUSTRY EMPLOYMENT REGRESSED ON CHANGES IN RELATIVE WAGES:

$$\Delta \ln(e) = \alpha + \beta \Delta \ln(w) + \varepsilon$$

Where: $e = E_i$, $e = E_i/E_{\bullet}$, or $e = E_i/\text{pop}$ respectively; E = employees 15-65 years old; i = industry index; pop = population 15-65 years old; $w = w_i/w_{\bullet}$; w = hourly wage.

3: CROSS-COUNTRY ANALYSIS.

The difference in industry employment between Germany and the US is regressed on the inter-country difference in relative industry wage:

$$\ln(e)_t^G - \ln(e)_t^{US} = \alpha + \beta [\ln(w)_t^G - \ln(w)_t^{US}] + \varepsilon$$

4: INTERNATIONAL COMPARATIVE ANALYSIS (DIFFERENCE IN THE DIFFERENCE ANALYSIS).

The difference between the growth of industry-specific employment in Germany and the growth of industry-specific employment in the US is regressed on the inter-country difference in the change of industry-specific wages:

$$\Delta \ln(e)_t^G - \Delta \ln(e)_t^{US} = \alpha + \beta [\Delta \ln(w)_t^G - \Delta \ln(w)_t^{US}] + \varepsilon$$